# Enforcement in Sovereign Debt Markets

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**Abstract**

This thesis studies one of the fundamental features of international financial markets: the limited mechanisms for enforcement of government debt (Reinhart and Rogoff, 2009, p. 53). Specifically, I analyze if sovereign debt can be legally enforced, and which impact creditor rights have for bond markets. Much of the sovereign debt literature assumes that legal enforcement mechanisms play an irrelevant role. This thesis provides new evidence which sheds doubt on this premise.

I introduce and analyze new datasets on lawsuits filed by private investors against foreign governments in courts in the United States (US) and the United Kingdom (UK), and combine these with existing data on prices and yields of sovereign bond markets. Based on five self-contained chapters, the thesis deals with two central questions: first, which role do lawsuits play as a cost of default? Second, how do bond markets develop in crisis situations? With respect to the first question, my co-authors and I find that since the early 1990s, an increasing share of sovereign defaults are subject to lawsuits in national courts in the US and the UK, although the numbers are still relatively small. Lawsuits are especially likely if governments impose large losses on their creditors (chapter 2). However, litigation can have significant repercussions on governments' financial markets and trade relations. Hence, even though the numbers are limited, it can create considerable nuisance value (chapter 3). Studying the 2001/02 Argentine default in depth, I furthermore show that contract design of sovereign bonds is significantly correlated with creditor participation and litigation in sovereign default workouts, and that especially distressed debt investors are likely to file and advance lawsuits (chapter 4). With respect to the second question, we find that pricing on sovereign bond markets reflects these developments. Government debt is predominantly traded on over-the-counter markets rather than on centralized exchanges. These markets become increasingly illiquid during debt crises, increasing the trading costs for creditors. This opens up opportunities for investors specializing in illiquid distressed debt (chapter 5). Furthermore, sovereign bonds with stronger legal protection against ex-post contract amendments by the debtor government trade at higher prices during financial crises. This implies that investors value legal enforcement opportunities, at least in distressed markets (chapter 6). Taken together the results indicate that legal enforcement plays an important role in sovereign debt markets.

*Keywords:* Sovereign debt; Legal enforcement; Litigation; Creditor coordination; Bond markets; Market liquidity

**Zusammenfassung**

Diese Dissertation befasst sich mit einem der zentralen Merkmale globaler Finanzmärkte: den begrenzten Möglichkeiten der Durchsetzung von Staatsschulden (Reinhart und Rogoff, 2009, S. 53). Sie analysiert ob Staatsschulden rechtlich durchgesetzt werden können, und welche Effekte Gläubigerrechte auf Anleihemärkte haben. Ein Großteil der ökonomischen Literatur zu Staatssschulden geht von der Annahme aus, dass diese nicht rechtlich durchgesetzt werden können. Die vorliegende Arbeit präsentiert neue Erkenntnisse, die diese Sichtweise in Frage stellen.

Die Dissertation stellt neue Datensätze zu Gerichtsverfahren von privaten Gläubigern vor Gerichten in den USA und Großbritannien gegen ausländische Regierungen vor und kombiniert diese mit umfassenden Daten zu Preisen und Zinsen auf Staatsschuldenmärkten. Die fünf eigenständigen Kapitel behandeln Aspekte zweier grundlegender Fragestellungen: Erstens, welche Rolle nehmen rechtliche Gläubigerklagen als Sanktionsmechanismus für Staatsbankrotte ein? Zweitens, wie entwickeln sich Staatsschuldenmärkte in Krisensituationen? Meine Ko-Autoren und ich zeigen, dass seit den frühen 1990er Jahren Staatsschuldenkrisen zunehmend häufiger von Gläubigerklagen begleitet sind, auch wenn die absolute Zahl nach wie vor relativ gering ist. Klagen treten insbesondere in großen Umschuldungen mit hohen Verlusten für Investoren auf (Kapitel 2). Diese Gerichtsverfahren können jedoch einen materiellen Einfluss auf den Kapitalmarktzugang einer Regierung oder die Handelsbeziehungen eines Landes haben. Daher können selbst wenige klagende Gläubiger erhebliche Kosten eines Staatsbankrotts verursachen (Kapitel 3). In einer detaillierten Fallstudie der argentinischen Schuldenkrise zeige ich zudem, dass die Ausgestaltung von Anleiheverträgen einen signifikanten Einfluss auf die Teilnahmeraten in Umschuldungen sowie Klagequoten von Gläubigern haben, und dass vor allem auf Krisen spezialisierte Investoren Klagen anstreben (Kapitel 4). Im Hinblick auf die zweite Frage zeige ich, dass diese Entwicklungen sich in den Preisen gehandelter Anleihen widerspiegeln. Regierungsanleihen werden größtenteils auf außerbörslichen Märkten gehandelt. Diese werden in Krisenszenarien zunehmend illiquide und erhöhen damit die Handelskosten für Investoren. Somit ergeben sich potentiell Möglichkeiten für auf Krisensituationen spezialisierte Investoren (Kapitel 5). Zudem finden wir, dass Staatsanleihen mit stärkeren rechtlichen Schutzklauseln gegen ex-post Vertragsänderungen durch die Schuldnerregierung während Krisen mit einem Preisaufschlag gehandelt werden. Dies bedeutet, dass Investoren durchaus rechtliche Durchsetzungsmöglichkeiten wertschätzen, zumindest in riskanten Marktumgebungen (Kapitel 6). Zusammenfassend findet diese Arbeit, dass rechtliche Durchsetzung von Staatsschulden heute eine wichtige Rolle für dieses Marktsegment einnimmt.

*Schlagwörter:* Staatsschulden; Rechtliche Durchsetzung; Zivilklagen; Gläubigerkoordination; Anleihenmärkte; Marktliquidität

# Contents

# List of Figures

# List of Tables

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Berlin/Wiesbaden, November 2015 Julian Schumacher

# Chapter 1

# Introduction

The most notable feature of sovereign debt is that it exists at all (Bulow and Rogoff, 1989a; Shleifer, 2003). For centuries, international relations rested on the premise that governments are sovereign actors which cannot be held accountable to the rulings of legal institutions. This principle of sovereign immunity also includes financial transactions. A government which is unable or unwilling to repay its contractually due debt is not subject to a supranational authority that could enforce penalties against such contract violations. No other relation on financial markets is subject to a similar power asymmetry. The only viable legal recourse for investors is to turn to the courts of global financial markets for enforcement of contractual rights, where the principle of sovereign immunity applies only to a restricted set of government actions. The determinants and effects of sovereign debt enforcement in national courts form the core of this thesis.

The unique legal situation of sovereign debt becomes clear in comparison to private business or household borrowers. A private debtor who does not repay either has to come to a voluntary agreement with its creditors about a reduction in her liabilities, or face court-organized bankruptcy proceedings. The bankruptcy court will oversee negotiations to distribute the remaining assets among creditors. An agreement accepted by the majority of creditors becomes binding for *all* creditors, even if they would not voluntarily agree to the terms. These conditions are also binding for the debtor, unpleasant as they may be, and will be enforced – if necessary, by means of the state's monopoly of force.[1] That is not the case for sovereign borrowers. There is no international bankruptcy court which could liquidate a country, and no international marshall service, police, or military force exists that could back up its authority by enforcing a hypothetical agreement. Despite notable policy efforts at establishing an international regime which

[1] Bankruptcy laws often distinguish between *reorganization* and *liquidation*. The former has the purpose of satisfying a reasonable share of the creditor's claims, but at the same time giving the debtor the opportunity to reduce her liabilities and continue her operations. It can therefore be applied to individuals, businesses, and (in the US) municipalities. Liquidation, on the other hand, implies the sale of a debtor's remaining assets and means that the enterprise cannot be continued afterwards. It is hence only applicable to businesses. In the US, bankruptcy procedures are codified in Title 11 of the United States Code, with different chapters for liquidation (Chapter 7), reorganization (Chapter 11), individual insolvency (Chapter 13), and public insolvency (Chapter 9). In Germany, bankruptcy is governed by the *Insolvenzordnung*, implemented in 1999. For a summary of the historical development of bankruptcy laws, see Skeel (2003) or Wood (2007).

could coordinate and govern the workout of sovereign defaults (Rogoff and Zettelmeyer, 2002; Krueger, 2002), the institutional framework has remained virtually unchanged.

## 1.1 Contribution to the literature

It is therefore commonly understood that legal enforcement plays no role in sovereign debt markets, or represents a minor nuisance at best (Reinhart and Rogoff, 2009; Aguiar and Amador, 2013; Moody's, 2013). In the absence of legal enforcement, alternative default penalties must give the government incentives to repay if borrowing can be maintained in equilibrium. The most well-known theoretical default penalties include reputation on financial markets (Eaton and Gersovitz, 1981; Kletzer and Wright, 2000; Arellano, 2008), direct punishments such as trade interference or military intervention (Bulow and Rogoff, 1989a), the signaling value of default on other aspects of the economy (Cole and Kehoe, 1998; Sandleris, 2008), or negative effect on domestic creditors such as banks or voters (Guembel and Sussman, 2009; Broner et al., 2010; Gennaioli et al., 2014).

Although most often quoted for contributing the argument that disruptions to trade flows can be a direct default penalty, Bulow and Rogoff (1989a, p. 158) explain that the underlying channel "for repayment is the threat of direct sanctions that lenders can impose by going to creditor country courts [...] For example, if a country repudiates its foreign loans, it will be forced to conduct its trade in roundabout ways to avoid seizure." More recently, Bolton and Jeanne (2009) and Pitchford and Wright (2012) revived the idea that even small numbers of litigating creditors can have significant effects on the debtor country's economy if they are veto players who can prevent the default from being cured. Empirical tests of this proposition (Rose, 2005; Martinez and Sandleris, 2011) focused on the correlation of default with trade flows, without taking into account that legal sanctions in creditor countries are a necessary condition for this mechanism.

The findings of this thesis provide new empirical evidence on legal enforcement of government debt in foreign courts. Two main results stand out. First, my co-authors and I find that since the early 1990s, an increasing share of sovereign defaults are subject to lawsuits in national courts in the US and the UK. Lawsuits are especially likely if governments impose large losses on their creditors (chapter 2). Besides – in some cases – being highly profitable to distressed investors, litigation can have significant repercussions on governments' financial markets and trade relations (chapter 3). Based on an in-depth case study of the Argentine 2001/02 default, I furthermore show that contract design of sovereign bonds is significantly correlated with creditor participation and litigation in sovereign default workouts (chapter 4).

Second, pricing on sovereign bond markets reflects these developments. Government debt is predominantly traded on over-the-counter markets rather than on centralized exchanges. These markets become increasingly illiquid during debt crises, increasing the trading costs for creditors. This opens up opportunities for investors specializing in illiquid distressed debt (chapter 5). Furthermore, sovereign bonds with stronger legal

protection against ex-post contract amendments trade at higher prices during financial crises (chapter 6). This implies that investors value legal enforcement opportunities, at least in distressed markets. If sovereign debt contracts and legal provisions were truly irrelevant, bond prices should be invariant to them.

## 1.2 Summary of chapters

**Chapter 2: What Explains Sovereign Debt Litigation?**
*With Christoph Trebesch and Henrik Enderlein*

Over the course of the 20th century, many countries moved away from a doctrine of absolute sovereign immunity towards a more restrictive interpretation, allowing lawsuits against foreign governments for an increasing number of reasons (Weidemaier, 2014). Since the late 1970s, it became possible to sue foreign defaulting states in the US and the UK which continue to be the most important global capital markets (Das et al., 2012). This chapter analyzes in which conditions creditors have resorted to legal enforcement of sovereign debt in these jurisdictions.

By drawing on a newly collected dataset of all lawsuits filed between 1976-2010 in the US and the UK, we find that the absolute number and likelihood of creditor litigation has indeed strongly increased over this period. However, there is a considerable variation between debt crises, with a few defaults triggering dozens of lawsuits, while the majority could be resolved without a single case. This chapter therefore analyzes the determinants of lawsuits by private creditors. We estimate the probability that a country's debt restructuring is affected by litigation conditional on a set of crisis-, country-, and global-level variables. We find that crisis-characteristics can explain the variation reasonably well. Debt restructurings involving large volumes are more likely to be accompanied by litigation, as are deals with high net present value losses for investors. In addition, country-characteristics play a significant role. States that are more dependent on international trade and have weaker bureaucracies are more often subject to lawsuits. We rationalize these empirical findings through a simple model in which governments can make a single offer to creditors who are heterogeneous in their costs of going to court. Depending on a country's characteristics, the government's optimal offer will change; this will result in different degrees of creditor litigation across debt crises.

**Chapter 3: Sovereign Defaults in Court**
*With Christoph Trebesch and Henrik Enderlein*

Models of direct default penalties such as those by Bulow and Rogoff (1989a), Bolton and Jeanne (2009), or Pitchford and Wright (2012) rely on the assumption that creditors can impose costs on foreign governments through their national judicial institutions. Possible realizations of such costs are the legal exclusion from capital markets, the seizure of trade revenues, or blocking a restructuring agreement with other investors. This

chapter empirically tests these possibilities as effects of creditor litigation.

Using the new dataset, we test three hypotheses with respect to the possible impact of creditor litigation: (i) countries subject to litigation are less likely to issue new debt, (ii) bilateral trade flows between countries decline if one trade partner is affected by litigation, (iii) debt restructuring negotiations take longer to be settled if some creditors are litigating against the country. In these three tests, we rely on established data and methods from the literature, and enhance the existing empirical models by our litigation measures as an additional dimension of default (for market access, see Gelos et al. 2011; for trade, see Rose 2005; for delay, see Trebesch 2010). We find that investor lawsuits significantly decrease the likelihood of market access, and significantly increase the duration of restructuring negotiations. The effects for trade are ambiguous and depend on the specification of the empirical model. To improve the causal interpretation of the empirical correlations, we rely on qualitative case studies for each hypothesis. We find ample evidence of cases in which creditors interfered with financial market access, trade flows (especially in natural resources), and restructuring negotiations.

**Chapter 4: Coordination Problems in Sovereign Debt Restructurings: Holdouts and Litigation in Argentina**

Argentina's 2001/02 default and 2005 restructuring is widely regarded as the debt crisis most strongly affected by creditor litigation (Sturzenegger and Zettelmeyer, 2006; Moody's, 2013). This is also the result from the new cross-sectional dataset on creditor litigation used in chapters two and three. Argentina's exchange had the lowest participation rate of all bond exchanges since the late 1970s, and was subject to an exceptionally high share of litigation, including not only institutional creditors, but also retail investors. The cases culminated in a 2012 injunction based on the *pari passu* clause prohibiting Argentina from making payments on a large number of bonds exchanged in the 2005/10 restructurings. These stylized facts suggest considerable variation between different types of creditors, as well as between different bond contracts. This chapter exploits the within-country variation to uncover the determinants of creditor participation and litigation.

The core of the chapter is a newly coded dataset on the Argentine restructuring, consisting of two parts. First, a systematic overview of all lawsuits filed in New York courts. Second, bond-by-bond data on non-participation (holdout) and litigation rates. Two main descriptive findings emerge from the data. With respect to litigation, the majority of lawsuits (measured by debt volume) were filed by a small number of specialized distressed debt hedge funds. These funds were also the plaintiffs driving the *pari passu* litigation, forcing Argentina into a new default in 2014. With respect to holdouts, however, bonds especially designed to appeal to retail investors were particularly likely to have low participation rates. I rationalize these findings with a highly stylized model of heterogeneous valuation, where retail investors are more optimistic about the value of

defaulted bonds, but have relatively high costs of filing a lawsuit.

**Chapter 5: Sovereign Debt Crises and Bond Market Liquidity**

After the sovereign debt crises of the 1980s especially in many Latin American countries, governments borrowing from international capital markets increasingly turned to issuing bonds to investors, rather than obtaining loans from banks (IMF, 2004; Tanaka, 2006; Hale, 2007). With this shift towards marketable debt, trading of bonds between investors on secondary markets became possible. Government bonds are mostly traded in over-the-counter markets (see for instance Duffie et al., 2007; Bai et al., 2012; Pelizzon et al., 2013), meaning that market makers (dealers) take an intermediary role by bridging temporary imbalances in supply and demand. The spread between dealers' purchase (bid) and sales (ask) prices is a widely used measure of the liquidity in these markets, as it approximates the trading costs for investors. Since liquidity is a priced risk factor (Duffie et al., 2003; Acharya and Pedersen, 2005), increasing illiquidity may contribute to vicious circles of reinforcing borrowing and trading costs (Brunnermeier and Pedersen, 2009; He and Milbradt, 2014). This chapter estimates the liquidity of sovereign bond markets during financial crises.

Using a comprehensive dataset of bond-by-bond pricing data, I run event studies of crisis events and panel regressions in a sample of defaulting and non-defaulting emerging market countries. The main result of this chapter is that increasing credit risk is indeed correlated with wider bid-ask spreads. Sovereign bond markets become especially illiquid once a payment default has occured or been announced. In such market conditions, specialized distressed investors discounting illiquidity may play a particularly important role. Furthermore, liquidity risk contributes negligibly to yield spreads in calm times, but significantly increases spreads in crisis episodes, both for defaulting and non-defaulting countries. This is in line with findings from Eurozone bond markets (Beber et al., 2009; De Pooter et al., 2014). Taken together, these results suggest that a possible negative feedback effect from liquidity risk to yield spreads exists.

**Chapter 6: Foreign Law Bonds: Can They Reduce Sovereign Borrowing Costs?**
*With Marcos Chamon and Christoph Trebesch*

Governments sometimes discriminate between their domestic and foreign creditors. While a number of models assume that domestic investors are generally preferred (Guembel and Sussman, 2009; Broner et al., 2010), the evidence in emerging markets is mixed: in numerous instances, governments have treated external creditors *more favorably* than domestic residents (Erce, 2012). This is in line with the notion of "hard-to-restructure debt" suggested by Bolton and Jeanne (2007, 2009). A particularly well-known example of such discrimination is the Greek 2012 bond exchange. While the restructuring imposed a haircut of circa 65% on domestic law bonds, participation for foreign law bondholders

was voluntary (Zettelmeyer et al., 2013). Those investors who did not tender their bonds subsequently received full and timely repayments according to the original terms. This chapter analyzes if foreign law bonds of Eurozone governments are priced at a premium relative to their domestic law counterparts, reflecting that the market is aware of possible discrimination.

Foreign law bonds are usually denominated in different currencies than domestic law bonds, which makes it difficult to disentangle a currency premium from a legal premium. Using a sample of Eurozone bond markets provides a unique setting to deal with this problem, since Germany issues credit risk-free bonds in the same currency as more risky countries. Using the difference between the yield curves of the US, the UK, Switzerland and Japan, and the yield curve of Germany to approximate currency risk, we compute hypothetical domestic law yields of Eurozone countries in foreign currencies. We can then compare the actually observed yields on the foreign law bonds with the theoretical domestic law yields in these currencies to derive a foreign law premium. We find that a significant premium for risky European issuers exists, but only during times when their credit risk is high, as measured by credit default swap (CDS) premia. This implies that while "hard-to-restructure-debt" exists, its ex-ante benefits for lowering borrowing costs in non-crisis times are likely to be limited.

## 1.3 Historical origins of legal sovereign debt enforcement

Legal enforcement of sovereign debt is not a completely new phenomenon, even though it has come to greater public attention in recent decades. Notable early examples of sovereign debt enforcement in court were related to the repudiation of US state debts in the mid-19th century (English, 1996; Waibel, 2011).[2] Allen (1933) provides numerous examples of creditor litigation against national and sub-national foreign governments in courts in Belgium, France, Germany, Italy, and Switzerland in the early 20th century. But one of the first legal battle between bondholders and a defaulting government involved a bond placed by the Republic of Bolivia in London in 1872.[3] Besides including notable contractual innovations,[4] the case provides an exemplary illustration of the causes and consequences of sovereign debt litigation.

In 1868, the Bolivian government approached a US engineer, George Earl Church,

[2]The American states had sold their debt abroad, notably in the UK, and as a result of their defaults faced "long and persistent litigation maintained by the council [Council of Foreign Bondholders] in the Federal courts." (New York Times, "The Old Dominion's Debt", 19 December 1891) Bondholders sued, among others, the states of West Virginia, North Carolina, Georgia, and Mississippi. The litigation against West Virginia, for instance, proceeded to the US Supreme Court in 1915 (238 U.S. 202) before a settlement was reached in 1920. The settlement prompted the Council of Foreign Bondholders to conclude that West Virginia had "now only done so under compulsion, and after the most determined efforts to evade the judgment of the Supreme Court of the United States." (Corporation of Foreign Bondholders, 1921, p.27)

[3]The following paragraphs rely on the extensive summary in *Wilson v. Church*, Court of Appeal 1878 W. 81., except where otherwise noted. See also Gulati and Scott (2012) for a brief summary of the case and the legal innovations in the bond prospectus.

[4]Weidemaier et al. (2013) argue that the bond was the first sovereign bond containing a *pari passu* clause.

for an infrastructure project to connect Bolivia to the Amazon river (Craig, 1907). The plan involved a complex web of companies incorporated specifically for this project in the US and the UK, government concessions granted by the Republic of Bolivia and the Republic of Brazil, and multiple subcontractors.

Importantly, however, the funding for the project should be almost entirely provided through a secured bond placed by Bolivia in London in 1872 (the newly set up companies were incorporated with almost no equity). The bond (see Figure 1.1) with a principal of GBP 1.7m, to be repaid through annual payments of 2% into a sinking fund, carried a coupon of 6% (National Bolivian Navigation Company, 1873) and promised a yield at issuance of 8.8%.[5] The bond included considerable safeguards: first, it explicitly pledged the future revenues from the newly constructed railway. Second, GBP 600,000 (the total estimated construction costs) of the GBP 1.7m were not transferred directly into the hands of the Bolivian government, but rather administered by an English trustee in an account with the Bank of England. And third, the trustee also retained enough money to cover the coupon and sinking fund payments until 1874, when the railway was planned to be completed.

Nevertheless, the bond quickly went into arrears. The original subcontractor failed to achieve any meaningful progress on the railway until 1874, and subsequent contractors did no better. Bolivia never made any payments, so that a payment default occurred in 1875 when the funds which had been retained and deposited with the trustee at issuance were exhausted (Corporation of Foreign Bondholders, 1876).

In January 1874, bondholders filed suit against the Republic of Bolivia, the trustee, and the railway companies. Although Bolivia was in default, the country could not be forced to fulfill its obligations. The legal battle hence quickly turned to the question what should be done with the remaining trust funds that were earmarked for construction expenses. Bondholders wanted the funds distributed pro rata among them;[6] the Bolivian government claimed them for herself; the engineers and the companies wanted them disbursed for further construction efforts.

After years of litigation, the creditors prevailed. While the bondholders were not able to receive their due payments, they successfully negotiated an agreement with Bolivia in 1876/77, according to which the government waived its claim on the trust funds and consented to have them distributed among the bondholders (Corporation of Foreign Bondholders, 1878). The trust fund, which had been invested in US treasuries by the trustees in the meantime, was sufficient for an estimated recovery value of between 48% (Corporation of Foreign Bondholders, 1882) and 52% (Craig, 1907, p. 450) of face value. Figure 1.2 shows the affirmation that the judgment was satisfied, invalidating the original claim of the bond.

Notably, for a specific set of bondholders, the settlement meant a highly profitable

[5]The bond was priced at 68% (Craig, 1907; Corporation of Foreign Bondholders, 1882, p.54); the yield reported here is for bonds held to maturity in January 1897, when the final sinking fund payment was due. This implied a spread of 5.6% over UK Gilts at the time of issue.

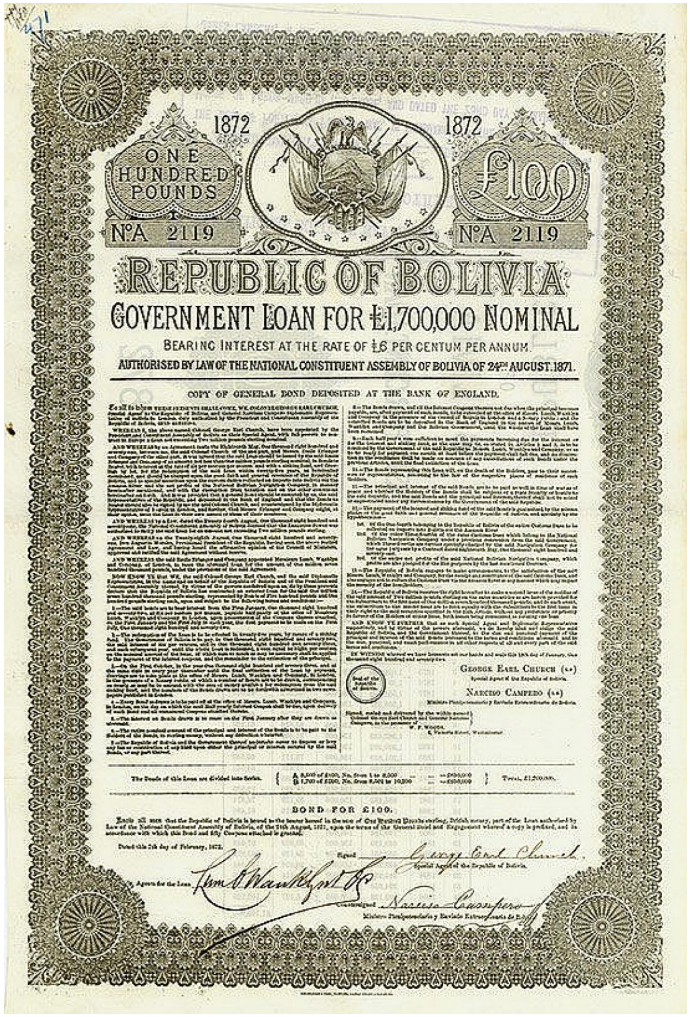
[6]This was one of the first applications of the *pari passu* clause, see Weidemaier et al. (2013).

outcome. Buyers who had purchased the bonds at the all-time low price of 16% of face value were able to more than triple their investments. Decried as "an unscrupulous body of commercial pirates" (Craig, 1907, p. 449), they were also seen as the driving force behind the abandonment of the railway project and distribution of funds among the bondholders.

Why did Bolivia settle with its creditors, despite the fact that the English court judgments could not be enforced on its sovereign assets? One possible reason is that an unresolved conflict with creditors prevented the country from re-accessing the UK capital market. A regulation by the London Stock Exchange (LSE), at the time the most important global financial center (Alquist, 2010), provided that a country could only issue new bonds in England if a "satisfactory arrangement" with the holders of defaulted bonds could be found (Wright, 2011). This meant that until the creditor lawsuits were abandoned, Bolivia was effectively excluded from global capital markets. Indeed, the 1877 agreement provided that the defaulted bonds should be exchanged for new certificates that could be traded again at the LSE; as of 1880, about 87% of creditors had tendered their claims in this manner (Corporation of Foreign Bondholders, 1881).

Figure 1.1: Republic of Bolivia bond, 1872

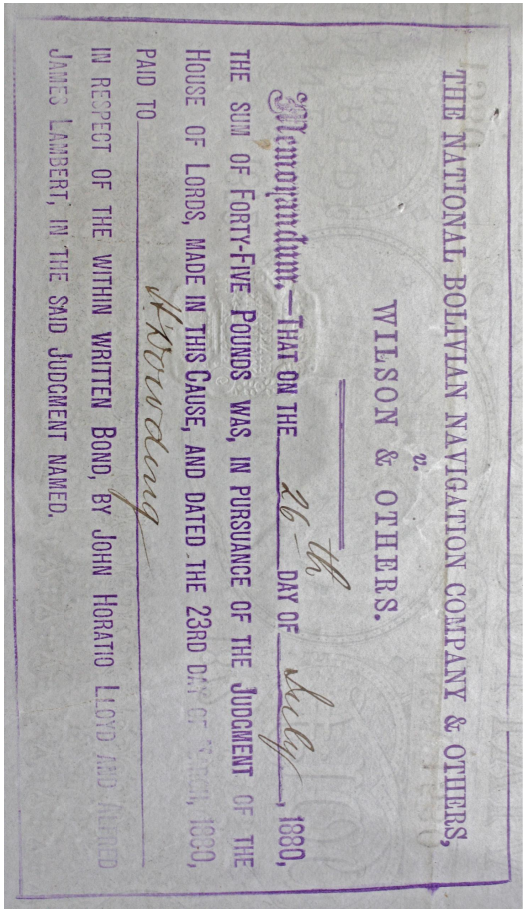
A GBP 100 bond of the GBP 1.7m loan issued in London.




Source: Original on file with the author.

Figure 1.2: Satisfaction of judgment, 1880

The creditor litigation after the default on the bond resulted in distributing the trust funds among the creditors. Once the judgment sum was repayed to the bondholder, the original bonds were invalidated by judicial stamp on the bond document.




Source: Original on file with the author

## 1.4 Conclusion

Why should we care about a railway project which failed almost 150 years ago? The story of the "ill-fated expedition" (Craig, 1907) holds more than just historical entertainment value. It exemplifies two central features of the enforcement of sovereign debt that are still prevalent today and are supported by the results of the subsequent chapters in this thesis.

First, legal enforcement is a difficult challenge for creditors. Even if debtors pledge collateral, or designate payment streams, the opportunities for the enforcement of such terms, or even judgments, are limited. Sovereign governments typically keep few assets abroad, and many are protected by legal immunity even today. This is one reason why sovereign debt litigation is, with some exceptions, a relatively rare phenomenon. However, creditor lawsuits can still be rewarding: The "nuisance value" (Bulow and Rogoff, 1989a) of a pending lawsuit in global financial centers can mean distortions to international financial and trade relations far exceeding the claims at stake. That is why sovereign debt litigation, though limited as a means of *direct* enforcement, plays a significant role in disciplining governments to repay.

Second, today's bond markets for distressed sovereign debt exist, and can be attractive for specialized distressed debt investors. Increasingly risky bond markets become illiquid, opening opportunities for distressed investors. As the Argentine experience shows, these are particularly likely to aggressively litigate for a better deal. Their investments seem to be reflected in the market prices during financial crises, though their impact on borrowing costs in normal times is possibly limited.

From "commercial pirates" in the early days of sovereign bond markets to "vulture funds", as distressed hedge funds are sometimes described today, the aggressive enforcement of sovereign debt is seen by some observers as making defaults excessively costly (e.g. Stiglitz, 2013; Stiglitz and Guzman, 2014). Many others, however, emphasize the ex ante benefits of legal enforcement as a commitment device for governments (Dooley, 2000; Shleifer, 2003; Scott, 2006). In either case, the results of this thesis provide evidence that legal enforcement is an important factor to be considered when analyzing sovereign debt markets.

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# Chapter 2

# What Explains Sovereign Debt Litigation?[1]

Joint work with
Christoph Trebesch[2]
Henrik Enderlein[3]

We study the occurrence of holdout litigation in the context of sovereign defaults. The number of creditor lawsuits against foreign governments has strongly increased over the past decades, but there is a large variation across crisis events. Why are some defaults followed by a "run to the courthouse" and others not? What explains the general increase in lawsuits? We address these questions based on an economic model of litigation and a new dataset capturing the near-universe of cases filed against defaulting sovereigns. We find that creditors are more likely to litigate in large debt restructurings, when governments impose high losses ("haircuts"), and when the defaulting country is more vulnerable to litigation (open economies and those with a low legal capacity). We conclude that sovereign debt lawsuits can be predicted reasonably well with a simple framework from the law and economics literature.

*Keywords: K12, F34, K22*

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## 2.1 Introduction

On 3 October 2012, a subsidiary of the US hedge fund Elliott Associates succeeded in seizing a flagship of the Argentine navy in a Ghanaian port, the vessel ARA Libertad with 300 sailors on board.[4] The hedge fund attempted to use the ship for enforcing claims from Argentina's defaulted government bonds. This drastic legal maneuver is just one of the many repercussions of the Argentine default of 2001. Over the past decade, creditors have tried countless strategies to legally force the country to repay the debt it defaulted on. This paper is an attempt to better understand the occurrence of creditor litigation against sovereign debtors. We study situations in which banks or investment funds refuse to participate in a sovereign debt exchange offer and, instead, sue a defaulting government for full repayment in New York or London courts.

Legal disputes are now a standard ingredient of sovereign debt renegotiations, including the 2012 Greek debt exchange.[5] It is also well-known that litigation can be costly and disruptive. Countries like Argentina devote substantial resources to defend against lawsuits and attachment attempts, despite the fact that sovereign assets are very difficult to seize. Moreover, litigious creditors can cause considerable externalities, such as a disruption of international trade flows, or by blocking government access to international capital markets (Sturzenegger and Zettelmeyer, 2006; Alfaro et al., 2010).

The rise of creditor litigation has triggered an international debate and many policy initiatives. Governments have advocated against litigious creditors[6] and concerns about holdouts have motivated proposals on introducing collective action clauses (CACs) or a new bancruptcy regime such as the IMF's Sovereign Debt Restructuring Mechanism (SDRM) (see Rogoff and Zettelmeyer, 2002; IMF, 2003; Bolton, 2003).[7] The European debt crisis has revived the debate on litigation and related creditor coordination problems (see Gianviti et al., 2010; Roubini, 2010; Weder Di Mauro and Zettelmeyer, 2010; Tirole, 2012; Mody, 2013). Buchheit et al. (2013b), for example, argue that the threat of holdout litigation is a main explanation for the large scale bailouts of Eurozone countries. Because governments want to avoid a "messy" default as in Argentina, they may have become less prone to impose (high) haircuts on their private creditors. Also, the recent reports by

[4] See "Argentine navy ship seized in asset fight", Financial Times, 3 October 2012.

[5] "Fund threatens to sue over Greek bond losses", Financial Times, 15 December 2011; "Bet on Greek Bonds Paid Off for 'Vulture Fund"', New York Times, 15 May 2012; and "Slovak bank sues Greece over 2012 bond swap", Kathimerini, 9 May 2013.

[6] In a speech to the United Nations, the former UK finance minister Gordon Brown called creditor litigation by distressed debt funds "morally outrageous" (BBC, 10 May 2002), while Hank Paulson, his former US colleague, said that he "deplore[s] what the vulture funds are doing" (Bloomberg, 8 January 2008). The World Bank, the Paris Club, and the IMF, as well as NGOs such as Jubilee also warned of the dangers of holdout litigation (see Alfaro et al., 2010), and they have recently been joined by the European Commission (2012).

[7] Additional initiatives include a 2010 law passed in the UK to ban creditor lawsuits against the poorest countries undergoing debt relief. Two Channel Islands, Jersey and Guernsey, are currently preparing legislation that resembles the UK bill, while Belgium passed a bill to prevent the seizure of assets by litigious creditors in 2008. The African Development Bank has also recently set up the "African Legal Support facility" to support debtor countries facing litigation.

the IMF (2013) and Buchheit et al. (2013a) suggest that creditor litigation has become a serious stumbling block for sovereign debt restructurings.

Others do not necessarily see creditor holdouts and litigation as a reason for concern. Shleifer (2003) and Scott (2006) argue that stronger creditor rights could have a positive effect on sovereign debt markets, because governments will be less likely to overborrow and default.[8] A similar argument is made by Dooley (2000) and Pitchford and Wright (2007), who conclude that it can be welfare-reducing to make debt renegotiation less costly ex-post, e.g. by reducing holdout litigation. More generally, Bolton and Jeanne (2007) analyse the welfare effects of "easy" versus "hard" sovereign debt restructuring.

This study is motivated by the fact that there is only little empirical knowledge on the phenomenon of sovereign debt litigation and related creditor coordination problems, despite the many policy initiatives and a large body of related theoretical work. The existing literature has predominantly focused on a few high profile litigation cases, like *Elliott v. Peru* or Argentina, while systematic evidence has been missing.

Our analysis builds on a new dataset by Schumacher et al. (2014) that comes close to a census of all debt-crisis related lawsuits filed between 1978 and 2010 in the US and the UK, the two most relevant jurisdictions for international sovereign debt disputes.[9] The data are hand-coded from electronic court records from the comprehensive PACER[10] database as well as from documents from Lexis Nexis Law, Westlaw, Casetrack, Justis, and BAILII. Altogether, we evaluated more than 10,000 pages of legal documents and verified each data entry across all sources available, including previous data collections and academic research.[11] This coding approach allows us to tackle one of the main hurdles in quantitative legal research: sample selection bias. For the US, we are able to identify the universe of initiated lawsuits following a default or restructuring, including those that are settled out-of-court or those which remain unresolved. The data reveal new insights:

- *Stylized Fact 1: The probability of litigation has strongly increased.*
  We find that the total number of lawsuits is only 121 (not counting multiple lawsuits by the same creditor), but more than half of these cases have been filed since the year 2000. The likelihood that a debt crisis is accompanied by creditor litigation has increased from less than 10% in the 1980s to more than 40% in recent years.

- *Stylized fact 2: There is a large variation across debt crisis cases.*
  We find that some defaults trigger dozens of lawsuit in foreign courts, others

[8] Similarly, Fisch and Gentile (2004) suggest that holdout creditors can foster the functioning of credit markets in distress and thereby facilitate the restructuring process.

[9] Recent research confirms the continued dominance of English and New York law in cross-border bond and loan markets, see IMF (2002), Das et al. (2012), and Gulati and Scott (2012).

[10] Public Access to Court Electronic Records, http://www.pacer.gov.

[11] In particular, the cases identified in the HIPC initiative reports by the IMF and the World Bank (various issues), and those listed in Cleary Gottlieb Steen & Hamilton and Clifford Chance (1992), Buchheit (1999), EMTA (2009), IIF (2009) and in the academic literature (Singh, 2003; Sturzenegger and Zettelmeyer, 2006; Alfaro et al., 2010; Trebesch, 2010).

none. Overall, litigation affected only 31 of the 174 sovereign debt restructurings with foreign banks and bondholders between 1978 and 2010 (18 % of all cases). Similarly, we find that only 26 debtor governments were affected, out of a total of 69 defaulters.

The aim of this paper is to rationalize the above stylized facts on litigation occurrence. Why are some debt crises followed by a veritable "run to the courthouse", while most cases see no litigation at all? Is it true that poorer countries are more likely to be sued, as often suggested in the policy debate? And what explains the general rise in litigation occurrence over the past decades? We address these questions with a standard model from the law and economics literature and by estimating probit and count models using litigation measures as our dependent variable. The resulting framework is a first attempt to develop an "early warning system" of creditor lawsuits in the context of sovereign defaults.

To guide the econometric analysis, we draw on an established framework on the economics of litigation that goes back to Coase (1960), Landes (1971) and Posner (1973) and is surveyed by Cooter and Rubinfeld (1989). The model predicts litigation to be determined (i) by the expected probability of winning a lawsuit (landmark judgments and changes in legal doctrine), (ii) by the cost of litigation to creditors and debtors, and (iii) by the scope of damage suffered by creditors. Moreover, we draw on theories from international finance and international trade disputes to further discipline our choice of explanatory variables. The seminal paper by Bulow and Rogoff (1989a) suggests that banks can impose legal sanctions on defaulting sovereigns and that the resulting asset seizures will disrupt international trade. If this is true, economies that are more open will be more vulnerable to litigation. We therefore include measures of trade and financial openness as a proxy for the creditor's probability of winning. We also account for the characteristics of each debt restructuring. First, we include the amount of restructured debt, as a proxy for the number of creditors. This is in line with the model by Pitchford and Wright (2012a), which predicts that more creditors increase negotiation delays and the probability of litigious holdouts. Second, we include the size of haircuts, which is in line with the related paper by Bi et al. (2011). High creditor losses make it more attractive to reject the exchange offer and instead sue for repayment of 100% of face value (see also Buchheit, 1999; Roubini and Setser, 2004). Finally, we control for the legal capacity of debtor governments, the cost of litigation to creditors, and for the existence of liquid secondary markets.

The results are in line with the theoretical priors. Landmark judgments are important in explaining the observed number of lawsuits. But legal factors become less relevant once we control for economic and financial variables. In particular, we find that trade openness, deal size (amounts restructured), and the scope of creditor losses ("haircuts") are economically and statistically significant predictors of creditor litigation after a sovereign default. A one standard deviation increase in haircut size or in the amount

restructured more than doubles the probability of litigation (from 6% to more than 12%). These findings are robust to including time fixed effects, restricting the sample to the 2000s, and excluding outliers (Argentina, Brazil, Peru). The results also hold when estimating IV regressions that account for the potential endogeneity of haircut size. We conclude that both legal and economic variables help to explain the occurrence and rise of sovereign debt litigation in the past decades.

**Related literature:** The paper contributes to the literature in several ways. First and foremost, we conduct the first broad-based empirical analysis on the occurrence of sovereign debt litigation, an issue that has received considerable attention in economic research. Many recent theory papers have analyzed creditor holdouts, litigation, and the legal framework of sovereign restructurings, including Miller and Zhang (2000), Ghosal and Miller (2003), Weinschelbaum and Wynne (2005), Gai et al. (2004), Haldane et al. (2005), Bolton and Jeanne (2007), Pitchford and Wright (2007, 2012a), Engelen and Lambsdorff (2009), Bi et al. (2011), Lanau (2011), and Ghosal and Thampanishvong (2013). Our paper differs from these contributions in that we use a modeling framework from law and economics which has proven successful in many fields, but has so far not been used to study litigation in sovereign debt markets. More importantly, we expand the empirical literature on creditor litigation, which has been lagging behind theory and remains scarce. Sturzenegger and Zettelmeyer (2006) summarize the history of sovereign debt law, Miller and Thomas (2007) analyze the Argentine litigation episode, Alfaro et al. (2010) and Bradley et al. (2010) test the impact of major court decisions on sovereign bond prices, while Schumacher et al. (2014) study the consequences of litigation on government access to capital markets, trade, and delays in crisis resolution.[12] We are not aware of any previous paper that tests under which circumstances litigation is most likely to occur.

Second, we expand the literature on the general economics of litigation (e.g. Lanjouw and Lerner, 1997; Lerner, 2010). We are among the first to empirically analyze litigation in the context of financial distress and default. Methodologically, we avoid the "tip of the iceberg" problem, a central obstacle in the quantitative analysis of litigation (Priest and Klein, 1984). Researchers on litigation typically only observe cases brought to court, but not the underlying sample of harmful events, such as the total pool of car accidents. In contrast, we observe the full sample of sovereign debt restructurings that could potentially have resulted in legal action by using the data collections by Enderlein et al. (2012), Das et al. (2012), and Cruces and Trebesch (2013). This allows us to draw unbiased inference on the decision to litigate.

Third, we add to a literature on international economic disputes involving sovereign states. Many recent papers have studied trade litigation and related enforcement problems (e.g. the models by Maggi and Staiger, 2011, 2013; Beshkar, 2013). Unlike in the sovereign

[12] There are also dozens of legal studies on the implications of individual cases or on the development of legal doctrine in the field, e.g. Hurlock (1984a,b), Goldman (2000), Wheeler and Attaran (2003), Fisch and Gentile (2004), Gelpern (2005), Blackman and Mukhi (2010), Broomfield (2010), Waibel (2011), and many others.

debt context, however, theory work in this field has been accompanied by a rich body of empirical papers on the determinants and effects of trade disputes, mostly using WTO data (e.g. Bown, 2004, 2005a,b; Busch and Reinhardt, 2006; Grinols and Perrelli, 2006; Davis and Bermeo, 2009). Here we exploit previously unavailable data to add empirical insights on sovereign debt litigation – an increasingly important type of cross-border disputes.

## 2.2 Background and stylized facts

This section describes the legal framework and characteristics of sovereign debt litigation over the past decades. We summarize insights from the legal literature and present stylized facts from our new database, which captures the near-universe of lawsuits filed by institutional investors in the US and the UK in the context of sovereign defaults and restructurings since 1978 (Schumacher et al., 2014). We focus on the period after 1978, since this is the year in which the UK implemented the State Immunity Act, which followed the US Foreign Sovereign Immunities Act (FSIA) of 1976. It was thus only in the late 1970s that sovereign debt lawsuits became possible in these two countries.

### 2.2.1 Sovereign immunity and creditor litigation: past and present[13]

Historically, private creditors had no legal device to force foreign governments to repay in the event of a default. Unlike corporations, governments cannot be liquidated and sovereign debt is typically not backed by collateral. In addition, debtor governments were protected from litigation and asset seizures by the doctrine of "absolute" sovereign immunity, which states that a government cannot be sued in foreign courts.

Since the 1950s, however, sovereign immunity has eroded and lawsuits against defaulting governments in foreign jurisdictions have become possible (Weidemaier, 2014). In the second half of the 1970s, however, both the US and the UK implemented the above mentioned legislation that allowed private individuals to take foreign governments to court over commercial disputes. These reforms opened the gate for today's era of sovereign debt litigation, which was shaped by four main court decisions.

The first benchmark case on sovereign debt litigation was *Allied Bank v. Costa Rica*[14] in 1982, when a group of banks went to court in the US after refusing to accept a haircut in Costa Rica's debt restructuring. The New York court granted a ruling in favor of Allied and established that Costa Rican government assets could in principle be subject to attachment in the US. The case significantly weakened the classic debtor defense of sovereign immunity, as well as further prominent defenses such as the act of state

[13] This section is largely based on Fisch and Gentile (2004), Sturzenegger and Zettelmeyer (2006), Foster (2008), Alfaro et al. (2010), Blackman and Mukhi (2010), Waibel (2011), and Weidemaier (2014). Parts are also taken from Schumacher et al. (2014), who provide a more detailed overview.

[14] Allied Bank International v. Banco Credito Agricola de Cartago, 757 F.2d 516.

doctrine and the principle of international comity (see Sturzenegger and Zettelmeyer, 2006).

A second landmark decision was *Weltover v. Republic of Argentina*[15] in 1992, when the US Supreme Court interpreted the issuance of external sovereign debt as a commercial activity. This decision was fundamental, since it effectively granted US courts jurisdiction over sovereign debt issued under US governing law. Three years later, *CIBC v. Banco Central do Brazil*[16] achieved the first major litigation success by a professional distressed debt investor. The fund owned by the Dart family acquired USD 1.4 bn of Brazilian debt, refused to participate in Brazil's Brady deal of 1992, received a favorable judgment in court, and then sold the debt again at a substantial profit. The case demonstrated the possibly large rewards of holdout litigation. It also weakened the so called champerty defense, which prohibited the purchase of debt with the primary intent of filing a lawsuit. The demise of champerty set the stage for litigation by distressed debt funds, which buy debt at depressed prices in the secondary market and then sue for full repayment in court. Our data show that hedge funds are now the dominant player in this market, accounting for more than 75% of lawsuits filed since 2000.

*Elliott v. Peru*[17] in 2000 marks a fourth landmark decision in this field of law. The case is in many ways representative for the past two decades of sovereign litigation, which can be described as a "hunt for assets". The main challenge for litigious creditors today is not to achieve a favorable judgment, but to execute it and to collect assets. This is because US law only allows attachments on government property that is both *located in the United States* and *used for commercial purposes*.[18] In the lawsuit against Peru, Elliott argued that the *pari passu* clause forces Peru to pay all creditors on an equal basis, including holdout creditors who refused to participate in a past restructuring. Based on this strategy, Elliott succeeded in blocking an interest payment on Peru's Brady bonds. To avoid a default, Peru then quickly settled at face value. The same *pari passu* interpretation has been invoked in numerous other cases, most notably in 2011 by a subsidiary of Elliott which eventually led to Argentina's 2014 default.[19] As of early 2015, however, no other plaintiff has succeeded in blocking interest or principal debt payments on sovereign bonds.[20]

The challenge of enforcing sovereign debt judgments has led distressed debt funds to attempt a variety of attachment strategies – including on assets such as government airplanes, oil tankers, export revenues, or central bank assets and social security funds in overseas accounts. Many of these seizure attempts are primarily aimed at disrupting a country's trade and capital flows, so as to increase the pressure on governments to negotiate a favorable out of court settlement.

[15] Republic of Argentina v. Weltover, Inc, 504 U.S. 607.

[16] CIBC Bank and Trust Co. (Cayman) Ltd. v. Banco Central do Brasil, 886 F. Supp. 1105.

[17] Elliott Associates L.P., General Docket No. 2000/QR192 (Ct. App. of Brussels)

[18] Similar constraints apply in the UK, France, or Germany (Foster, 2008).

[19] NML Capital, Ltd. v. Republic of Argentina, 08 Civ. 6978 (S.D.N.Y.)

[20] Another recent case based on *pari passu*, led by Export-Import Bank of China v. Grenada, 13 Civ. 1450 (S.D.N.Y.), was settled in January 2015 before a similar injunction had been made ("Grenada cuts loan deal with Taiwan", International Financing Review, 7 January 2015).

Besides these spillover costs, governments and creditors are also faced with direct legal fees. While systematic data on the cost of litigation is missing, anecdotal evidence suggests that they can be very high.[21] In the context of the 2006 Iraq restructuring, which involved large-scale litigation, the government paid reportedly USD 6.5m in fees to its legal advisor,[22] while Greece is said to have paid USD 8.5m for legal counsel in the context of the 2012 debt restructuring, including for advice against holdouts and litigation.[23] Even higher fees are reported for Argentina, which is estimated to have paid about USD 400m for its defense.[24] On the creditor side, the hedge fund Elliott claims to have paid "tens of millions of in legal fees" to sue Argentina over the past 12 years,[25] initiating "over 900 seizure attempts over Argentine assets".[26] Similarly, the investment fund FG Hemisphere claims to have spent USD 20m in its legal dispute with the Democratic Republic of Congo (Brown Rudnick, 2012).

### 2.2.2 Stylized facts: a puzzling variation across crises

Figure 2.1 shows the evolution of sovereign debt litigation 1978-2010, in two ways. First, by counting the total number of cases pending in each year (left axis).[27] This data series is obviously influenced by individual crises, in particular the large number of cases filed against Argentina. We therefore also match the litigation cases to the related debt crisis events and show the share of restructurings affected, i.e. the subset of restructurings which involved at least one sovereign debt lawsuit (as five year moving average, right axis). Both ways to cut the data confirm that the prevalence of litigation has strongly increased since the 1980s.

A further key insight from the data is the large variation across crises, as shown in Table 2.5. Only 18% of restructuring events since 1978 were affected by litigation. The majority of crises involve only a single lawsuit, while others are followed by a veritable 'run to the courthouse'. Argentina faced lawsuits by 41 institutional creditors after its 2001 default, as well as dozens of suits by retail investors (which are not considered here).[28] Other restructurings with large-scale litigation were Peru's Brady debt exchange, which triggered 13 lawsuits in the US, as well as Iraq 2006, Liberia 2009 and Congo 2007, which involved 10, 9 and 7 cases, respectively. Generally, we find that most cases are

[21] Pitchford and Wright (2012a) provide a detailed overview on the cost of sovereign debt renegotiations, including legal expenses.

[22] "Cleary Plays Key Role in Easing Iraq's Private Debt", New York Law Journal, 14 April 2006.

[23] "Greece Discloses Fees Paid to Cleary During Sovereign Debt Crisis", The American Lawyer Daily, 22 March 2012; "Greece Details Payments to Advisers Used in Debt Restructuring", Bloomberg Business, 22 March 2012.

[24] "Buitres: el país gastó en abogados unos USD 400 millones", La Nacion, 2 November 2014.

[25] "Last Tango in Buenos Aires", Times Magazine, 14 August 2014.

[26] "Argentina and hedge fund NML Capital ratify their commitment to keep fighting", Mercopress, 6 November 2014.

[27] We merge multiple suits by the same creditor against the same country into one observation, so that the data are structured in creditor-debtor conflict pairs.

[28] Retail investors typically sue for small amounts and are typically not successful in achieving favorable settlements (or in attaching assets).

filed against middle-income countries in the emerging market world, albeit a third of all cases targeted highly indebted poor countries (HIPCs).

What explains the startling variation in litigation across restructuring events? Before conducting our own analysis below, we review the existing literature in search for explanations. We find no systematic study on the drivers of sovereign debt litigation, but various hints:

- A study on sovereign debt litigation by the financial sector groups IIF and EMTA emphasizes that investors will be likely to agree to a restructuring if the offer contains "mutually acceptable terms". Litigation is supposedly least likely in "cooperative agreements performed in good faith" that are considered as "fair by the parties involved" (IIF, 2009, p. 3). This suggests that unilateral defaults with high haircuts may be more prone to litigation. Similarly, engaging in talks with a representative creditor committee is regarded as helpful to prevent legal disputes.

- In her proposal for an SDRM, Anne Krueger (2002) famously suggests that "the increasingly diverse and diffuse creditor community poses coordination and collective action problems" in sovereign debt restructurings, including litigation. Restructurings with a large number of diverse creditors could therefore be more affected by litigation.

- Moreover, in a memorandum to the IMF, Buchheit (1999) explains that litigious creditors partly select their "target" country based on the following criteria: (i) it must be easy to purchase and sell the country's debt on secondary markets, (ii) the debt must be in default and available at a deep discount, and (iii) the restructuring must involve debt issued under New York or English law, or in other ways be potentially subject to jurisdiction in New York or England.

Neither of these propositions, however, has been tested or brought to the data. We therefore have only limited empirical knowledge on what drives sovereign debt litigation. The next sections will try to shed new light on the issue.

## 2.3 Theoretical framework and hypotheses

This section proposes a theoretical framework to structure our empirical analysis. We start with a standard litigation model as reviewed by Cooter and Rubinfeld (1989) and Spier (2007) but apply it to the context of sovereign default and restructurings. The central trade-off in this framework is that creditors will only start a lawsuit if the expected value of going to court exceeds the expected value of not doing so.[29] More specifically,

[29]Coase (1960) famously suggested that a conflict between two negotiating parties is most likely to result in a private settlement instead of a lawsuit in order to avoid the unnecessary costs of a legal battle. This assertion is reflected in sovereign debt markets as well: Most debt exchange offers achieve creditor participation of more than 90% (see Das et al., 2012).

we view a creditor's decision to file suit as a function of three terms: First, the full value of the claim in case she wins the case, multiplied by the expected probability of success. Second, the recovery value that she will be left with if she loses, multiplied by the expected probability of losing. And third, the costs associated with conducting a trial, which occur independently from the trial's outcome. Since the government can influence this trade-off by setting the terms of the restructuring offer, our model consists of a single period two-stage game, which we solve by backward induction.

Suppose the government owes debt to external creditors and for some exogenous reason, e.g. a negative income shock, it decides to fully default or restructure this debt. This implies an exchange offer on the entire stock of outstanding debt, which is reduced by a haircut $h \in [0, 1]$. A government has some discretion in its choice of $h$, but it is also subject to external pressure, in particular if it has requested official sector bailout money, which is the case in the vast majority of debt crises (Marchesi, 2003). The IMF and the Paris Club, for example, can demand a minimum haircut on commercial creditors to reduce the risk of a future default and to assure fair burden-sharing between the private and the official sector (Erce, 2013). We thus assume that the overall haircut $h$ has two components: first, an exogenous part $h_e$, which is determined by ability-to-pay constraints and external pressure. Second, an endogenous component $\delta \in [0, 1 - h_e]$, which is freely chosen by the government and can be interpreted as the willingness-to-pay variable. The lower $\delta$, the more "creditor friendly" the offer, so that the overall haircut is given by $h = h_e + \delta$.

The government faces a trade-off when it decides about $\delta$: increasing the haircut reduces the payment to the creditors who accept the restructuring, but at the same time induces more investors to litigate by reducing the recovery value. If the government cannot find a haircut which allows repayment out of its available resources, it will go into full default, without any repayments to foreign creditors. This outside option implies that an increase in the creditors' legal rights can become detrimental if too many choose to hold out and litigate instead of accepting the offer.

Importantly, we assume that the government cannot discriminate among creditors. The haircut offer $h$ is identical for all investors. This implies that the universal (one-size-fits-all) offer can trigger different reactions among heterogeneous creditors.

### 2.3.1 Creditor decision

The market consists of $n$ creditors, each of which holds an identical claim against the government equal to $d$, such that the aggregate debt the government owes is given by $D = nd$. Creditors are heterogeneous in the costs they face when going to court. For instance, highly specialized distressed investors are more experienced in suing debtor governments and in locating attachable assets and could thus face lower costs of litigating (rejecting the offer). We therefore denote creditor litigation costs $c$ with a subscript $i$, where each $c_i$ is a realization of $c \in [0, \bar{c}]$. $f(c)$ and $F(c)$ describe the density and

cumulative distribution functions of $c$, respectively. We assume that $f'(c) > 0$ in order to describe a cost distribution with fewer creditors with low costs of litigating than creditors with high costs. This is in line with the relatively limited number of creditors engaging in litigation that we observe in the data.[30]

After receiving the restructuring offer, creditors decide whether to accept or not. Accepting implies that the debt claim is reduced by the size of the haircut to $(1-h)d$. This claim will be paid out for sure. The alternative choice is to reject the offer and go to court to demand full repayment. This litigation decision is denoted by a binary variable $L_i = \{0, 1\}$, where $L = 0$ if the creditor participates in the restructuring and $L = 1$ if she litigates instead.

Litigating is risky, because the full claim will only be recovered with success probability $p \in [0, 1]$. The lawsuit will thus fail with probability $(1-p)$, in which case the creditor receives nothing. As in Spier (2007), we assume that the plaintiff's probability of winning $p$ increases in the opportunity cost of the defendant. In the sovereign debt context, one can think of $p$ as a function of the strength of creditor rights at the time of default $l_t$, and the government's cost of facing litigation, denoted as $c_g$, so that $p \equiv p(l_t, c_g)$, with $\frac{\partial p}{\partial l_t} > 0$ and $\frac{\partial p}{\partial c_g} > 0$. We assume that both $l_t$ and $c_g$ are exogenously given. Government costs will arise due to legal fees but also due to litigation externalities such as the cost of losing access to international capital markets or due to asset seizures abroad. Changes in legal doctrine also play a crucial role. As we discuss above, landmark judgments have strengthened creditor rights since the 1980s, thus pushing up $l_t$.

Creditors maximize profits subject to a budget constraint. Their profits consist of income from the recovery value of defaulted government debt if they participate in the restructuring, $(1-h)d$, and cash savings, $s_i$. Creditors will thus invest their full endowment $w_i$ into savings or into expenses for litigation $c_i$, so that:

$$\begin{aligned} \max_{L_i} \quad & \Pi_i = s_i + L_i(pd) + (1 - L_i)(1-h)d \\ \text{s.t.} \quad & w_i = s_i + L_i c_i \end{aligned} \tag{2.1}$$

Combining objective and constraint yields $\Pi_i = w_i + L_i(pd - c_i) + (1 - L_i)(1-h)d$. Hence, the individual expected value of litigating is $pd - c_i$. Creditor $i$ will only choose $L_i = 1$ and litigate if this expected value exceeds the return of accepting the exchange offer, $(1-h)d$:

$$pd - c_i \geq (1-h)d \tag{2.2}$$

Conditional on $h$ and $p$, there can be a creditor for which eq. (2.2) holds with equality. This marginal creditor $i^*$ is indifferent between litigating and accepting the haircut so

[30] We do not make a specific assumption about the cost distribution in order to keep the analysis general. However, it is reasonable to think about the distribution of litigation costs as having a small mass of creditors with low costs, and a relatively large mass with high costs. An example would be a beta distribution with parameter specification $\alpha > \beta$.

that:

$$c_i^* = (p - (1 - h))\, d \tag{2.3}$$

The intuition is that for this marginal creditor, the probability of winning has to exactly offset the loss from accepting the offer, so that she is indifferent between her two options.

In case $c_i^* < 0$, it is not optimal for any existing creditor to file suit, resulting in full participation. However, if there is a $c_i^* \geq 0$ such that eq. (2.3) is fulfilled, there will be a non-negative share of litigating creditors. This creditor group, with costs smaller than the marginal creditor $i^*$, is equal to $Prob(c_i \leq c_i^*) = F(c_i^*) \equiv \Phi$. Put differently, $\Phi$ is the share of creditors that will reject the restructuring offer and litigate instead, while $(1 - \Phi) = Prob(c_i^*)$ is the share of creditors that accept the haircut. We denote the density at the marginal creditor $f(c_i^*)$ as $\varphi$.

### 2.3.2 Government decision

The government can choose to offer a debt restructuring with a haircut $h$ and receive its income less repayments, $V^R$, or go into full default and refuse any payments to its creditors (this is equivalent to the government's problem in Bolton and Jeanne, 2007, 2009). Going into full default represents the government's outside option with value $V^{FD}$. If the government chooses this option, creditors receive nothing. The outside option presents essentially a participation constraint limiting the government's willingness to repay more than its available resources (see e.g. Aguiar and Amador, 2013; Sandleris, 2012, for a detailed exposition of such a framework). The government's payoff is given by:

$$V = \max\{V^R, V^{FD}\} \tag{2.4}$$

We normalize $V^{FD} = 0$ for simplicity, although assuming a different autarky payoff does not affect the results. If the government chooses to make an exchange offer, it can anticipate the creditors' reaction to the haircut $h$. Moreover, we follow previous work and assume that a default causes an additional output cost $\kappa$, which increases in the magnitude of the discretionary haircut, $\kappa'(\delta) > 0, \kappa''(\delta) > 0$ (a similar assumption is made e.g. by Calvo, 1988; Bolton and Jeanne, 2007; Bi et al., 2011). This additional output cost can be thought of as other costs of default considered in the literature, for example reputational costs, trade sanctions, or damages to the domestic banking system. The

government's payoff from offering a restructuring is thus given by:

$$V^R = \max_{\delta} \; y - D\Bigg( \underbrace{\int_0^{c_i^*} f(c)p \; dc}_{\text{Repayment to holdouts}} - \underbrace{\int_0^{c_i^*} f(c)c_g \; dc}_{\text{Gov't cost of litigation}} - \underbrace{\int_{c_i^*}^{\bar{c}} f(c)(1-h) \; dc}_{\text{Repayment to participants}} \Bigg) - \kappa(\delta)$$

$$= \quad y - D\Big(\Phi(p + c_g) + (1-\Phi)(1-h)\Big) - \kappa(\delta) \tag{2.5}$$

where $y \in [y_L, y_H]$ denotes the government's uncertain exogenous income. The government will choose to make a restructuring offer as long as the sum of the second and third term in (2.5), the expected repayments and additional costs, do not exceed the realized income. Let $\bar{y}$ denote the income equal to these costs of a restructuring offer. Then the probability of full default is given by the probability that $y \leq \bar{y}$, which can be written as $\pi = \int^{\bar{y}} f(y)dy$. An implication of the full default outside option is that a change in the variables increasing the expected repayments is beneficial for investors only as long as the government does not go into full default. But an increase in the expected repayments also increases the probability $\pi$. For instance, stronger legal creditor rights may increase the probability of successful litigation $p$, and thus raise expected repayments. However, this can also lead to a higher $\pi$ by making an inorderly full default more attractive than a debt exchange whose costs could exceed the government's resources.

Empirically, the latter case is an unlikely situation. In our sample period, all defaulting countries restructured their debt rather than going into complete autarky. We are therefore more concerned with predictions about the share of creditors litigating, conditional on a debt restructuring.

In designing the terms of a debt exchange, the government can anticipate the share of litigating investors. Maximizing $V^R$ with respect to $\delta$ yields the first order condition as:

$$\Gamma \equiv \frac{\partial V^R}{\partial \delta} = D\Big(\varphi d(1-h-p-c_g) - (1-\Phi)\Big) - \kappa'(\delta) \tag{2.6}$$

This simple setup helps rationalizing the occurrence of creditor litigation in sovereign debt restructurings, especially when complemented with insights from the international finance literature. The comparative statics on $\Phi$ from (2.6) lead us to three testable hypotheses about the share of litigation, which are presented in the next section.[31]

### 2.3.3 Hypotheses

First, we expect an increase in $p$ to increase the likelihood of litigation.

$H1:$ $\frac{\partial \Phi}{\partial p} > 0$**.** The higher the creditor probability of winning a lawsuit (or favorable settlement), the higher the risk of litigation.

As explained above, we think of the probability of winning as a function of the legal environment $l_t$ and the government's cost of litigation $c_g$. We control for the legal

[31] See the appendix for a derivation of the comparative statics.

environment by including variables capturing the effect of the four benchmark decisions outlined in section 2.2. Our main proxy for $c_g$ is the openness of the debtor economy, which is motivated by the seminal paper by Bulow and Rogoff (1989a). Their model assumes that creditors can impose legal sanctions on a defaulting country by "seizing" a portion of its exports and lowering its gains from trade (see also Rose, 2005; Mendoza and Yue, 2012). In line with this argument, we expect open economies to be particularly vulnerable to the disruptive effects of debt litigation on trade and capital flows. As an additional proxy for sovereign litigation costs, we use a measure of legal capacity. We expect a poor, developing country to be ill-prepared for a protracted legal dispute in New York or London, and also to be less able to shield its assets from attachment by experienced distressed investors. This intuition is in line with Davis and Bermeo (2009), who argue that developing countries face high fixed costs in WTO disputes, as well as Maggi and Staiger (2013) and Busch and Reinhardt (2003), who find that poorer countries tend to settle their trade disputes earlier and are also less successful in extracting concessions. Accordingly, we expect an increase in debtor legal capacity to lower $c_g$ and thereby $p$, resulting in less litigation.

Second, we focus on those parameters that vary across debt crises, in particular the haircut and the scope of the restructuring $D$.

$H2:$ $\frac{\partial \Phi}{\partial h_e} > 0$, $\frac{\partial \Phi}{\partial D} > 0$**.** Higher exogenous haircuts and larger restructurings increase the risk of litigation.

It is intuitive that a higher haircut increases the incentives to reject an exchange offer and litigate for full repayment, i.e. for 100% of face value. The higher the haircut, the lower the break-even cost of going to court. A similar rationale applies when investors buy defaulted debt on the secondary market, because the wedge between face value and market value of traded debt is likely to increase in the (expected) haircut on that debt. In line with Bi et al. (2011), we therefore expect a higher haircut to increase litigation occurrence. Since the endogenous haircut is the choice variable of the government, in the empirical analysis we will allow haircuts to be both exogenously and endogenously determined.

Furthermore, we expect larger debt restructurings to be more affected by litigation. One reason is that larger restructurings typically affect a larger number of creditors.[32] More creditors make coordination more difficult and increase the probability that at least some creditors hold out and litigate. This simple rationale is consistent with the model of Pitchford and Wright (2012a,b), which predicts that a higher number of creditors results in longer delay in sovereign debt renegotiation. Another potential reason why larger deals involve more litigation are economies of scale. To see this, recall that we have assumed a fixed cost of litigation for creditors, meaning that $c_i$ is independent of the size

[32]Trebesch (2010) codes the number of creditors for a sample of 90 sovereign bank debt exchanges in the "London Club" era, i.e. between 1980 and 1997. He finds a close relationship between deal size (amount restructured in USD) and the number of banks affected by the exchange (the correlation coefficient is 0.46).

of debt involved. A larger $D$ will then translate into a higher share of litigating creditors because the ratio of cost to potential return (full repayment of $d$) decreases.

Third, we expect litigation to decrease in $\bar{c}$.

$H3: \quad \frac{\partial \Phi}{\partial \bar{c}} < 0$. Higher legal costs for creditors decrease the risk of litigation.

To account for this, it is useful to think of $c_i$ as the opportunity costs of holding out. When credit is cheap for all investors (and the distribution of creditor costs bound by a low $\bar{c}$), it is less costly to buy and hold non-performing debt for litigious purposes. In contrast, holdout litigation is a costly activity in times of high borrowing cost (high $\bar{c}$), such as the high-yield period of the 1980s.

In the next section, we bring these theoretical predictions to the data.

## 2.4 Empirical approach and results

### 2.4.1 Estimation strategy and data

Empirically, we do not observe the marginal creditor's cost $c_i^*$. However, we do observe the actual occurrence of litigation in debt restructurings, $Y$. For this purpose, we use the full list of sovereign restructuring events between 1978 and 2010 from Cruces and Trebesch (2013), and match it with our dataset on litigation events, accounting for lawsuits filed either before or after the respective debt exchange. This leaves us with a cross-section of 174 restructuring events, of which 31 involved creditor litigation.[33]

As a baseline we estimate the probability of a restructuring being affected by legal disputes. Put differently, we are looking for debt crises in which $c_i^* \geq 0$, so that the marginal creditor's cost of litigation is within the bounds of $c$ (non-negative), resulting in at least one lawsuit. Translated into a standard latent variable model, this implies that

$$Y = \begin{cases} 1 & \text{if } c_i^* \geq 0 \\ 0 & \text{if } c_i^* < 0 \end{cases} \tag{2.7}$$

where $Y$ switches from 0 to 1 if one or more creditors file suit in London or New

[33]The original dataset by Cruces and Trebesch (2013) listed 180 debt exchanges. We use their recently updated version, which includes four previously omitted cases (Congo 1988, Mozambique 2007, Nicaragua 2007 and Liberia 2009,) and drops two deals which turned out to not have been implemented (Mozambique 1987 and Cameroon 2002). Note also that a few countries saw two debt restructurings in the same year. In case the court documents do not allows us to uniquely match a litigation case to one of the two events, we merge them into one observation per country and year. This yields a final sample of 174 cases.

York. We thus estimate the following reduced-form model:

$$Prob(Y = 1|\mathbf{X}) = \tag{2.8}$$

$$\Phi\Bigg( \underbrace{\beta_1 \text{Landmark Judgments}}_{Legal\ Environment} + \underbrace{\beta_2 \text{Trade Openness} + \beta_3 \text{Legal Capacity}}_{Debtor\ Costs}$$

$$+ \underbrace{\beta_4 \text{Haircut} + \beta_5 \text{Debt Amount} + \beta_6 \text{Bond Exchange}}_{Restructuring\ Characteristics} + \underbrace{\beta_7 \text{Borrowing Costs}}_{Creditor\ Costs}$$

$$+ \underbrace{\beta_8 \text{GDP per capita} + \beta_9 \text{Sec. Market} + \beta_{10} \text{Share US/UK debt}}_{Controls} \Bigg)$$

In our main model we use a dummy on litigation occurrence as dependent variable, because this approach is least likely to suffer from measurement error. However, we also propose two alternative approaches. First, we show results of a count model that uses the number of lawsuits filed as dependent variable. For this purpose, we assume $Y$ to follow a mixed Poisson-gamma (negative binomial) distribution, since the number of cases per debt crisis is naturally restricted to positive integers (Cameron and Trivedi, 1986).[34] In addition, we compute the debt under litigation as a share of total restructured debt (in %) and use this "share litigated" as our dependent variable. Specifically, we estimate a generalized linear model with a probit link function, a method best suited for fractional dependent variables that vary between 0 and 1. Unfortunately, the data on the number of litigating creditors and on litigation amounts are noisy, so that the results from these two alternative models should be taken with care.[35]

Methodologically, a further important step is to account for the possibility that haircut size is endogenous in our model. We do so by instrumenting the haircut measure with the country's debt/GDP ratio in the year prior to the restructuring. With a view to our model, debt/GDP can be thought of as an ability-to-pay variable that exogenously determines a part of the government's offered haircut. More formally, our exclusion restriction is that the level of indebtedness will only affect creditor litigation through its effect on haircut size (after controlling for the amount restructured, and per capita GDP). As we confirm below, we find that the debt/GDP ratio is an important determinant of haircut size, but not significantly correlated with litigation occurrence.

The ordering of the explanatory variables follows our theoretical discussion above. As before, we start with proxies for $p$, the creditor's expected probability of winning, in particular measures for the legal environment and the cost of litigation for debtor countries. To account for changes in legal doctrine, we follow a similar approach

[34] We consider likelihood ratio tests, AIC statistics, and Vuong test results for model selection between the negative binomial model, the Poisson model, and variants accommodating zero-inflation.

[35] We do not have information on amounts for 24% of the lawsuits, resulting in a downward bias in this measure. Also, the number of lawsuits can be biased upwards or downwards. Multiple creditors can unite behind one lawsuit (e.g. *Allied v. Costa Rica*), while in other cases the same creditors can file multiple actions under different names and we cannot always identify these instances.

as Bradley et al. (2010) and use time dummies on particularly important landmark judgments and their aftermath. The first dummy captures the period after the first significant sovereign litigation case *Allied Bank v. Costa Rica*, and takes the value 1 for each year between 1985 and 1991. The second indicator captures the time after *Weltover v. Argentina* (1992-1994), a decision that paved the way for US-based creditor litigation. The third dummy covers 1995-1999, the period after *CIBC v. Brazil*, which was the first major "vulture" success against a defaulting sovereign. Finally, we include a dummy for the year 2000 onwards, when *Elliott v. Peru* set a precedent on how judgments could actually be enforced. Our reference category is the time pre-1985, which means that we expect the coefficient of each dummy to be positive. To proxy for debtor litigation cost, we include measures of trade openness, in particular (Imports+Exports)/GDP, for which we use data from the World Bank and the IMF Direction of Trade Statistics. In addition, we measure financial openness based on Lane and Milesi-Ferretti (2007) and compute (Foreign Assets+Foreign Liabilities)/GDP. With a view to the above, we expect more open economies to be more prone to litigation. The same is true for those debtor countries with a weak bureaucratic and legal capacity. To proxy for legal capacity, we draw on a standard measure from the World Bank Governance Indicators (Kaufmann et al., 2010), because there is no cross-country measure of actual legal capacity. Specifically, we use the "Government Effectiveness" subindicator, which captures the sophistication of a country's public administration and its institutional and bureaucratic effectiveness.[36]

The second set of explanatory variables vary across debt restructurings, in particular proxies for $h$ and $D$. We rely on the data on haircuts (creditor losses) and restructuring amounts as coded by Cruces and Trebesch (2013) for all deals since the 1970s. In our benchmark regressions, we use the present value (PV) haircut estimates where $h = 1 - \frac{PV_{new}}{PV_{old}}$, but the results are very similar when using haircuts in face value terms (reduction in principal). The amount of debt restructured is computed in real 2005 USD. In line with the arguments outlined above, we expect larger restructurings and those with higher haircuts to trigger more litigation. Figure 2.2 provides preliminary indication that this is indeed the case. For completeness, we also include a dummy indicating whether the restructuring involved sovereign bonds, as opposed to deals that only involved bank debt. In line with the literature on creditor coordination problems, we expect bond exchanges to affect a more dispersed creditor population, resulting in more holdouts.

Third, we introduce a proxy for creditor litigation costs. We use Barclays' US Corporate High Yield Bond Index, a measure of corporate borrowing costs which goes back to the late 1970s. Since higher borrowing costs decrease the returns to litigation, we expect a negative relationship between this yield index and the probability of lawsuits.

Finally, we aim to account for additional heterogeneity across countries and default cases. First, we include per capita GDP in 1980.[37] Second, we construct a dummy variable

[36]For reasons of data availability and to reduce potential endogeneity, we use average government effectiveness over the entire sample period.

[37]We use beginning-of-sample values instead of time-varying GDP data in order to avoid endogenous

for the presence of secondary market debt trading. It takes the value 1 if a country's sovereign bonds or loans are actively traded on secondary markets.[38] However, the role of secondary markets trading in our context is not straightforward. Buchheit (1999) argues that liquid secondary markets make it easier for specialized investors to buy defaulted bonds and then litigate for full repayment. In contrast, Pitchford and Wright (2010) show that the effects of secondary markets on debt renegotiation are ambiguous. The impact of secondary market trading is therefore an empirical question. As a last control, we account for the legal characteristics of a country's sovereign debt portfolio, by measuring the share of outstanding external debt that was issued under either US/New York or English law. We construct this measure from Dealogic whenever possible, using the information on the legal characteristics of more than 20,000 sovereign bonds and loans issued in international primary markets.[39] In line with Buchheit (1999), we expect a higher ratio of US or English law debt to increase the probability of litigation in US and UK courts. Table 2.1 provides an overview of all variables used in the analysis, their sources, as well as their respective summary statistics.

### 2.4.2 Main results

Table 2.2 reports our main results, displayed as average marginal effects. All main explanatory variables have the expected sign. Landmark judgments are clearly significant, with a large quantitative effect on the propensity of litigation (column 1). This finding is consistent with our theoretical prediction that a higher creditor probability of winning results in more lawsuits. The erosion of sovereign immunity since the early 1980s was an important precondition for the strong increase in litigation which we observe in the data. Our other proxies of creditors' winning probability are economic openness and government legal capacity. As shown in column (2) both variables are significant and have the expected sign. The more open the country and the weaker its legal and administrative capacity, the more likely a restructuring will be accompanied by litigation.

Next, we show results for the role of restructuring characteristics, in particular the amount restructured and haircut size (column 3). Both are positively correlated with the probability of litigation. This is consistent with our own theoretical argument above, as well as with the models by Pitchford and Wright (2012a,b) and Bi et al. (2011). Surprisingly, however, we do not find a statistically significant coefficient for the bond

effects of debt crises on GDP. The results, however, are robust to using yearly lags of GDP per capita.

[38] For the 1990s and 2000s we check whether a country's bonds are included in the JP Morgan Emerging Market Bond Index, which was launched in 1993 and only includes debt instruments that meet a range of liquidity conditions. For the late 1980s and early 1990s we account for secondary market trading of sovereign loans using data by Sawada (2001). The data show that during the 1980s only 15% of the countries in our sample had a liquid debt market. This number rises to over 40% for restructurings during the 1990s and 2000s.

[39] Specifically, we use the sample average share of sovereign bonds issued under US or UK law relative to the total amount of externally issued bonds. For countries with missing observations, we use data on governing laws of corporate bonds. Finally, for the subset of countries for which we do not have any data, we interpolate the variable from countries with the same legal origins according to Glaeser and Shleifer (2002).

restructuring dummy. Corporate borrowing costs, on the other hand, have a significant negative correlation with litigation (column 4), although this finding is not robust to all changes in model specifications that we attempt later on.

Column (5) shows our full model including all main explanatory variables and additional country-specific factors. As expected, we find countries with a higher share of debt issuances under US or UK governing law to be more likely to be sued in New York or London, but we do not find a significant effect of secondary market trading or GDP per capita. Arguably, the most notable insight from our full model is that the dummies on landmark judgments are now clearly insignificant, both individually and as a group, as confirmed by a standard Wald test for joint significance. Taken at face value, this result suggests that the legal environment is only a weak predictor of creditor litigation during debt crises. However, we are fully aware that our approach to capture legal doctrine is imperfect. What we can say with some confidence is that it does not suffice to account for legal factors only. Instead, we find that economic fundamentals and restructuring characteristics are surprisingly powerful predictors of litigation occurrence.

In terms of effect size, the variables on trade openness, haircuts, and restructuring volume seem to be particularly relevant. To see this, we refer to the marginal effect estimates in column (6), which shows how a one standard deviation increase in each of the variables (around their sample mean) changes the predicted probability of litigation, while holding all other variables constant at mean values. A one standard deviation increase in haircut size around the sample mean of 38% (from 24% to 52%) is associated with an increase in the probability of litigation of 7 percentage points, i.e. from 7 to 14%. Similarly, we find that an increase in deal size by one standard deviation increases the probability of litigation by 12 percentage points, while increasing the trade to GDP ratio from 45% to 83% raises the litigation probability by 5 percentage points.

The results are quantitatively and qualitatively similar when using our alternative dependent variables and estimation techniques. This is evident in columns (7) and (8), which use the number of lawsuits filed and the amount under litigation (in % of total restructured debt), respectively. One notable change is that the coefficient for bond restructurings turns significant, suggesting that a more dispersed group of creditors increases case numbers and the amount under dispute. In addition, we now find the dummy for secondary market trading to be significant, although with a negative sign.

There are considerable time trends in our explanatory variables through the sample period. The predicted probability of litigation at the sample means for all variables is 9.7%. However, this value disguises significant changes over time. For example, global average trade openness has increased from 38% during the average 1980s to 52% since 2000. Using the 1980s trade openness value and keeping all other variables constant at their sample mea), the predicted probability of litigation is 6.6%. Using the average 2000s trade openness value, on the other hand, results in a predicted litigation risk of 8.2%. This means that the change in global trade openness over the sample period corresponds to a two-percentage point increase in the estimated risk of litigation. Similar

to the developments in trade openness, there has been an upward trend in haircuts. The average haircut size has increased from 26% in the 1980s to 62% in recent years. Comparing the predicted probability at these two values implies a 10 percentage point increase in the predicted probability of litigation (from 7.0% to 16.7%, again keeping the other variables at their sample mean). Finally, borrowing rates for high-yield debt have dropped from an average of about 15% during the 1980s to less than 10% in the 2000s. According to our baseline estimates, this drop in borrowing costs is associated with a 13 percentage point increase in the predicted risk of litigation (from 6% to 19%). Considering these three variables together, the predicted probability of litigation at the average 1980s values amounted to only 3%, compared to 27% at the average 2000s values.

Importantly, however, we find that time trends do not appear to drive our main findings. Column (3) of Table 2.3 shows that the estimates are stable in a post-2000 sample, i.e. after the landmark *Elliott* judgment and during the 'modern' era of sovereign borrowing, featuring bond debt and increasing secondary market trading. The findings are also similar in the pre-2000 sample and when including decade fixed effects. We therefore conclude that the results discussed above are not spurious, and that our empirical model is robust to changes in market structure or global economic developments.

### 2.4.3 Performance as "Early Warning System"

How does the model perform as an early warning tool of creditor litigation? As a first assessment, we can apply the customary binary classification rule with a predicted probability threshold of 0.5. This shows that our benchmark model of column (5) in Table 2.2 correctly predicts litigation occurrence in 88% of restructuring events since the 1970s. However, litigation is a rare event, with an unconditional probability of just 18% (base rate=82%), so that the 88% number masks the true model performance. Moreover, it is not clear a priori, whether the 0.5 threshold is appropriate for the data at hand: we face the classic trade-off between maximizing the sensitivity of the model (by trying to correctly predict each observed litigation case) or maximizing the model's specificity (by avoiding false positives, i.e. litigation predictions when it did in fact not occur).

A more objective evaluation tool is to estimate a receiver operating characteristic (ROC) curve, which does not require choosing an (arbitrary) classification probability cut-off, as illustrated for financial crisis prediction in Schularick and Taylor (2012). The ROC curve plots the true positive rate against the false positive rate for all possible probability cut-offs between 0 and 1. The area under the curve (AUROC) can thus be interpreted as a generalized measure of model performance. An AUC value of 0.5 means that the model does not perform any better than tossing a coin for prediction (45-degree line), while a value of 1 indicates perfect classification. Thus, intuitively, the ROC curve illustrates how well the model predicts the outcome of interest compared to a random classification.

Figure 2.3 shows the ROC curve for our full benchmark model. The AUROC is

0.86 and it outperforms the benchmark coin-toss model at the 1% significance level. The AUROC is also notably higher than in any of the crisis prediction classifications in Schularick and Taylor (2012), who explain that values above 0.75 can be regarded as high, e.g. in medical trials. The second ROC curve shown is based on column (1) and includes only the legal era variables, i.e. the court decision time dummies, to account for the rising trend in litigation. The legal-only model also does well, with an AUROC statistic of 0.77, but our full model has a statistically significantly higher AUROC value. We thus conclude that our main specification with legal and economic variables performs reasonably well in explaining litigation events across the debt crises of the past decades.

### 2.4.4 Robustness

In Table 2.3 we conduct a series of robustness checks. For this purpose, we depart from our most conservative specification (column 5 of Table 2.2), which is the model that also shows the highest log likelihood. Overall, our main results remain stable.

Column (1) replaces trade openness with financial openness, which also turns out to be a statistically and economically significant predictor of litigation. Column (2) includes an indicator that captures whether the debt renegotiations were coordinated with a recognized creditor committee, as during most exchanges in the "London Club" era (data on creditor committees is taken from Trebesch (2010) and Das et al. (2012)). This dummy does not have a significant correlation with litigation risk and including it does not affect the results in any meaningful way.

The results also hold if we exclude the main outlier cases, in particular Argentina 2005 (column 4), or additionally Brazil 1994 and Peru 1997, which together account for more than two-thirds of the restructured debt in our sample period alone (column 5). Likewise, we find all main results to be stable when controlling for regional effects, i.e. dummies for Latin American and African countries, which are the two continents with most sovereign debt litigation cases (column 6). In column (7) we exclude cases of strictly pre-emptive restructurings based on a new dataset by Asonuma and Trebesch (2014). Strictly pre-emptive deals are those in which no payments are missed during the restructuring process. The results remain stable when dropping these non-default cases. The same is true when we consider the forum where litigation takes place. Of the 121 lawsuits in our sample, 104 were filed in the US, 14 in the UK, and 3 were brought to international arbitration tribunals. Column (8) presents results when restricting the sample only to lawsuits filed in US courts. While the marginal effect on the government effectiveness variable is no longer significant, the effect direction does not change and its size remains at a considerable level.

The effect of our main variables could change in the size of the debt restructuring, in particular if there is a fixed cost of litigation. In case of fixed costs for the sovereign, small countries would be more affected by litigation given the smaller size of their debt. This could make them more likely to settle lawsuits at favorable terms, resulting in more

creditor lawsuits. In contrast, fixed costs for the creditors would imply that larger debt restructurings are more likely to be affected by legal action, since creditors can leverage their legal cost by buying larger volumes of debt. In either of these cases, the effect of our variables would change depending on the volume of debt restructured.[40]

We therefore interact our main variables of interest with the deal size (restructuring amounts). Because the estimated coefficients in non-linear interaction models cannot be meaningfully interpreted (Greene, 2010), we display our results in form of Figure 4. The underlying regression results are shown in the appendix.

Regarding debtor country variables, i.e. our proxies for the vulnerability to litigation like trade openness and government effectiveness, we find little or no interaction effects. The marginal effect of these measures does not change importantly in the size of restructurings. The same is true for the bond restructuring indicator. However, when focusing on the creditor side, restructuring amounts show significant interaction effects. We find that haircut size is insignificant for small debt restructurings (less than USD 200m) but matters importantly in large ones, with a strongly increasing marginal effect. For large debt exchanges of more than USD 3bn, a one standard deviation increase in haircuts is associated with a more than 16 percentage points increase in the predicted risk of litigation (from 13 to 29%). Similarly, we find that the marginal effect of higher corporate borrowing costs changes from almost zero for small debt restructurings, to more than -2.5 for debt restructurings exceeding USD 1bn. We interpret this as evidence that in larger deals, litigating creditors are more sensitive to their costs and losses.

Finally, we account for endogeneity of the haircut. In line with our theoretical framework, haircuts could be partly endogenous, because governments anticipate creditors to file suit when facing high losses. This would result in a downward bias in the estimated haircut coefficient, since our main result is based on a sample of debt restructurings with high haircuts that were imposed *despite* the threat of creditor litigation. Table 2.4 shows results when running instrumental variable regressions using the lagged debt/GDP ratio as an instrument for haircut size, for both probit and linear probability models in the second stage. The results indicate that our baseline haircut coefficients are indeed downward biased. The average marginal effect of haircut size is about twice as large compared to our benchmark model. The instrument performs well with respect to standard specification statistics. We are able to reject the null of a weak instrument, which further increases our confidence in the regression results.[41]

[40] We thank an anonymous referee for pointing this out to us.

[41] We also considered using IMF programs at the time of restructuring as an instrument, to capture the effect of IMF pressure on haircut size. The instrument performed very weakly, which is why we do not show the results. However, including both the debt/GDP ratio and the IMF indicator as instruments allows testing the exclusion restriction. Based on the resulting Hansen's J statistic, we could not reject the null of valid instruments, which supports our choice of the debt/GDP ratio as an instrument for haircuts.

## 2.5 Conclusion

This paper studies a prominent type of creditor coordination problems in the context of sovereign debt defaults: holdout litigation. We find that litigation against defaulting sovereigns can be explained reasonably well within a simple framework from the law and economics literature. Similar to other fields of law, sovereign debt lawsuits are more likely (i) when the damage is large, i.e. in case of high haircuts and larger restructuring amounts, (ii) when litigation costs are low for the plaintiffs, i.e. when borrowing costs are low, and (iii) when the defendant is vulnerable, e.g. when the defaulting country has a high degree of financial and trade openness. These insights may be relevant for the ongoing reform debate on sovereign debt and default, for theory work in international finance, and for scholars working on litigation in other fields.

Looking forward, our findings suggest that creditor litigation will remain relevant and potentially increase further. Most debtor countries are open economies, which facilitates attachments and increases the chance of creditors to achieve a favorable settlement. Borrowing costs continue to be low, which means that holding out is relatively cheap. Moreover, we are witnessing an increase in government indebtedness worldwide, which makes it likely that future debt restructurings may involve large debt amounts and also result in high haircuts, thus raising the probability of creditor litigation. Besides these economic trends, recent litigation successes against Argentina and Ireland have arguably strengthened creditor rights further, and may thus encourage more distressed debt funds to hold out and litigate in future debt exchanges (see Buchheit et al., 2013b). At the same time, the issuance of debt under New York and English law could become an increasingly relevant commitment device for sovereigns, since defaults on these types of bonds can have costly legal consequences. This has already happened in Greece, which issued its new bonds under English law to signal its willingness to pay (Gulati and Zettelmeyer, 2012).

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# Figures

Figure 2.1: The rise of creditor litigation

The bars show the number of outstanding creditor lawsuits against sovereigns in US and UK courts for each year between 1978 and 2010 (pending cases, left axis). The orange line represents the share of debt restructurings per year which saw at least one creditor filing a lawsuit (5-year moving average, right axis). The figure shows a strong increase in case numbers and litigation risk over the past decades.

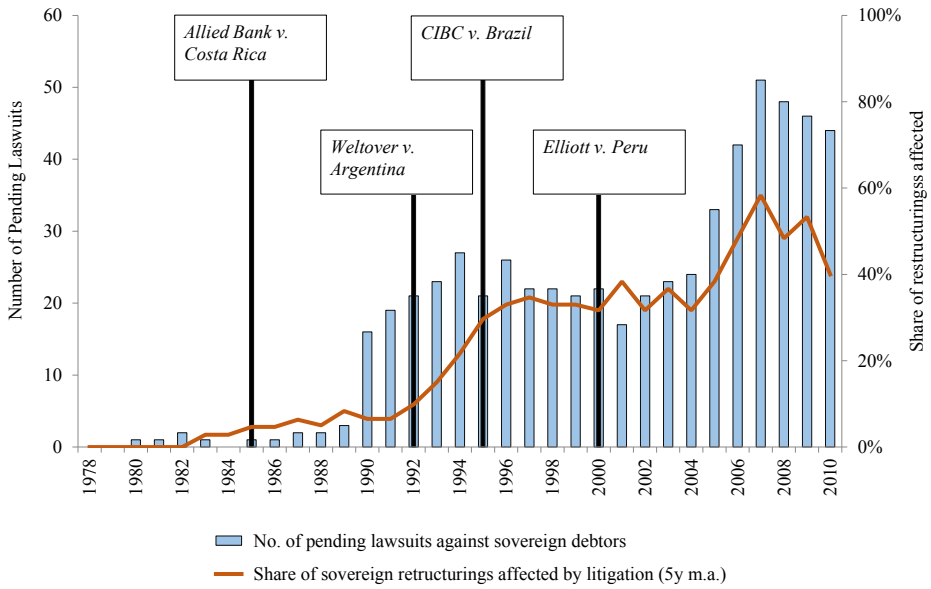
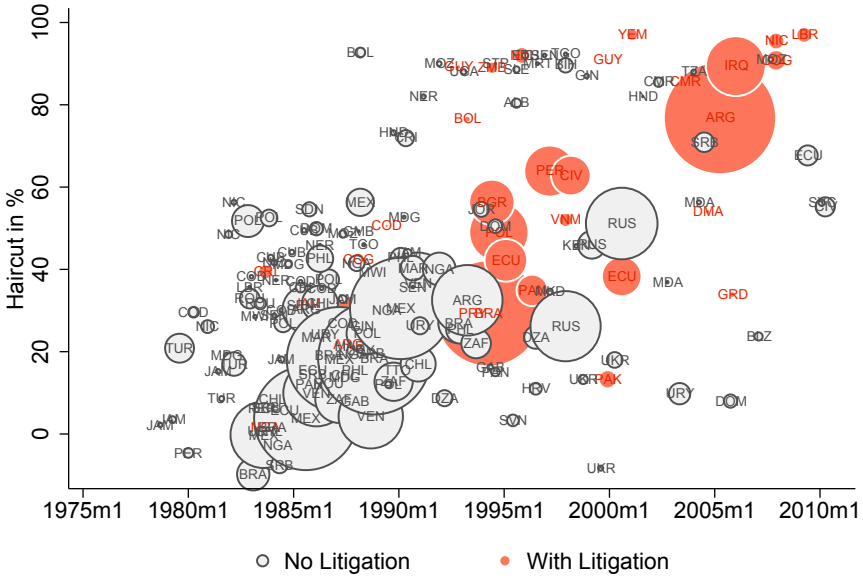


Figure 2.2: The role of deal sizes and haircuts

The figure shows restructurings with and without litigation in the full sample 1978-2010, where red colored deals are those involving at least one creditor lawsuit. The bubble size reflects the volume of restructured debt in real USD (indexed to 2005), while the vertical axis shows the size of haircuts, based on the preferred estimates by Cruces and Trebesch (2013). The figure suggests that recent restructurings were more often affected by litigation, especially those with high haircuts and large debt amounts (high creditor numbers).




Note: Bubble size reflects debt amount restructured (in 2005 USD).

Figure 2.3: ROC curves of model performance

This figure shows estimated ROC curves based on the models of column (1) (legal only) and (6) (full model) from Table 2.2. The horizontal axis shows the false positive rate, i.e. the probability of diagnosing litigation if there is none, against the true positive rate (vertical axis) for all possible probability cut-off levels. Intuitively, the curve illustrates how well the model performs as a predictor tool compared to a random classification model ("coin toss", represented by the 45-degree line). A curve closer to the upper left corner indicates better model fit, which will also be captured by the area under the ROC curve (AUROC) statistic. This ranges from 0.5 for a coin toss model to a value of 1 for a model with perfect classification.

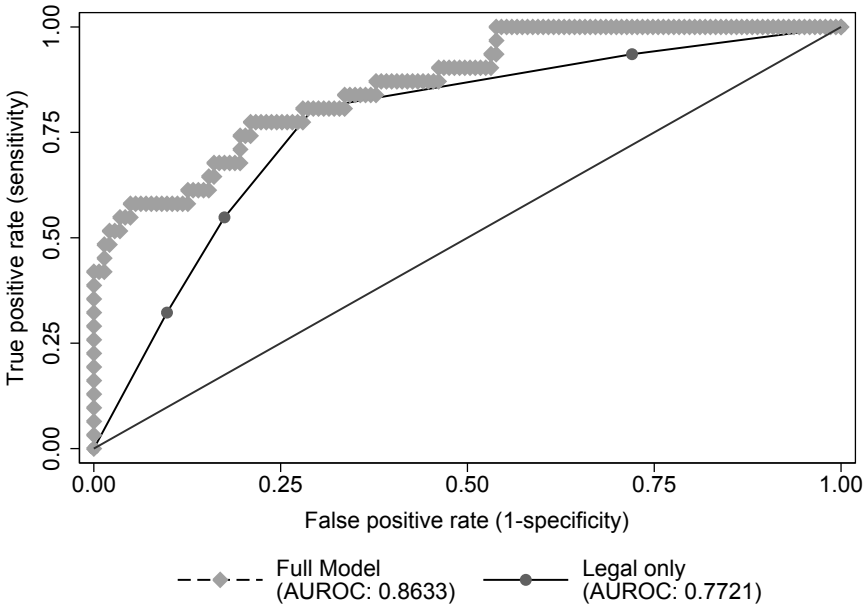
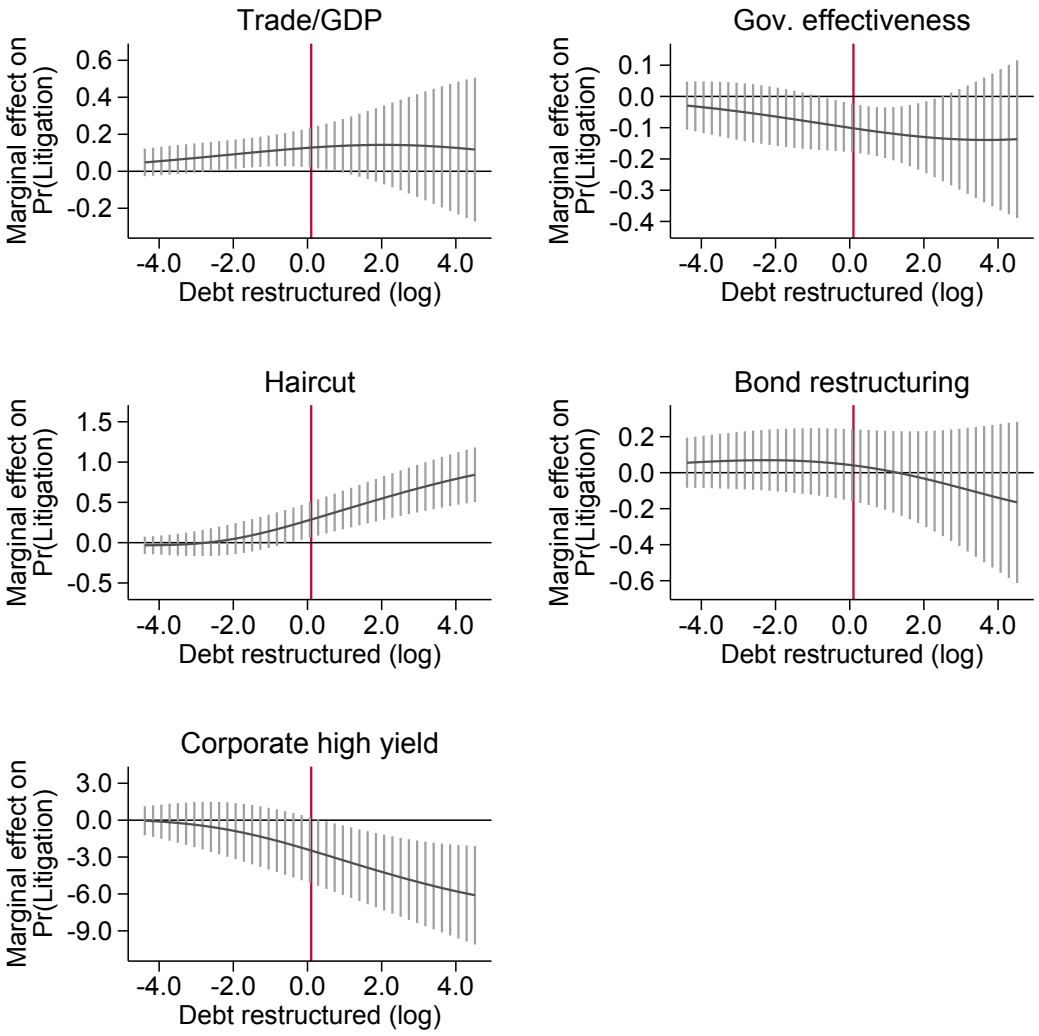


Figure 2.4: Interactions of main variables with debt volume

This figure shows the average marginal effects of the main variables from interactions with the restructured debt volume (in logs). The dark grey line represents the marginal effect, and the light grey lines mark the 95% confidence interval around the estimate. The red vertical lines mark the median deal size (USD 1bn). Note that the marginal effect is a non-linear function of the other variables in the model.



# Tables

Table 2.1: Variable definition, sources, and summary statistics

| Variable | Definition | Source | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|---|---|
| Litigation | Dummy (1 if at least one investor filed suit) | This dataset | 0.18 | 0.38 | 0 | 1 | 174 |
| Litigation (sum of cases) | Number of filed cases in connection with restructuring | This dataset | 0.70 | 3.47 | 0 | 41 | 174 |
| Litigation (share of restructured debt) | Ratio of principal in litigation to total restructured debt | This dataset | 0.01 | 0.03 | 0 | 0.22 | 172 |
| Openness to trade | Exports plus imports as a percentage of GDP | World Bank WDI, IMF Direction of Trade Statistics | 0.64 | 0.38 | 0.09 | 2.8 | 174 |
| Government effectiveness | "Government Effectiveness" index measuring multiple dimensions of bureaucratic and legal capacity | World Bank Governance Indicators, Kaufmann et al. (2010) | -0.36 | 0.64 | -1.78 | 1.2 | 174 |
| Haircut (PV) | Creditor losses in the restructuring in percent, computed in present value terms (following Sturzenegger and Zettelmeyer (2008)) | Cruces and Trebesch (2013) | 0.38 | 0.28 | -0.10 | 0.97 | 174 |
| Debt restructured (log) | Log of amount of dollars restructured (in 2005 USD) | Cruces and Trebesch (2013) | 0.08 | 2.04 | -4.39 | 4.52 | 174 |
| Bond restructuring | Dummy (1 for restructurings of sovereign bonds) | Cruces and Trebesch (2013) | 0.10 | 0.30 | 0 | 1 | 174 |
| Corporate high yield | Average yield of Baa rated corporate bonds in the US | Barclays / Lehman Brothers | 0.13 | 0.03 | 0.07 | 0.18 | 174 |
| GDP per capita (log) | Log of 1980 GDP per capita | United Nations National Accounts | 7.54 | 1.20 | 4.22 | 10.58 | 174 |
| Secondary market | Dummy (1 if a liquid secondary market for debt existed) | JP Morgan EMBI; Sawada (2001) (for 1980s) | 0.28 | 0.45 | 0 | 1 | 174 |
| US, UK/Total external debt | External debt issued under US or UK law as percentage of total external debt | Dealogic Bondware | 0.45 | 0.31 | 0 | 1 | 174 |
| Financial openness | Assets plus liabilities as a percentage of GDP | Lane and Milesi-Ferretti (2007) | 1.45 | 1.24 | 0.18 | 9.96 | 162 |
| Creditor Committee | Dummy (1 if the debt renegotiations were conducted by a recognized creditor committe of banks and/or bondholders) | Trebesch (2010); Das et al. (2012) | 0.93 | 0.25 | 0 | 1 | 173 |
| Debt/GDP (Log, Lag) | Gross general government debt scaled to nominal GDP | Abbas et al. (2010) | -0.3 | 0.61 | -1.77 | 2.06 | 154 |

## Table 2.2: Main results: Creditor litigation in sovereign debt restructurings 1978–2010

Columns (1) to (5) show average marginal effects, derived from a probit estimation using a dummy for the occurrence of litigation as the dependent variable. The sample includes all sovereign debt restructuring events between 1978 and 2010. Heteroskedasticity robust standard errors clustered on country level are reported in parentheses. Column 6 ("Prob. Change") displays changes in the probability of observing litigation based on the full model, obtained by calculating $\Phi([\bar{X}_{expl} + \frac{1}{2}\sigma_{X_{expl}}]\beta_{expl} + \bar{\mathbf{X}}'_{\mathbf{ctrl}}\mathbf{fi}_{\mathbf{ctrl}}) - \Phi([\bar{X}_{expl} - \frac{1}{2}\sigma_{X_{expl}}]\beta_{expl} + \bar{\mathbf{x}}'_{\mathbf{ctrl}}\mathbf{fi}_{\mathbf{ctrl}})$, where $\bar{X}_{expl}$ denotes the mean of the variable of interest, $\sigma_{X_{expl}}$ its standard deviation, and $\bar{X}_{ctrl}$ is a vector capturing all the other variables included in the regression. Column 7 ("Count Model") reports coefficients from a negative binomial model estimating the number of creditors litigating. This model is estimated in a log-level form, so that a one-unit increase in the independent variable is related to a $(100 \times \beta)$% change in the number of litigation cases, counted as the number of creditors filing suit before or after the debt exchange. The last column ("Share litigated") uses the share of litigated debt to total restructured debt (in %) as the dependent variable. This is estimated by a generalized linear model with a probit link function.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Legal Controls only | Probability of Success | With Restruct. Charact. | Creditor Cost | Full Model w/ Controls | Prob. Change | Count Model | Share Litigated |
| Post Allied ('85-'91) | 0.027 | | | | -0.042 | -0.040 | -1.627 | -0.005 |
| | (0.095) | | | | 0.094) | | (1.066) | (0.007) |
| Post Weltover ('92-'94) | 0.297*** | | | | 0.072 | 0.022 | -1.381 | -0.012 |
| | (0.092) | | | | 0.134) | | (1.088) | (0.010) |
| Post CIBC ('95-'99) | 0.257*** | | | | -0.003 | -0.003 | -1.353 | -0.010 |
| | (0.095) | | | | 0.136) | | (1.044) | (0.010) |
| Post Elliott ('00-'10) | 0.312*** | | | | 0.000 | 0.000 | -1.629 | -0.017** |
| | (0.093) | | | | 0.142) | | (1.087) | (0.008) |
| Openness to trade | | 0.163** | | | 0.136** | 0.051 | 0.864*** | 0.010*** |
| | | (0.066) | | | 0.057) | | (0.294) | (0.003) |
| Gov. effectiveness | | -0.085** | | | -0.101*** | -0.063 | -0.949*** | -0.003 |
| | | (0.041) | | | 0.039) | | (0.334) | (0.003) |
| Haircut (PV) | | | 0.478*** | | 0.248** | 0.068 | 3.748*** | 0.038*** |
| | | | 0.087) | | 0.119) | | (1.161) | (0.009) |
| Debt restruct. (log) | | | 0.034** | | 0.062*** | 0.125 | 0.847*** | 0.003* |
| | | | 0.014) | | 0.015) | | (0.175) | (0.001) |
| Bond restructuring | | | 0.119 | | 0.022 | 0.023 | 0.871* | 0.014** |
| | | | 0.083) | | 0.098) | | (0.496) | (0.006) |
| Corporate high yield | | | | -4.433*** | -2.493* | -0.071 | -28.630*** | -0.216** |
| | | | | (0.862) | 1.386) | | (9.921) | (0.107) |
| GDP per capita (log) | | | | | -0.007 | -0.008 | -0.027 | 0.004** |
| | | | | | 0.027) | | (0.222) | (0.002) |
| Secondary market | | | | | -0.099 | -0.083 | -0.975** | -0.017*** |
| | | | | | 0.070) | | (0.454) | (0.006) |
| US, UK/Total ext. debt | | | | | 0.256*** | 0.079 | 2.728*** | 0.025*** |
| | | | | | 0.078) | | (0.769) | (0.008) |
| Constant | | | | | | | -0.657 | |
| | | | | | | | (2.677) | |
| AUROC | 0.772 | 0.643 | 0.780 | 0.758 | 0.863 | | | |
| s.e. | 0.045 | 0.057 | 0.047 | 0.047 | 0.036 | | | |
| Pseudo R2 | 0.18 | 0.06 | 0.17 | 0.14 | 0.33 | | 0.28 | 0.28 |
| Log Likelihood | -67.07 | -76.89 | -67.58 | -69.80 | -55.03 | | -104.68 | -5.04 |
| Obs | 174 | 174 | 174 | 174 | 174 | | 174 | 172 |
| Chi2 | 32.61 | 8.67 | 24.77 | 26.32 | 95.66 | | 183.63 | 107.89 |
| p>Chi2 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 |

Significance levels indicated by $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

## Table 2.3: Robustness checks

This table shows results from variations of the benchmark model in Table 2.2, expressed as average marginal effects. Heteroskedasticity robust standard errors clustered on country are reported in parentheses. The first two columns add variables to the benchmark model, in particular the degree of financial openness (Foreign Assets+Liabilities/GDP) and the existence of a negotiating creditor committee. Column (3) restricts the sample to debt restructurings which took place in the 2000s. Column (4) excludes the Argentina 2005 restructuring, and column (5) excludes the Argentina 2005, Brazil 1994, and Peru 1997 restructurings. Column (6) excludes pre-emptive restructurings without a payment default based on the classification by Asonuma and Trebesch (2014). Column (7) includes regional controls for Africa and Latin America. Column (8) considers only the 104 lawsuits filed in US courts.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Financial openness | With creditor committee | Post-2000 (after *Elliott*) | Exclude ARG | Exclude ARG, BRA, PER | Exclude pre-emptive deals | Region fixed effects | US lawsuits only |
| Post Allied ('85-'91) | -0.048 | -0.079 | | -0.035 | -0.042 | -0.109 | -0.024 | -0.124 |
| | (0.099) | (0.092) | | (0.093) | (0.094) | (0.102) | (0.097) | (0.086) |
| Post Weltover ('92-'94) | 0.100 | 0.050 | | 0.093 | 0.073 | -0.015 | 0.102 | -0.047 |
| | (0.141) | (0.124) | | (0.131) | (0.134) | (0.150) | (0.124) | (0.121) |
| Post CIBC ('95-'99) | 0.040 | -0.001 | | 0.023 | -0.002 | -0.111 | 0.025 | -0.137 |
| | (0.142) | (0.122) | | (0.134) | (0.136) | (0.147) | (0.126) | (0.125) |
| Post Elliott ('00-'10) | 0.031 | -0.027 | | 0.028 | 0.001 | -0.047 | 0.026 | -0.110 |
| | (0.151) | (0.129) | | (0.140) | (0.141) | (0.153) | (0.133) | (0.136) |
| Gov. effectiveness | -0.097** | -0.078** | -0.329* | -0.101*** | -0.102*** | -0.098** | -0.142*** | -0.049 |
| | (0.041) | (0.034) | (0.199) | (0.039) | (0.039) | (0.044) | (0.054) | (0.034) |
| Openness to trade | | 0.120** | 0.107 | 0.135** | 0.136** | 0.129** | 0.112** | 0.102** |
| | | (0.052) | (0.256) | (0.056) | (0.057) | (0.062) | (0.053) | (0.040) |
| Haircut (PV) | 0.217* | 0.316*** | 0.727* | 0.220* | 0.248** | 0.276** | 0.233** | 0.247** |
| | (0.123) | (0.105) | (0.427) | (0.125) | (0.119) | (0.139) | (0.117) | (0.121) |
| Debt restruct. (log) | 0.054*** | 0.065*** | 0.142** | 0.059*** | 0.062*** | 0.054*** | 0.057*** | 0.053*** |
| | (0.014) | (0.016) | (0.059) | (0.016) | (0.015) | (0.016) | (0.015) | (0.015) |
| Bond restructuring | 0.003 | | 0.191 | 0.002 | 0.022 | -0.058 | 0.017 | -0.000 |
| | (0.095) | | (0.238) | (0.103) | (0.098) | (0.104) | (0.092) | (0.082) |
| Corporate high yield | -2.436 | -2.416* | -12.322* | -2.235 | -2.495* | -3.286** | -2.403* | -3.067** |
| | (1.526) | (1.358) | (6.369) | (1.370) | (1.387) | (1.471) | (1.331) | (1.269) |
| GDP per capita (log) | -0.008 | 0.017 | 0.051 | -0.008 | -0.007 | -0.001 | -0.014 | 0.008 |
| | (0.027) | (0.020) | (0.072) | (0.027) | (0.027) | (0.028) | (0.032) | (0.022) |
| Secondary market | -0.091 | -0.121* | -0.652* | -0.095 | -0.100 | -0.023 | -0.112 | -0.043 |
| | (0.072) | (0.063) | (0.333) | (0.072) | (0.070) | (0.071) | (0.069) | (0.060) |
| US, UK/Total ext. debt | 0.217** | 0.277*** | 1.196*** | 0.255*** | 0.256*** | 0.236*** | 0.185** | 0.226*** |
| | (0.086) | (0.077) | (0.397) | (0.077) | (0.078) | (0.080) | (0.094) | (0.069) |
| Financial openness | 0.045** | | | | | | | |
| | (0.018) | | | | | | | |
| Creditor committee | | -0.100 | | | | | | |
| | | (0.087) | | | | | | |
| Region fixed effects | | | | | | | Yes | |
| AUROC | 0.859 | 0.882 | 0.832 | 0.864 | 0.863 | 0.852 | 0.873 | 0.840 |
| s.e. | 0.036 | 0.034 | 0.042 | 0.036 | 0.036 | 0.038 | 0.035 | 0.044 |
| Pseudo R2 | 0.31 | 0.37 | 0.51 | 0.31 | 0.32 | 0.34 | 0.35 | 0.34 |
| Log Likelihood | -53.37 | -50.38 | -7.93 | -54.72 | -55.04 | -48.99 | -53.10 | -44.99 |
| Obs | 162 | 173 | 24 | 173 | 174 | 152 | 174 | 174 |
| Chi2 | 71.87 | 78.03 | 26.21 | 80.64 | 95.89 | 89.65 | 85.09 | 48.24 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Significance levels indicated by $^{*}p < 0.1$,$^{**}$ $p < 0.05$,$^{***}$ $p < 0.01$.

## Table 2.4: Instrumental variable regressions

The table shows instrumental variable (IV) regression results using ln(debt/GDP) as an instrument for haircut size. The first column shows the first stage regression on the determinants of haircuts. The second and third column show second-stage results on litigation occurrence using an OLS and probit model, respectively. The sample size is somewhat smaller due to the lack of data on debt/GDP for some countries during the 1980s and early 1990s, but all our main results above hold in this subsample as well. Heteroskedasticity robust standard errors clustered on country are reported in parentheses.

| | (1) | (2) | (3) |
|---|---|---|---|
| Instrument: | Debt/GDP | | |
| | 1st stage: | 2nd stage: | |
| | Haircut | OLS | Probit |
| Post Allied ('85-'91) | 0.111*** | -0.153 | -0.115 |
| | (0.034) | (0.096) | (0.106) |
| Post Weltover ('92-'94) | 0.346*** | -0.083 | -0.096 |
| | (0.079) | (0.220) | (0.172) |
| Post CIBC ('95-'99) | 0.429*** | -0.180 | -0.215 |
| | (0.079) | (0.195) | (0.173) |
| Post Elliott ('00-'10) | 0.640*** | -0.265 | -0.300 |
| | (0.083) | (0.265) | (0.213) |
| Openness to trade | -0.111** | 0.174** | 0.154*** |
| | (0.051) | (0.079) | (0.058) |
| Haircut (PV) | | 0.924*** | 0.693*** |
| | | (0.318) | (0.258) |
| Gov. effectiveness | -0.058** | -0.036 | -0.069 |
| | (0.023) | (0.049) | (0.044) |
| Debt restruct. (log) | -0.029** | 0.076*** | 0.070*** |
| | (0.011) | (0.021) | (0.017) |
| Bond restructuring | -0.321*** | 0.127 | 0.162 |
| | (0.065) | (0.202) | (0.142) |
| Corporate high yield | 1.785** | -2.899* | -3.297** |
| | (0.859) | (1.670) | (1.409) |
| GDP per capita (log) | -0.027* | 0.011 | 0.009 |
| | (0.014) | (0.036) | (0.028) |
| Secondary market | 0.060 | -0.101 | -0.109 |
| | (0.046) | (0.083) | (0.074) |
| US, UK/Total ext. debt | 0.014 | 0.221** | 0.214*** |
| | (0.063) | (0.107) | (0.079) |
| Debt/GDP (Log, Lag) | 0.178*** | | |
| | (0.026) | | |
| Constant | 0.228 | 0.049 | |
| | (0.192) | (0.372) | |
| Anderson Rubin Wald | 8.45 | | |
| p-Value | 0.01 | | |
| Cragg-Donald F | 43.74 | | |
| Kleibergen-Paap Wald rk F | 46.96 | | |
| Obs | 154 | 154 | 154 |

Significance levels indicated by $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$.

Table 2.5: Case list: Litigation across sovereign debt restructurings

This table shows our new sovereign debt litigation data matched to the list of restructurings and haircuts by Cruces and Trebesch (2013) (Data in columns designated with * are also taken from the Cruces/Trebesch dataset). All amounts are in 2005 USD.

| Country | Year* | Restructured debt* (USD m) | Haircut* | Litigation | No. cases | Litigation volume (USD m) |
|---|---|---|---|---|---|---|
| Albania | 1995 | 611.2 | 80.4% | no | 0 | - |
| Algeria | 1992 | 1,897.3 | 8.7% | no | 0 | - |
| Algeria | 1996 | 3,833.8 | 23.5% | no | 0 | - |
| Argentina | 1985 | 15,893.3 | 30.3% | no | 0 | - |
| Argentina | 1987 | 45,290.1 | 21.7% | yes | 2 | 2.0 |
| Argentina | 1993 | 36,218.7 | 32.5% | no | 0 | - |
| Argentina | 2005 | 60,572.0 | 76.8% | yes | 41 | 2,855.0 |
| Belize | 2007 | 487.7 | 23.7% | no | 0 | - |
| Bolivia | 1988 | 701.3 | 92.7% | no | 0 | - |
| Bolivia | 1993 | 217.5 | 76.5% | yes | 1 | 1.2 |
| Bosnia and Herzegovina | 1997 | 1,531.3 | 89.6% | no | 0 | - |
| Brazil | 1983 | 7,637.6 | -9.8% | no | 0 | - |
| Brazil | 1984 | 8,028.5 | 1.7% | no | 0 | - |
| Brazil | 1986 | 10,497.8 | 19.2% | no | 0 | - |
| Brazil | 1988 | 92,067.8 | 18.4% | no | 0 | - |
| Brazil | 1992 | 11,937.0 | 27.0% | no | 0 | - |
| Brazil | 1994 | 53,871.8 | 29.3% | yes | 1 | 1,743.5 |
| Bulgaria | 1994 | 9,851.0 | 56.3% | yes | 1 | 14.9 |
| Cameroon | 2003 | 844.1 | 85.5% | yes | 2 | 13.6 |
| Chile | 1983 | 3,721.0 | 0.7% | no | 0 | - |
| Chile | 1984 | 1,921.8 | 8.4% | no | 0 | - |
| Chile | 1986 | 9,452.9 | 31.7% | no | 0 | - |
| Chile | 1987 | 9,055.0 | 14.3% | no | 0 | - |
| Chile | 1990 | 8,936.8 | 17.0% | no | 0 | - |
| Congo, Dem. Rep. | 1980 | 832.4 | 29.6% | no | 0 | - |
| Congo, Dem. Rep. | 1983 | 99.5 | 38.2% | no | 0 | - |
| Congo, Dem. Rep. | 1984 | 106.0 | 30.1% | no | 0 | - |
| Congo, Dem. Rep. | 1985 | 97.9 | 37.0% | no | 0 | - |
| Congo, Dem. Rep. | 1986 | 102.3 | 35.4% | no | 0 | - |
| Congo, Dem. Rep. | 1987 | 93.6 | 26.8% | no | 0 | - |
| Congo, Dem. Rep. | 1989 | 87.1 | 50.6% | yes | 1 | 12.3 |
| Congo, Rep. | 1988 | 321.7 | 42.3% | yes | 1 | - |
| Congo, Rep. | 2007 | 1,984.7 | 90.8% | yes | 7 | 148.5 |
| Costa Rica | 1983 | 1,044.8 | 39.4% | yes | 2 | 77.5 |
| Costa Rica | 1985 | 706.4 | 35.6% | no | 0 | - |
| Costa Rica | 1990 | 1,904.6 | 71.9% | no | 0 | - |
| Cote d'Ivoire | 1998 | 7,530.0 | 62.8% | yes | 1 | 9.3 |
| Cote d'Ivoire | 2010 | 2,672.2 | 55.2% | no | 0 | - |
| Croatia | 1996 | 1,027.9 | 11.0% | no | 0 | - |
| Cuba | 1983 | 223.0 | 42.9% | no | 0 | - |
| Cuba | 1984 | 170.6 | 44.2% | no | 0 | - |
| Cuba | 1985 | 144.5 | 49.5% | no | 0 | - |
| Dominica | 2004 | 148.6 | 54.0% | yes | 1 | 11.7 |
| Dominican Republic | 1986 | 1,295.1 | 49.9% | no | 0 | - |
| Dominican Republic | 1994 | 1,353.7 | 50.5% | no | 0 | - |
| Dominican Republic | 2005 | 1,280.0 | 8.0% | no | 0 | - |
| Ecuador | 1983 | 1,664.1 | 6.3% | no | 0 | - |
| Ecuador | 1984 | 579.9 | 5.7% | no | 0 | - |
| Ecuador | 1985 | 6,781.1 | 15.4% | no | 0 | - |
| Ecuador | 1995 | 8,747.0 | 42.2% | yes | 4 | 44.5 |
| Ecuador | 2000 | 7,526.4 | 38.3% | yes | 2 | 5.6 |
| Ecuador | 2009 | 2,934.5 | 67.7% | no | 0 | - |
| Ethiopia | 1996 | 270.8 | 92.0% | no | 0 | - |
| Gabon | 1987 | 59.8 | 7.9% | no | 0 | - |
| Gabon | 1994 | 232.9 | 16.2% | no | 0 | - |
| Gambia, The | 1988 | 28.2 | 49.3% | no | 0 | - |
| Grenada | 2005 | 210.0 | 33.9% | yes | 1 | 20.3 |
| Guinea | 1988 | 63.8 | 26.1% | no | 0 | - |
| Guinea | 1998 | 151.5 | 87.0% | no | 0 | - |

*continues on next page*

Table 2.5: Case list: Litigation across sovereign debt restructurings (continued)

| Country | Year* | Restructured debt* (USD m) | Haircut* | Litigation | No. cases | Litigation volume (USD m) |
|---|---|---|---|---|---|---|
| Guyana | 1992 | 121.1 | 89.2% | yes | 1 | 18.4 |
| Guyana | 1999 | 64.3 | 91.0% | yes | 1 | 12.0 |
| Honduras | 1989 | 188.4 | 73.2% | no | 0 | - |
| Honduras | 2001 | 14.3 | 82.0% | no | 0 | - |
| Iraq | 2006 | 17,181.8 | 89.4% | yes | 10 | 168.9 |
| Jamaica | 1978 | 154.0 | 2.2% | no | 0 | - |
| Jamaica | 1979 | 336.4 | 3.5% | no | 0 | - |
| Jamaica | 1981 | 168.6 | 15.2% | no | 0 | - |
| Jamaica | 1984 | 273.4 | 18.1% | no | 0 | - |
| Jamaica | 1985 | 592.4 | 31.7% | yes | 1 | 16.1 |
| Jamaica | 1987 | 437.3 | 32.8% | no | 0 | - |
| Jamaica | 1990 | 456.9 | 44.0% | no | 0 | - |
| Jordan | 1993 | 1,639.5 | 54.6% | no | 0 | - |
| Kenya | 1998 | 106.0 | 45.7% | no | 0 | - |
| Liberia | 1982 | 53.5 | 35.7% | no | 0 | - |
| Liberia | 2009 | 1,175.5 | 97.0% | yes | 9 | 46.4 |
| Macedonia, FYR | 1997 | 269.7 | 34.6% | no | 0 | - |
| Madagascar | 1981 | 278.4 | 19.0% | no | 0 | - |
| Madagascar | 1984 | 323.1 | 41.3% | no | 0 | - |
| Madagascar | 1987 | 92.1 | 13.7% | no | 0 | - |
| Madagascar | 1990 | 67.4 | 52.7% | no | 0 | - |
| Malawi | 1983 | 97.8 | 28.5% | no | 0 | - |
| Malawi | 1988 | 51.9 | 39.2% | no | 0 | - |
| Mauritania | 1996 | 63.5 | 90.0% | no | 0 | - |
| Mexico | 1983 | 32,252.0 | -0.2% | no | 0 | - |
| Mexico | 1985 | 78,182.2 | 3.8% | no | 0 | - |
| Mexico | 1987 | 80,253.2 | 18.1% | no | 0 | - |
| Mexico | 1988 | 5,442.5 | 56.3% | no | 0 | - |
| Mexico | 1990 | 74,725.8 | 30.5% | no | 0 | - |
| Moldova | 2002 | 43.3 | 36.9% | no | 0 | - |
| Moldova | 2004 | 118.7 | 56.3% | no | 0 | - |
| Morocco | 1986 | 846.6 | 23.5% | no | 0 | - |
| Morocco | 1987 | 3,750.3 | 21.3% | no | 0 | - |
| Morocco | 1990 | 4,403.7 | 40.3% | no | 0 | - |
| Mozambique | 1991 | 165.2 | 90.0% | no | 0 | - |
| Mozambique | 2007 | 144.6 | 91.0% | no | 0 | - |
| Nicaragua | 1980 | 1,205.1 | 26.1% | no | 0 | - |
| Nicaragua | 1981 | 363.6 | 48.5% | no | 0 | - |
| Nicaragua | 1982 | 178.3 | 56.3% | no | 0 | - |
| Nicaragua | 1984 | 240.2 | 41.7% | no | 0 | - |
| Nicaragua | 1995 | 1,341.9 | 92.0% | yes | 4 | 299.1 |
| Nicaragua | 2007 | 1,323.1 | 95.5% | yes | 1 | 8.8 |
| Niger | 1984 | 44.7 | 37.4% | no | 0 | - |
| Niger | 1986 | 81.8 | 45.8% | no | 0 | - |
| Niger | 1991 | 147.8 | 82.0% | no | 0 | - |
| Nigeria | 1983 | 3,319.6 | 1.6% | yes | 3 | 144.8 |
| Nigeria | 1984 | 1,532.5 | -2.8% | no | 0 | - |
| Nigeria | 1987 | 6,520.0 | 19.3% | no | 0 | - |
| Nigeria | 1988 | 1,798.4 | 41.5% | no | 0 | - |
| Nigeria | 1989 | 8,318.5 | 30.1% | no | 0 | - |
| Nigeria | 1991 | 7,835.4 | 40.1% | no | 0 | - |
| Pakistan | 1999 | 1,593.5 | 13.3% | yes | 1 | 0.3 |
| Panama | 1985 | 929.5 | 12.0% | no | 0 | - |
| Panama | 1994 | 562.9 | 15.1% | no | 0 | - |
| Panama | 1996 | 4,715.6 | 34.9% | yes | 2 | 34.4 |
| Paraguay | 1993 | 25.4 | 29.2% | yes | 1 | - |
| Peru | 1980 | 704.0 | -4.6% | no | 0 | - |
| Peru | 1983 | 651.9 | 6.3% | no | 0 | - |
| Peru | 1997 | 12,485.8 | 63.9% | yes | 13 | 31.9 |
| Philippines | 1986 | 5,101.8 | 42.6% | no | 0 | - |
| Philippines | 1987 | 14,869.1 | 15.4% | no | 0 | - |
| Philippines | 1990 | 2,917.5 | 42.8% | no | 0 | - |
| Philippines | 1992 | 5,822.0 | 25.4% | no | 0 | - |
| Poland | 1982 | 7,457.5 | 51.7% | no | 0 | - |

*continues on next page*

Table 2.5: Case list: Litigation across sovereign debt restructurings (continued)

| Country | Year* | Restructured debt* (USD m) | Haircut* | Litigation | No. cases | Litigation volume (USD m) |
|---|---|---|---|---|---|---|
| Poland | 1983 | 2,044.9 | 52.5% | no | 0 | - |
| Poland | 1984 | 2,302.8 | 26.9% | no | 0 | - |
| Poland | 1986 | 3,100.1 | 37.5% | no | 0 | - |
| Poland | 1988 | 12,514.4 | 24.4% | no | 0 | - |
| Poland | 1989 | 294.0 | 12.0% | no | 0 | - |
| Poland | 1994 | 16,851.4 | 49.0% | yes | 1 | 4.5 |
| Romania | 1982 | 2,849.6 | 32.9% | no | 0 | - |
| Romania | 1983 | 972.7 | 31.7% | no | 0 | - |
| Romania | 1986 | 1,258.9 | 12.3% | no | 0 | - |
| Russian Federation | 1997 | 35,926.2 | 26.2% | no | 0 | - |
| Russian Federation | 1999 | 5,667.3 | 46.0% | no | 0 | - |
| Russian Federation | 2000 | 37,350.9 | 51.2% | no | 0 | - |
| Sao Tome and Principe | 1994 | 12.5 | 90.0% | no | 0 | - |
| Senegal | 1984 | 127.6 | 28.8% | no | 0 | - |
| Senegal | 1985 | 32.1 | 31.3% | no | 0 | - |
| Senegal | 1990 | 50.9 | 35.7% | no | 0 | - |
| Senegal | 1996 | 95.8 | 92.0% | no | 0 | - |
| Serbia | 1983 | 1,629.8 | 6.5% | no | 0 | - |
| Serbia | 1984 | 2,070.9 | -7.5% | no | 0 | - |
| Serbia | 1985 | 5,779.4 | 14.5% | no | 0 | - |
| Serbia | 1988 | 10,222.3 | 19.7% | no | 0 | - |
| Serbia | 2004 | 2,786.6 | 70.9% | no | 0 | - |
| Seychelles | 2010 | 290.8 | 56.2% | no | 0 | - |
| Sierra Leone | 1995 | 286.7 | 88.6% | no | 0 | - |
| Slovenia | 1996 | 990.6 | 3.3% | no | 0 | - |
| South Africa | 1987 | 16,725.8 | 8.5% | no | 0 | - |
| South Africa | 1989 | 10,703.1 | 12.7% | no | 0 | - |
| South Africa | 1993 | 6,359.5 | 22.0% | no | 0 | - |
| Sudan | 1985 | 1,477.0 | 54.6% | no | 0 | - |
| Tanzania | 2004 | 161.0 | 88.0% | no | 0 | - |
| Togo | 1988 | 72.6 | 46.0% | no | 0 | - |
| Togo | 1997 | 88.3 | 92.3% | no | 0 | - |
| Trinidad and Tobago | 1989 | 636.5 | 15.5% | no | 0 | - |
| Turkey | 1979 | 6,090.6 | 20.9% | no | 0 | - |
| Turkey | 1981 | 189.4 | 8.6% | no | 0 | - |
| Turkey | 1982 | 4,046.2 | 17.0% | no | 0 | - |
| Uganda | 1993 | 194.6 | 88.0% | no | 0 | - |
| Ukraine | 1998 | 616.4 | 13.3% | no | 0 | - |
| Ukraine | 1999 | 187.3 | -8.3% | no | 0 | - |
| Ukraine | 2000 | 1,795.1 | 18.0% | no | 0 | - |
| Uruguay | 1983 | 986.4 | 0.7% | no | 0 | - |
| Uruguay | 1986 | 3,081.2 | 24.3% | no | 0 | - |
| Uruguay | 1988 | 2,624.2 | 20.3% | no | 0 | - |
| Uruguay | 1991 | 2,144.3 | 26.3% | no | 0 | - |
| Uruguay | 2003 | 3,315.8 | 9.8% | no | 0 | - |
| Venezuela, RB | 1986 | 31,956.0 | 9.9% | no | 0 | - |
| Venezuela, RB | 1987 | 30,152.6 | 4.3% | no | 0 | - |
| Venezuela, RB | 1990 | 26,952.2 | 36.7% | no | 0 | - |
| Vietnam | 1997 | 921.1 | 52.0% | yes | 1 | 1.8 |
| Yemen, Rep. | 2001 | 666.6 | 97.0% | yes | 1 | 9.0 |
| Zambia | 1994 | 709.9 | 89.0% | yes | 3 | 76.6 |

# Appendix

## A Comparative statics

The following section derives the comparative statics guiding the hypotheses. Note that since $\Phi = F(c_i^*(p, h_e, \delta, d))$, we can use the shorter notation $\frac{\partial \Phi}{d\delta} = \frac{\partial \Phi}{\partial c_i^*}\frac{\partial c_i^*}{\partial \delta} = \varphi d$. Thus equation (2.6) gives the first-order condition of the government's optimization problem in a debt restructuring as

$$\Gamma \equiv \frac{\partial V^R}{\partial \delta} = D\Big[\varphi d(1 - h - p - c_g) + (1 - \Phi)\Big] - \kappa'(\delta) \tag{A1}$$

First, we show that the government chooses a discretionary haircut $\delta$ which maximizes its payoff of the restructuring $V^R$. To see this, consider the second derivative of $V^R$ with respect to $\delta$:

$$\frac{\partial \Gamma}{\partial \delta} = D\left[\varphi' d^2(1 - h - p - c_g) - 2\varphi d\right] - \kappa''(\delta) \tag{A2}$$

where $\varphi' = \partial\varphi/\partial c_i^*$. Eq. (A2) is negative if

$$-c_g - 2\frac{\varphi}{\varphi' d} - \frac{\kappa''(\delta)}{\varphi' d^2 D} < p - (1 - h) \tag{A3}$$

The left-hand side of (A3) is clearly negative since $c_g > 0$, the probability density function $\varphi > 0$ by definition, and we have assumed $\varphi' > 0$ in order to represent a creditor distribution with an increasing mass of creditors with high costs of litigation. The right-hand side of (A3) is positive in all cases where a litigating creditor exists (see eq. 2.3). Hence, (A3) ensures that the haircut $\delta$ chosen by the government which solves the value function (A1) is the haircut which maximizes the government's payoff.

**Lemma 2.1** (Hypothesis 1)**.** *The equilibrium share of litigating creditors is increasing in the probability of success $p$.*

*Proof.* To see the effect of a change in the success probability on the share of litigating creditors, we need to take into account both the direct effect on the creditors' decision, as well as the indirect effect through the government adjusting its optimal haircut. We start with deriving the indirect effect. First, take the derivative of (A1) with respect to $p$,

$$\frac{\partial \Gamma}{\partial p} = D\left[\varphi' d^2(1 - h - p - c_g) - 2\varphi d\right] \tag{A4}$$

Since the value function (A1) must be zero at the optimal haircut, and we have established that (A3) is negative, we can apply the implicit function theorem to get

$$\frac{\partial \delta}{\partial p} = -\frac{D(\varphi' d^2(1 - h - p - c_g) - 2\varphi d)}{D(\varphi' d^2(1 - h - p - c_g) - 2\varphi d) - \kappa''(\delta)} \tag{A5}$$

Because the common term in the numerator and denominator is negative and $\kappa''(\delta) > 0$, we have $-1 < \frac{\partial \delta}{\partial p} < 0$. This means that the government will react to an increase in the success probability with decreasing the haircut in order to induce less creditors to hold out. But the reaction will be somewhat inelastic, such that the change in the success probability is not completely offset through the haircut.

To see the impact of a change in the probability of success on the litigation rate, we can therefore look at its total derivative:

$$\begin{aligned}\frac{d\Phi}{dp} &= \frac{\partial \Phi}{\partial c_i^*}\frac{dc_i^*}{dp} \\ &= \varphi\left(\frac{\partial c_i^*}{\partial p} + \frac{\partial c_i^*}{\partial \delta}\frac{\partial \delta}{\partial p}\right) \\ &= \varphi d\left(1 + \frac{\partial \delta}{\partial p}\right) > 0 \end{aligned} \tag{A6}$$

where the sum in brackets is positive but less than 1. The implication is that the government will stem against an increase in the litigation rate by lowering the haircut, but will not completely offset this effect due to the additional costs which the haircut implies.

□

**Lemma 2.2** (Hypothesis 2a)**.** *The equilibrium share of litigating creditors is increasing in the exogenous haircut $h_e$.*

*Proof.* The derivation is analogous to Hypothesis 1. An increase in the exogenous haircut will have a direct effect on the creditors' decision, increasing the litigation rate; but the government will counter this to some extent by lowering the endogenous part of the haircut. First, see that

$$\frac{\partial \Gamma}{\partial h_e} = D\left[\varphi' d^2(1 - h - p - c_g) - 2\varphi d\right] \tag{A7}$$

which can be combined with (A2) to get the indirect effect

$$\frac{\partial \delta}{\partial h_e} = -\frac{D(\varphi' d^2(1 - h - p - c_g) - 2\varphi d)}{D(\varphi' d^2(1 - h - p - c_g) - 2\varphi d) - \kappa''(\delta)} \tag{A8}$$

The total derivative of $\Phi$ for a change in the exogenous haircut is thus positive:

$$\frac{d\Phi}{dh_e} = \varphi d\left(1 + \frac{\partial \delta}{\partial h_e}\right) \tag{A9}$$

again, because the elasticity of the endogenous haircut is less than 1.

□

**Lemma 2.3** (Hypothesis 2b)**.** *The equilibrium share of litigating creditors can increase in the restructured debt volume.*

*Proof.* The derivation is analogous to Hypothesis 1 and 2a. The total derivative of $\Phi$ for a change in the debt volume is:

$$\begin{aligned}\frac{d\Phi}{dD} &= \frac{\partial \Phi}{\partial c_i^*}\frac{dc_i^*}{dD} \\ &= \varphi\left(\frac{p - (1 - h)}{n} + d\frac{\partial \delta}{\partial D}\right) \end{aligned} \tag{A10}$$

The elasticity of the haircut with respect to a larger debt volume is negative, meaning the government will choose a smaller loss if the restructured debt is high. This is due to the

fact that we assume a fixed cost of litigation for creditors, and hence an increase in the debt volume will make litigation relatively more profitable by allowing greater leverage. Hence, the direct effect of a greater debt volume (first term in brackets) is positive, and the second term is negative. Under a positive relationship between the debt volume and the share of litigating creditors, $\partial\delta/\partial D > \frac{1-h-p}{D}$ must be true.

First, the derivative of (A1) with respect to $D$ is given by

$$\frac{\partial\Gamma}{\partial D} = (1-h-p-c_g)\left[2\varphi d + \varphi' d^2(p-1+h)\right] + 1 - \Phi - \varphi d(p-1+h) \tag{A11}$$

Hence the condition for the total effect to be positive can be expressed as

$$\begin{aligned} \frac{\partial\Gamma}{\partial D} &> \frac{p-1+h}{D}\frac{\partial\Gamma}{\partial\delta} \\ (p-1+h)\frac{\kappa''(\delta)}{D} + 1 - \Phi &> (p-1+h+2c_g)\varphi d \end{aligned} \tag{A12}$$

Since both sides are positive, the direction of the effect will depend on the other parameter values. In the empirical part, we therefore consider interaction effects between the main variables and the debt size.

□

**Lemma 2.4** (Hypothesis 3)**.** *: The equilibrium share of creditors can decrease in the upper bound of creditor litigation costs.*

*Proof.* The elasticity of the haircut to changes in creditor cost distribution is given by:

$$\frac{\partial\delta}{\partial\bar{c}} = -\frac{D(\frac{\partial\varphi}{\partial\bar{c}}d(1-h-p-c_g) - \frac{\partial\Phi}{\partial\bar{c}})}{D(\varphi' d^2(1-h-p-c_g) - 2\varphi d) - \kappa''(\delta)} \tag{A13}$$

Since $\frac{\partial\varphi}{\partial\bar{c}} > 0$ and $\frac{\partial\Phi}{\partial\bar{c}} > 0$, the elasticity of the haircut with respect to an increase in the upper bound of the creditor cost distribution is positive. If creditor costs increase, the government will choose a higher discretionary haircut, anticipating that it will lead to a smaller share of litigating creditors. To see the total effect, we need to combine this indirect effect with the direct effect:

$$\begin{aligned} \frac{d\Phi}{d\bar{c}} &= \frac{\partial\Phi}{\partial\bar{c}} + \frac{\partial\Phi}{\partial c_i^*}\left(\frac{\partial c_i^*}{\partial\bar{c}} + \frac{\partial c_i^*}{\partial\delta}\frac{\partial\delta}{\partial\bar{c}}\right) \\ &= \frac{\partial\Phi}{\partial\bar{c}} + \varphi d\frac{\partial\delta}{\partial\bar{c}} \end{aligned} \tag{A14}$$

Plugging in (A13) and rearranging, we see that there exist solutions where the total derivative is negative as long as:

$$\frac{\partial\Phi}{\partial\bar{c}} < \frac{D\frac{\partial\varphi}{\partial\bar{c}}d^2\varphi(1-h-p-c_g)}{D\varphi' d^2(1-h-p-c_g) - \kappa''(\delta) - \varphi d(2D-1)} \tag{A15}$$

If (A15) holds depends on the other parameters' values. But in the limit for the debt volume increasing, the right hand side of the equation will approach a negative constant, making the statement true for large debt volumes. In the empirical section, we therefore interact the creditor cost variable with the debt volume. □

# B Interaction effects

Table B1: Interaction effects

This table shows the results from a model with interactions of the main variables of interest with the debt volume restructured in each case. Heteroskedasticity robust standard errors clustered on country are reported in parentheses. Consistent with the results in the other tables, the results are expressed as average marginal effects, thus the coefficient on the interaction term is not explicitly included. In non-linear models with interactions between independent variables, the marginal effect of the interacted variables depends non-linearly on the level of the other variable. This implies that the coefficient on the interaction term cannot be meaningfully interpreted, see the discussion by Greene (2010). Specifically, the marginal effect for a change in $Z$ is given by $\frac{\partial Pr(Y=1)}{\partial Z} = \phi(\beta_1 Z + \beta_2 \text{Debt Amount} + \beta_3 Z \times \text{Debt Amount} + \boldsymbol{X}'\boldsymbol{\beta})(\beta_1 + \beta_3 \text{Debt Amount})$, where $\phi$ represents the p.d.f. of the probit function.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Openness to trade | Gov. effectiveness | Haircut (PV) | Bond restructuring | Corporate high yield |
| Post Allied ('85-'91) | -0.043 | -0.043 | -0.020 | -0.048 | -0.023 |
| | (0.094) | (0.092) | (0.091) | (0.096) | (0.095) |
| Post Weltover ('92-'94) | 0.069 | 0.071 | 0.091 | 0.076 | 0.092 |
| | (0.135) | (0.135) | (0.130) | (0.137) | (0.134) |
| Post CIBC ('95-'99) | -0.003 | -0.003 | 0.025 | -0.002 | 0.018 |
| | (0.136) | (0.136) | (0.128) | (0.139) | (0.135) |
| Post Elliott ('00-'10) | 0.001 | 0.001 | 0.011 | -0.001 | 0.029 |
| | (0.141) | (0.141) | (0.136) | (0.146) | (0.140) |
| Gov. effectiveness | -0.105*** | -0.101*** | -0.082** | -0.109*** | -0.091** |
| | (0.041) | (0.038) | (0.036) | (0.037) | (0.039) |
| Openness to trade | 0.126** | 0.138** | 0.122** | 0.134** | 0.131** |
| | (0.056) | (0.062) | (0.058) | (0.058) | (0.054) |
| Haircut (PV) | 0.247** | 0.247** | 0.273** | 0.274** | 0.228* |
| | (0.120) | (0.120) | (0.111) | (0.127) | (0.121) |
| Debt restruct. (log) | 0.061*** | 0.062*** | 0.064*** | 0.062*** | 0.063*** |
| | (0.015) | (0.016) | (0.014) | (0.016) | (0.015) |
| Bond restructuring | 0.024 | 0.023 | 0.005 | 0.031 | 0.022 |
| | (0.098) | (0.097) | (0.097) | (0.099) | (0.097) |
| Corporate high yield | -2.511* | -2.505* | -2.227 | -2.246 | -2.482* |
| | (1.365) | (1.388) | (1.398) | (1.379) | (1.361) |
| GDP per capita (log) | -0.007 | -0.008 | -0.012 | -0.006 | -0.011 |
| | (0.027) | (0.030) | (0.025) | (0.027) | (0.025) |
| Secondary market | -0.100 | -0.100 | -0.107 | -0.100 | -0.116 |
| | (0.069) | (0.069) | (0.070) | (0.067) | (0.074) |
| US, UK/Total ext. debt | 0.256*** | 0.257*** | 0.252*** | 0.252*** | 0.264*** |
| | (0.079) | (0.077) | (0.073) | (0.076) | (0.076) |
| AUROC | 0.863 | 0.863 | 0.870 | 0.866 | 0.864 |
| s.e. | 0.035 | 0.036 | 0.037 | 0.035 | 0.036 |
| Pseudo R2 | 0.33 | 0.32 | 0.35 | 0.33 | 0.33 |
| Log Likelihood | -54.97 | -55.04 | -53.16 | -54.66 | -54.46 |
| Obs | 174 | 174 | 174 | 174 | 174 |
| Chi2 | 93.47 | 100.04 | 113.82 | 98.15 | 99.34 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Significance levels indicated by $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

# Chapter 3

# Sovereign Defaults in Court[1]

Joint work with
Christoph Trebesch[2]
Henrik Enderlein[3]

Sovereign debt is widely seen as non-enforceable and immune from legal action. This paper takes a different perspective, by documenting the changing environment for sovereign debt enforcement in courts. We construct a comprehensive dataset of lawsuits filed by creditors against defaulting governments since 1976 and find a strong increase in case numbers, volumes, and attachment attempts. In recent years, almost 50% of sovereign debt restructurings involved litigation abroad. Our empirical analysis also suggest that legal disputes have negative spillover effects on (i) government access to international credit markets, (ii) international trade, and (iii) delays in crisis resolution. We conclude that the legal remedies against sovereign defaults have greatly increased – with high costs inside and outside the courtroom.

*Keywords: Sovereign debt; Litigation; Creditor rights; Debt enforcement*

*JEL classification: F34, K12, H63*

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## 3.1 Introduction

One of the central notions in international macroeconomics is that sovereign debt cannot be enforced – and that governments can therefore not commit to honor their obligations.[4] Unlike corporations, a defaulting government cannot be liquidated and its debt is not backed by collateral, so that creditors have few options to force a government to repay. Recent developments, however, undermine this textbook view of (non-enforceable) sovereign debt. Since the 1970s, sovereign immunity has eroded and lawsuits against sovereigns abroad have become possible. This has been particularly visible in the case of Argentina, which defaulted in 2001 and has since fought a legal battle with holdout creditors. In October 2012, Argentina suffered a notable defeat, when the New York Second Circuit Court of Appeals ruled in favor of NML, a subsidiary of the US hedge fund Elliott, turning the case into the "sovereign debt trial of the century".[5]

This paper shows that Argentina is no exception but part of a more general trend. The environment of sovereign debt enforcement has undergone fundamental changes over the past decades. We document these trends by analyzing cases of creditor litigation against sovereigns, meaning situations in which banks or so-called "vulture funds" sue a defaulting government for repayment in courts in New York or London. Based on a new dataset of sovereign debt lawsuits, we then assess the direct and indirect consequences of these legal disputes.

Our main result is that creditor litigation is increasingly common and costly for defaulting sovereigns. Most importantly, the data suggest that litigation in London and New York undermines a sovereign's access to international capital markets (as modeled by Benjamin and Wright, 2009; Pitchford and Wright, 2012). In years with legal action, external issuance drops close to zero and borrowing shifts to domestic markets. We also find that attempts to seize a country's assets abroad are associated with a decline in international trade of the debtor country, over and above the default effect per se (in line with Bulow and Rogoff, 1989a). Moreover, the data show that sovereign debt restructuring take longer to conclude once creditors start legal action.

These results bridge two classic strands of the sovereign debt literature, namely reputation models (in the tradition of Eaton and Gersovitz, 1981) and those models emphasizing sanctions and other direct means of enforcement. In this paper, we show that lawsuits are increasingly common in sovereign debt markets, in line with the sanctions view of Bulow and Rogoff (1989a). But we also find that litigation disrupts

[4]Recent surveys by Panizza et al. (2009), Wright (2011) and Aguiar and Amador (2013) all describe limited enforceability as *the* defining feature of sovereign debt. This unique characteristic of sovereign debt has motivated a large body of research (why do countries ever repay?) and proposals for a new international financial architecture. Reinhart and Rogoff (2009), for example, see the lack of an enforcement mechanism against foreign sovereigns as "perhaps the most fundamental 'imperfection' of international capital markets" (p. 53).

[5]See, for example, Financial Times, 22 November 2012, "Argentina angry at hedge fund court win." Although the outcome of Argentina's appeal is uncertain, the government may eventually be forced to repay USD 1.4bn to litigating creditors, or default again. See http://ftalphaville.ft.com/tag/pari-passu-saga/ for detailed information on the case.

international credit market access and may result in market exclusion, which is a channel traditionally emphasized in the reputation literature. The two dominant explanations for why sovereign debt can exist (sanctions vs. reputation) may thus be less disparate than previously thought.

The results also relate to a large policy debate, which has been ongoing for more than 20 years. For example, litigation has been a main motivation behind proposals for a statutory insolvency regime such as the IMF's Sovereign Debt Restructuring Mechanism (SDRM), which envisaged an "automatic stay" on legal action, as is already the case for corporations undergoing bankruptcy (see e.g. Rogoff and Zettelmeyer, 2002; Krueger, 2002; IMF, 2003; Bolton and Skeel, 2004). In the wake of the European debt crisis, the discussion on debt restructuring and an international bankruptcy court has returned (Gianviti et al., 2010; Roubini, 2010; Weder Di Mauro and Zettelmeyer, 2010; Tirole, 2012; UNCTAD, 2012; Buchheit et al., 2013a; IMF, 2013; Mody, 2013). In addition, Eurozone governments agreed to introduce collective action clauses (CACs) in all sovereign bond issues from 2013 onwards, partly to "deter disruptive litigation by minority bondholders" in future crises (ECB, 2011, p. 81).[6] Against this backdrop, it is surprising that there is only little empirical research on litigation and debt enforcement. Much of the debate keeps referring to a few well-known anecdotes, while a comprehensive picture has been missing. One reason for this lack of evidence is that no institution is responsible for collecting representative data. This stands in contrast to other areas such as trade disputes, where case information is readily available from the WTO (and much more research exists).

In the first part of the paper, we summarize new facts on sovereign debt litigation over the past four decades: How frequent are legal disputes between creditors and sovereigns? Which countries are most affected? Who are the creditors filing suit? What amounts are involved? What is the outcome of these lawsuits? And how often do creditors attach sovereign assets? To answer these questions we code a comprehensive new dataset, which comes close to a census of all debt-crisis related lawsuits filed between 1976 and 2010 in the two most relevant jurisdictions: the US and the UK. Indeed, until this day, New York and London continue to be the primary locations for external sovereign borrowing and related legal disputes.[7] To minimize coding errors and sample selection bias, we evaluated more than 10,000 pages of case material from electronic court records such as

[6] Further related policy initiatives include a 2010 UK law that bans creditor lawsuits against poor countries undergoing debt relief. Similar legislation has been implemented in Belgium and two Channel Islands, while US Congresswoman Maxine Waters initiated the "Stop Vulture Funds Act" in 2009. In addition, the African Development Bank established a "African Legal Support Facility" in 2009, to assist debtor governments facing litigation, while the Commonwealth Secretariat has set up a "Legal Debt Clinic" to serve the same purpose.

[7] Recent research confirms the continued dominance of English and New York law in foreign bond and loan markets. The IMF (2002) shows that about 80 percent of international bonds were issued under New York law as of 2002, with English law accounting for less than 20 percent. Das et al. (2012) provide similar figures for selected countries as of 2010, while Gulati and Scott (2012) show similar data based on a comprehensive historical overview of legal provisions in international sovereign borrowing.

PACER[8], and verified each data entry across all sources available, including in previous data collections and research. For the US, this allowed us to identify the full set of initiated lawsuits following a default or restructuring, including those that are settled out-of-court or those which remain unresolved.

The coding results show the *rise of creditor litigation* in several dimensions. The total number of lawsuits is only 120 (not counting multiple lawsuits by the same creditor), but more than half of these cases have been filed since the year 2000. The likelihood that a debt crisis is accompanied by creditor litigation has increased from less than 10% in the 1980s to 50% in recent years. Since the mid-1990s the total amount under litigation has more than doubled, to more than USD 3 bn in 2010. On average, from 2000 to 2010, the claims under litigation corresponded to 3% of total debt restructured or 1.5% of debtor country GDP (averages from 2000 to 2010).

The duration of cases has also increased, to an average of 6.2 years, and we observe more and more attachment attempts, meaning strategies to seize sovereign assets abroad. A main reason behind these trends is the proliferation of distressed debt funds or "vulture" funds, which typically sue for longer periods of time, initiate more attachment attempts, and litigate for larger amounts than other types of creditors, such as banks. Between 2000 and 2010 "vultures" filed nearly 75% of all lawsuits against foreign governments. Taken together, we observe a significant increase in both the occurrence and intensity of sovereign debt litigation. At the same time, we find that the legal enforcement of sovereign debt claims via courts remains very difficult.

Litigious creditors have therefore increasingly relied on indirect enforcement tactics that disrupt a country's trade and capital flows. They seize oil tankers, export revenues, presidential airlines, or financial assets such as a country's social security accounts held abroad or interest payments to other creditors. Bolton and Jeanne (2009) explain that the resulting externalities can be much larger than the value of the litigated claims. Creditors anticipate this and hope that the "nuisance value" of their legal action will force the government into an out-of-court settlement.

In the second part of the paper, we assess the potential spillover effects of litigation systematically. Building on established theory work, we test the three hypotheses of how legal disputes affect (1) international borrowing, (2) international trade flows, and (3) the resolution of debt crisis (negotiation duration). Empirically, we follow widely cited papers such as Gelos et al. (2011) and Rose (2005) and extend their models by one previously omitted dimension: litigation.

Our results provide strong support for Hypotheses (1) and (3), on bond market access and negotiation delay. Legal disputes are associated with a significantly lower likelihood of issuing bonds internationally, after controlling for country and year fixed effects, macroeconomic and political conditions, and accounting for the fact that governments can abstain from borrowing voluntarily. Remarkably, between 2000 and 2010, we could not find a single instance in which a government facing litigation in London or New York

[8]PACER stands for Public Access to Court Electronic Records (http://www.pacer.gov).

also placed a sovereign bond in these jurisdictions. With regard to negotiation duration, we find strong indication that litigation causes delay. The likelihood for successful debt settlement (crisis exit) is 40% lower in months with ongoing legal disputes. We find somewhat weaker support on trade spillovers (Hypothesis 2): in the empirical model of Rose (2005), litigation is associated with a 11% decline in bilateral trade, over and above the default effect per se. However, this finding is not robust to including time fixed effects.

**Related literature:** The paper contributes to several literatures. First and foremost, we add to research on the "elusive" costs of sovereign default (surveyed by Panizza et al., 2009). Until this day, "estimates of the costs of sanctions are few and necessarily imprecise" (Bulow and Rogoff, 1989a, p. 175). This paper is an attempt to improve on this, by conducting the first broad-based test on the legal consequences of default, which have been a matter of debate since at least Alexander (1987). The results suggest that legal disputes with foreign creditors can trigger substantial direct and indirect costs for defaulting countries. Thus, the legal consequences of default seem to be more important than generally recognized. Our case studies and estimates therefore provide empirical support for a small group of theory papers that assume legal sanctions and costly creditor litigation such as Bulow and Rogoff (1989a,b); Schwartz and Zurita (1992) and, more recently, Bolton and Jeanne (2007, 2009); Adam and Grill (2013); Pitchford and Wright (2012), and Arellano et al. (2013). We should emphasize, however, that our results do not necessarily imply that litigation reduces welfare. We do not explore the ex-ante effects of stronger or weaker creditor rights.[9] This is not a general equilibrium analysis.[10] Instead, we show that the "legal threat" to sovereign debt restructuring is increasingly relevant ex-post, which may affect the incentives to default or to settle with potential holdouts ex-ante (Sturzenegger and Zettelmeyer, 2006).

Second, we contribute to the debate on sovereign debt restructuring mechanisms and creditor coordination problems in times of distress. Many recent theory papers have analyzed the legal framework of sovereign debt restructurings and the implications of holdouts and litigation, in particular Miller and Zhang (2000), Ghosal and Miller (2003), Weinschelbaum and Wynne (2005), Gai et al. (2004), Haldane et al. (2005), Bolton and Jeanne (2007), Pitchford and Wright (2007, 2012), Engelen and Lambsdorff (2009), Bi et al. (2011), Lanau (2011) and Ghosal and Thampanishvong (2013). In contrast, the empirical evidence has been limited. Sturzenegger and Zettelmeyer (2006) provide a historical overview on the development of sovereign debt law and litigation. Miller and Thomas (2007) analyze the Argentine litigation episode from an economic perspective, while Alfaro et al. (2010) and Bradley et al. (2010) assess the market reaction to important court decisions. There is also a vast legal literature with detailed studies on prominent cases,

[9] Eaton (1990) and Scott (2006) argue that better enforcement may have a positive ex-ante effect, since governments will be less likely to overborrow and default. A similar argument is made by Dooley (2000), Shleifer (2003), and Pitchford and Wright (2007).

[10] Nevertheless, in Appendix C we discuss why litigation can occur in equilibrium.

such as *Elliott v. Peru*, and a discussion on their judicial implications.[11] Our contribution is to provide the first representative dataset on the issue, which may help to discipline future theoretical work and may facilitate an informed policy debate.

Third, we contribute to research on international economic disputes and enforcement problems involving sovereign states more broadly. There is a large body of work on trade disputes and litigation within the GATT and WTO, which shows interesting parallels to the debate on sovereign debt enforcement. For example, the recent paper by Maggi and Staiger (2011) assesses the role of an international court to enforce trade agreements, while Limão and Saggi (2008) propose the issuance of bonds as collateral against potential trade disputes. Importantly, the theoretical work in this area been accompanied by a rich empirical literature on the determinants and effects of trade disputes and trade related litigation (e.g. Bown, 2004a,b; Grinols and Perrelli, 2006). In contrast, research on sovereign debt disputes has so far remained almost exclusively theoretical.[12]

The remainder of the paper is structured as follows. Section 2 summarizes the legal context and history of sovereign debt litigation based on the existing literature. Section 3 presents our database and main stylized facts. Section 4 develops and tests three hypotheses on the consequences of creditor litigation for market access, trade and restructuring delays. Section 5 concludes.

## 3.2 What do we know about sovereign debt litigation?

### 3.2.1 Historical background – The decline of sovereign immunity[13]

For most of history, private creditors lacked a direct enforcement device against foreign governments. It is difficult to force a government to repay, and sovereigns hold most of their assets domestically, which shields them from access by foreign creditors. In addition, there are legal principles protecting debtor governments, in particular the doctrine of "absolute" sovereign immunity, which states that a government cannot be sued in foreign courts. Lacking legal remedies, creditors had few other choices than to accept unilateral defaults and restructurings, or to seek support from their own governments, e.g. by lobbying for trade sanctions or for military interventions.[14]

A far-reaching shift in legal doctrine occurred after World War II, when the United States and a number of European countries started to adopt a more restrictive view on sovereign immunity, which excluded commercial activities like cross-border investment

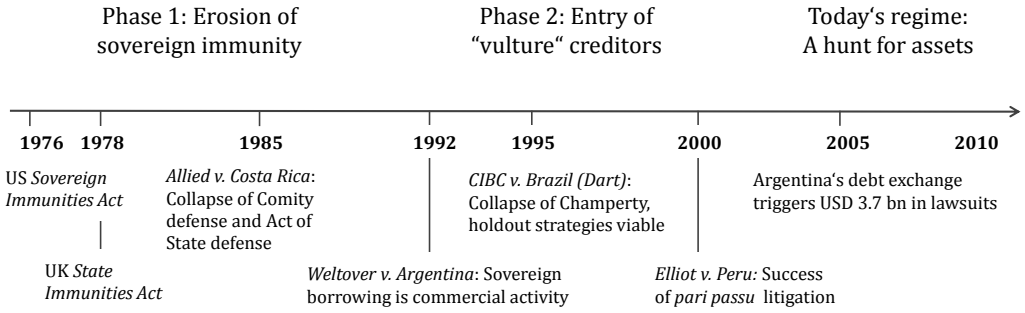
[11] See Hurlock (1984a,b), Goldman (2000), Wheeler and Attaran (2003), Fisch and Gentile (2004), Gelpern (2005), Blackman and Mukhi (2010), Broomfield (2010), Waibel (2011), and many others.

[12] Mitchener and Weidenmier (2010) take a historical perspective on sovereign debt enforcement, by analyzing military interventions ("gunboat diplomacy") to enforce repayments prior to World War I.

[13] This section is largely based on Fisch and Gentile (2004), Sturzenegger and Zettelmeyer (2006), Foster (2008), Alfaro et al. (2010), Blackman and Mukhi (2010) and Waibel (2011).

[14] Buchheit (2005) and Waibel (2011) explain that creditors have often asked their governments to intervene on their behalf, especially in the 19th and early 20th century. These attempts were often fruitless, however, except for a few prominent examples of "supersanctions" in the era of gunboat diplomacy, 1880-1913 (see the debate between Tomz (2007) and Mitchener and Weidenmier (2010)).

Figure 3.1: Stylized evolution of litigation environment




and trade.[15] The restrictive theory of sovereign immunity was codified into US law through the Foreign Sovereign Immunities Act of 1976 (FSIA). Shortly thereafter, the United Kingdom passed a similar law, the State Immunity Act in 1978, and many other countries followed suit. As a result, states and their public entities could now be held legally accountable for breach of commercial contracts, that is, they could be sued in foreign commercial courts.

The history of sovereign debt litigation since the FSIA can be described as a gradual erosion of government immunity. Debtor defenses collapsed, one after the other, making creditor remedies in court more effective, at least at the margin. Figure 3.1 illustrates the evolution of the legal environment for sovereign debt litigation in a stylized form. We roughly categorize three main "eras" since 1976, which are structured around a set of high-profile decisions.

The first era of sovereign debt litigation was triggered by the 1980s debt crisis in developing countries. Lawsuits were mostly filed by banks and other buy-and-hold investors who aimed at enforcing better terms than those negotiated in the London Club process. The first well-known case that built on the FSIA was filed in 1982, when *Allied Bank* refused to participate in the debt restructuring agreement with Costa Rica. After several rounds of hearings, the New York Second Circuit eventually ruled in favor of Allied, but the US government pressured the bank to settle out of court, at the same terms as the other syndicate banks. Despite this outcome, the success of *Allied* set an important precedent: it showed that holdout strategies could work and that classic defenses such as sovereign immunity, the act of state doctrine or the principle of international comity were insufficient to protect a sovereign from lawsuits (see Fisch and Gentile, 2004, and Sturzenegger and Zettelmeyer, 2006, for a detailed explanation). In addition, the case confirmed that Costa Rican government assets in the US were attachable, because the

[15]One of the reasons for restricting sovereign immunity was that governments and their state-owned enterprises were becoming increasingly active in cross-border investment and trade during the 1940s and 1950s. Their legal immunity gave public firms an undue competitive advantage over private firms. In addition, Western governments were concerned that Soviet firms could not be held legally accountable for their commercial activities abroad (see McNamara, 2006).

government had explicitly waived its immunity.

During the remainder of the 1980s only about a dozen further creditor lawsuits were filed. The most prominent case was *Weltover v. Republic of Argentina*, decided in 1992, which gave a definitive blow to the defense of sovereign immunity. The Supreme Court confirmed the plaintiff's argument that issuing sovereign debt on international capital markets qualifies as a commercial activity, and that a subsequent suspension of payments causes a direct effect in the United States according to the provisions of the FSIA. Effectively, this decision granted US courts the jurisdiction over any sovereign loans or bonds issued under US law and concluded the demise of debtor defenses from suits.

From the early 1990s on, the sovereign debt litigation regime reached a watershed with the entrance of a new type of plaintiff: specialized distressed debt funds, or, as they would later be called, "vulture funds". "Vulture funds" are often based in tax havens, such as Liechtenstein or the British Virgin Islands, and often act as temporary vehicles, being established solely to pursue a specific case. *CIBC v. Banco Central do Brazil* was the first major litigation success by a "vulture fund" against a sovereign debtor. The case was launched by the Dart family, which had acquired USD 1.4 bn of Brazilian long-term debt in the secondary market but refused to participate in Brazil's Brady deal of 1992, going to court instead. After a favorable judgment, Brazil agreed to settle a part of the past due interest, and the Dart family was able to sell its entire debt stake at a substantial profit.

The *CIBC* case gave an early example of how rewarding holdout strategies could be. In addition, *CIBC* played an important role for case law development because it weakened the so called champerty defense, which, until then, prohibited the purchase of debt with the primary intent of filing a lawsuit. Champerty could have undermined the key business model of "vulture funds": buying debt on secondary markets at a steep discount and then suing for full repayment. But the defense continued to be rejected in most subsequent cases and was effectively eliminated in 2004 (Blackman and Mukhi, 2010). This set the stage for the modern era of sovereign debt enforcement, in which "vulture" creditors can easily obtain favorable judgments, but devote most of their resources to seize attachable sovereign assets.

### 3.2.2 The current litigation environment - A hunt for assets

The current sovereign debt litigation environment is perhaps best described as a hunt for assets. Since 1992, immunity from *suits* is no longer the main hurdle. Instead, the legal battleground has moved to immunity from *attachment*, as creditors continue to face serious difficulties in executing judgments and collecting assets. The main legal obstacle from a creditor perspective is that sovereign immunity laws, like the FSIA, continue to protect many government assets from attachments. Recent court decisions in the US have confirmed that sovereign assets are only attachable if they are *located in the United States* and *used for commercial purposes*.[16] This narrows down the number of potential assets to

[16]Similar constraints apply in the UK, France or Germany (Foster, 2008).

seize considerably.

The heyday of debt enforcement seemed to have arrived in the late 1990s, when the hedge fund Elliott used a novel interpretation of the *pari passu* clause that could have rendered any further asset searches unnecessary (*Elliott v. Republic of Peru*). *Pari passu* is a standard clause contained in most sovereign debt contracts, although its exact meaning and relevance remains controversial until today. In corporate bond contracts, the clause is meant to ensure equal treatment of creditors in case of a liquidation. Since this situation does not arise in the sovereign context, the clause's interpretation has been subject to an ongoing debate (see Gulati and Scott, 2012). Back in the 1990s, Elliott argued that the clause prohibited Peru from paying its restructured creditors without making a payment to holdouts as well. Based on this strategy, Elliott succeeded in blocking an interest payment that Peru was about to make via the settlement provider Euroclear in September 2000. Rather than risking a default on its entire stock of Brady debt, Peru quickly settled at face value, transferring about USD 58 m to Elliott. Not surprisingly, the case encouraged a wave of similar pari passu litigation.[17] Ultimately, however, no other plaintiff succeeded in attaching interest or principal debt payments, at least until 2013.[18] As a consequence, judgment creditors were back searching for non-immune, attachable assets – and they have done so actively.

Since the early 2000s and Argentina's debt default, "vulture funds" have stepped up their collection efforts by trying to seize a variety of assets around the globe. Amongst other, "vultures" have attempted to seize Argentina's government airplane, its central bank assets and social security funds in the US, a sailing ship of the Argentine Navy (ARA Libertad), and even dinosaur fossils on exhibition in Europe (see Blackman and Mukhi, 2010; Foster, 2008). So far, however, most of these attempts have been unsuccessful, in the sense that attachments were ultimately rejected by US and European courts.

## 3.3 The dataset: sovereign debt litigation 1976-2010

### 3.3.1 Data sources and case selection

To identify the set of relevant cases we start with the list of 180 sovereign debt restructurings assembled by Cruces and Trebesch (2013). Their dataset captures the full sample of restructurings of medium and long-term sovereign debt owed to foreign commercial creditors, including banks and bondholders, by 69 debtor countries worldwide, between 1970 and 2010.[19] For each debt crisis event we then searched for litigation cases filed in foreign courts by commercial creditors. We focus on cases initiated in the US or the UK

[17] In particular, *Red Mountain Finance v. Democratic Republic of Congo*, *LNC Investments v. Nicaragua*, *Kensington International v. Republic of Congo*, *Export-Import Bank of China v. Grenada*, and the argument has also been prominently invoked in the lawsuits following Argentina's 2001/02 default.

[18] The pending Argentine pari passu case(s) might turn out as a creditor success eventually.

[19] We update this list by three recently completed HIPC buyback operations, namely Mozambique 2007, Nicaragua 2007 and Liberia 2009, and include the Congo 1988 restructuring as an additional case.

and cover the time period after the enactment of the FSIA, from 1976 until 2010.[20]

The database excludes litigation cases filed in domestic courts. We also exclude suits filed by retail investors, including class action suits, as these differ in many respects from suits filed by professional investors. Retail cases involve small amounts and mainly played a role in a single case: the recent Argentinean default. Furthermore, we are not aware of one single case in which retail creditors were successful in attaching assets or receiving a favorable settlement.[21]

Our aim is to analyze litigation related to sovereign bonds and loans in default. As a consequence, we disregard lawsuits on sovereign liabilities that are not related to a debt crisis or restructuring as well as public liabilities that are detached from sovereign debt markets, such as procurement bills or unpaid checks by embassies abroad.[22] Our focus on debt crisis events implies that we drop a number of litigation cases that do not go back to a sovereign default or restructuring (one example is *Noga v. Russia)*.[23] Relatedly, we exclude lawsuits by investors seeking compensation for expropriation or otherwise perceived foul treatment by foreign governments.

For the statistical analysis, we organize the information in a creditor-debtor conflict pair dataset. This implies combining multiple legal actions between identical plaintiffs and defendants into one observation, even if these actions took place in multiple court actions or jurisdictions. As an example, NML Capital, a subsidiary of Elliott Management, filed more than 10 individual actions against Argentina in the Southern District of New York court, plus lawsuits in multiple other US federal district courts. These actions are at times consolidated (merged), or abandoned when new proceedings are initiated. For the purpose of analyzing the determinants of legal disputes, it does not appear sensible to treat these cases of "jurisdiction shopping" as separate observations. The creditor-debtor pair *NML Capital v. Republic of Argentina* therefore enters our database as a single observation only. This approach allows us to analyze the drivers of litigation without biases arising from the legal complexities of any specific case, or due to the tactics of individual maverick creditors.

[20]For completeness, we also include three related arbitration proceedings, since arbitration tribunals are supra-jurisdictional in nature and usually have repercussions in US or UK courts for enforcement reasons; all of our results are robust to excluding these cases.

[21]In the US, we identify more than 70 lawsuits filed by groups or individual retail investors against Argentina, as well as 13 class action suits. Most of the individual cases involved negligibly small sums and did not move beyond the recognition of claims. After years of unsuccessful efforts, a large number of these lawsuits were abandoned after Argentina's second exchange offer in 2010. A separate search revealed that 13 retail cases were filed in Italian courts, while 648 individual retail investors filed suit in Germany (on a total of EUR 270m in claims - the German legal system does not allow for groups or classes filing suit). Anecdotal evidence suggests that German retail investors were able to recover small amounts, see Frankfurter Allgemeine Zeitung, 27 April 2005).

[22]Besides lawsuits on sovereign bonds and loans we add a few cases in which trade credit or letters of credit were restructured into medium- and long-term loans or bonds as part of a formal sovereign debt exchange. Nigeria, for example, restructured letters of credit into sovereign medium-term loans during the 1980s, while Guyana exchanged debt of nationalized industries into long-term government bonds in 1992.

[23]Noga's claim has little to do with a default or restructuring of sovereign debt. Instead, it goes back to a bilateral commercial transaction outside of sovereign loan or bond markets – the delivery of foodstuffs to Russia in exchange for oil in 1991.

Our main sources are electronic legal databases. For the United States, we relied on the comprehensive PACER archive maintained by the US court system, which allows identifying all cases filed against any given person or entity, even for those cases that are discontinued or resolved through out-of-court settlements, thus mitigating concerns of sample selection. To verify the set of US cases we also applied systematic searches in the more standard legal database Lexis Nexis and the press database Factiva.[24] For the United Kingdom, there is no official court record archive comparable to PACER. We therefore relied on a broad range of available UK-specific legal databases, including Lexis Nexis UK, Westlaw, Casetrack, Justis, and BAILII, and again applied our standardized search algorithms.

To complement and cross-check the information retrieved in these electronic databases we draw on the case details provided in policy reports and the academic literature. In particular, we rely on the annual survey of litigation cases conducted by the IMF and World Bank in up to 40 HIPCs since 2002 (see IMF and World Bank, 2000-2011), as well as the case list by Singh (2003). Both were very helpful points of departure, but many of the cases in these lists turned out to be unrelated to sovereign debt crises and cross-checking with court records revealed inaccuracies and omissions. Further important case lists include the reports by Cleary Gottlieb Steen & Hamilton and Clifford Chance (1992), Buchheit (1999), the Emerging Market Traders Association (EMTA, 2009), the Institute for International Finance (IIF, 2009) and the case lists compiled by Sturzenegger and Zettelmeyer (2006), Alfaro et al. (2010) and Trebesch (2010).

### 3.3.2 Coding results: stylized facts on creditor litigation 1976-2010

Table 3.1 summarizes main results from our database. Overall, we identify 120 instances of litigation by commercial creditors against 25 debtor countries that restructured sovereign debt vis-à-vis their foreign private creditors. Of these, 102 cases were filed in the United States, mostly in the Southern District of New York court. Only 15 cases were filed in England and 3 are the arbitration cases mentioned above. The dominance of US cases is partly due to the fact that most Latin American defaulters issued their debt under New York law. Interestingly, we find that some creditors file suit in more than one jurisdiction. 15% of cases are brought forward in more than one jurisdiction: 4 plaintiffs filed a case in English courts that had already been initiated in New York, while another 4 cases started in the UK and were later continued in the US.

**Case numbers:** A first notable pattern in the data is the strong increase in litigation occurrence over time. This becomes particularly evident in Figure 3.2, which shows the

[24]For the legal databases, we employed a search for `COUNTRY w/25 (debt OR bond OR loan) AND (default OR payment OR insolvency OR attachment OR sovereign immunity OR FSIA)`. For Factiva, we searched for `COUNTRY near25 (debt and (vulture OR litigation OR lawsuit OR suit OR court decision OR holdout creditor OR southern district of New York OR district court OR high court OR ewhc OR default judgment OR summary judgment OR out-of-court OR out of court OR attachment))`.

number of pending lawsuits for each year between 1976 and 2010.[25] This number has gone up from less than 5 throughout the 1980s, to more than 40 ongoing disputes in more recent years. In parallel, there has been an increase in the total amount of principal under litigation, from close to zero to nearly USD 3bn in 2010 (excluding accrued interest).

The picture is very similar when matching individual lawsuits to the respective debt restructuring event.[26] Figure 3.3 shows the total number of debt restructurings per year, and the subset of these which were subject to at least one creditor lawsuit in the US or the UK. The share affected by litigation has increased substantially. During the 1980s about 5% of restructurings were accompanied by legal creditor action. This figure has increased to more than 40% during the 2000s. The resulting picture is also very similar if we construct the same graph using default years from Standard & Poor's (S&P), instead of the Cruces and Trebesch (2013) data on restructuring events.

A further notable pattern in the data is the strong variation across crisis events. In total, only 30 out of the 176 restructurings were accompanied by a legal conflict (a share of 16%). Of these 30 restructurings, 16 involve only a single lawsuit, while the remaining suits are concentrated on a few crisis cases. Argentina accounts for a third of the case universe, with 41 commercial creditor lawsuits filed after the default of 2001. Peru's Brady debt exchange in 1997 was also accompanied by an unusually high number of court cases, triggering 13 lawsuits in the United States. Next come Iraq 2006, Liberia 2009 and Congo 2007 with 10, 9 and 7 cases, respectively, as well as Nicaragua 1995, Ecuador 1995, Nigeria 1983, and Zambia 1994 with three to four cases each. These numbers show that a "run to the courthouse" could generally not be observed in the context of sovereign debt crises, except for a few cases such as Argentina, Peru, Iraq and Liberia.

**Countries and creditors involved:** As to the type of countries, governments in Latin America and Africa were most affected, accounting for 79 and 27 creditor lawsuits, respectively. Most debt-crisis related cases are filed against middle-income countries in the emerging market world. Nearly 30% of all lawsuits were launched against HIPCs, or 34 out of 120 cases. Turning to creditor characteristics, the data show that distressed debt funds are the dominant type of plaintiff filing suit, and increasingly so. For the 114 cases for which we have information on the creditor, 63 were filed by funds, 30 were filed by banks and the rest by other commercial creditors such as suppliers or insurance companies. Since the year 2000, 75% of all cases were initiated by distressed debt funds. Table 3.2 shows that most of these litigious funds are not well-known, also because prominent creditors, such as Elliot or the Dart family, file suit through one of their subsidiaries such as NML capital, CIBC or EM Ltd., respectively. This opaqueness

[25]The upward trend in case numbers is also clearly evident when showing the number of cases *initiated* in each year between 1976 and 2010. The resulting figure is, however, much more volatile.

[26]Cruces and Trebesch (2013) identify 180 sovereign debt restructuring events since 1976. However, a few countries implemented two sovereign debt restructurings in the same year. In case the court documents do not allows us to uniquely match a litigation case to one of the two events, we merge them into one observation per country and year. This leaves us with a final cross section of 176 relevant debt restructuring events. Note that debt crisis related lawsuits have been filed both before or after a debt restructuring operation is implemented.

is a characteristic feature of "vulture" litigation.

**Amounts:** The volume of claims is not high compared to the volume restructured, but it is strongly increasing. For those deals for which we could collect details on the amounts litigated, the average claim is USD 60m, with a median of USD 10m. This compares to an average restructuring volume of USD 6.5bn, with a median of USD 1.1bn. Thus, on average, the litigated claims correspond to 3.1% of total debt restructured (with a median of 1.1%), or 0.8% of debtor country GDP. Interestingly, the litigated amounts shows a notable upward time trend, from 2.5% of restructured debt in the 1990s, to 4% in the 2000s (the latter corresponds to 1.5% of GDP). In absolute numbers, the largest suits were filed against Argentina after 2001, with a total of USD 3.7bn[27](including arrears and accrued interest), or about 5% of the 2005 debt exchange. Next comes *CIBC v. Brazil*, with a total amount of USD 1.4bn. In relative terms, however, the scope of litigation is most relevant for poorer and smaller countries. Two HIPC examples are Nicargaua (in the 1990s) and Liberia (in the 2000s) where lawsuits amounted to 5.9% and 4.3% of GDP, respectively. Similarly, the recent litigation cases against Dominica and Grenada accounted for more than 3% of GDP in each case, or 8% and 10% of total amounts restructured.

**Case outcomes:** We were able to code the process and outcome for 106 of the 120 lawsuits in the database. Regarding case outcomes, it is surprising that only 4 lawsuits were outright failures, in the sense that the court rejected the claim and discontinued the case. In contrast, creditor claims were full satisfied in 13 cases according to the legal records. 48 lawsuits, or nearly half the sample, were settled out of court with little details available, at least not from official sources.[28] Nearly half of these out of court settlements took place after creditors were granted an attachment order, which is when creditor activism can be particularly disruptive for debtor countries.

**Recovery rates and returns for creditors:** We could not gather representative information on recovery rates and creditor returns. Data on settlement amounts is not available from court documents – our most important and reliable source. Nevertheless, for a few cases, we could gather (noisy) information on financial outcomes from policy reports, the press and previous research. These case anecdotes should be taken with care, because they are often based on rumors only. But they do provide suggestive evidence that the recovery rates in out-of-court settlements are often high, at least as high as in the original exchange offer. Appendix B provides a few examples of settlements that were particularly lucrative for creditors, sometimes implying investment returns of more than 100%. In addition, we report anecdotes on a few failed litigation attempts. The available evidence confirms that sovereign creditor litigation is a high-risk, high-return strategy.

**Duration of lawsuits:** We find that sovereign debt lawsuits have become significantly

[27]This figure is from Argentina's 2011 SEC filing, which is available at http://www.sec.gov/Archives/edgar/data/914021/000090342311000486/roa-18k_0928.htm. The face value under litigation amounts to USD 2.87bn, see Table 3.2 (for comparability we use this amount in the econometric analysis).

[28]Sometimes we could find guesstimates on settlement amounts and investor returns from the financial press or various policy reports, but these figures are hard to verify and often do not match across sources.

more protracted since investors specializing in distressed government debt became more active. During the 1990s the average case duration was 4.8 years, but this figure has increased to 6.2 years during the 2000s. A more systematic way to assess the duration of lawsuits across cases is to estimate an empirical survival function. The results of a non-parametric Kaplan-Meier estimation confirm that "vulture" lawsuits are particularly protracted: after 5 years (60 months) the probability of case survival is still above 75%, compared to less than 50% for other creditors. Even after 10 years, distressed debt funds continue to litigate with a probability of more than 50%. The likelihood of early settlement is generally low, particularly for cases initiated after the mid-1990s.

**Attachment attempts**: Finally, we identify an increasing number of attachment attempts. The share of lawsuits with attempted asset seizures has increased from below 20% in the early 1990s to nearly 50% in recent years. As expected, "vulture" funds are much more likely to initiate attachments: 56% of "vulture" cases involve at least one attempt to seize assets, compared to just 21% of cases filed by other creditors.

Taken together, these procedural data strongly indicate that creditor strategies have become more aggressive over time and that the direct costs of legal disputes have increased.

## 3.4 The spillover effects of litigation: empirical evidence

This section implements three empirical tests to assess the externalities of creditor litigation, that is, indirect costs beyond the immediate expenses such as settlement payments and legal fees. We build on theoretical papers to derive three hypotheses on the role of litigation for (i) government access to capital markets, (ii) international trade flows and (iii) delays in sovereign debt renegotiations. For each hypothesis, we gather case study evidence and test them systematically using cross-country panel regressions. We opt for a very conservative approach in our econometric analysis and closely follow the most influential empirical papers on the cost of default. More specifically, we use existing estimates and add variables on the occurrence and scope of creditor litigation. This facilitates the comparability of our results with the previous literature.

### 3.4.1 Theory and hypotheses

A widely discussed spillover effect of sovereign litigation is that it may disrupt government borrowing in international capital markets. The seminal paper by Eaton and Gersovitz (1981) suggests that foreign creditors can retaliate against a defaulting country by denying access to new borrowing. The assumption of financial exclusion has since been widespread in the sovereign debt literature,[29] but there is no agreement on the

[29]Exclusion is costly since it weakens a country's ability to smooth consumption and to insure against bad shocks. See also the debate in subsequent papers by Bulow and Rogoff (1989b), Kletzer and Wright (2000), Amador (2003), Aguiar and Amador (2006), Kovrijnykh and Szentes (2007), Arellano (2008), Sandleris (2008), and Yue (2010).

mechanism causing the observed loss of market access during debt crises (see Wright (2011) for a review). One explanation are direct legal sanctions, as suggested by Pitchford and Wright (2007, 2012), who generate prolonged exclusion in a debt bargaining game, and not as a result of an exogenous process as in previous papers. In their 2012 model, individual creditors can effectively veto a government's attempt to tap foreign debt markets, which results in a strategic hold-up effect: all creditors need to settle before the government can borrow again. This reasoning is similar to Benjamin and Wright (2009) and in line with Alfaro (2007), who argue that the threat of creditor attachment is severe and effectively imposes a "virtual blockade" on capital flows to the country. Also Sturzenegger and Zettelmeyer (2006) suggest that litigation can have adverse implications for market access and investments, partly due to the reputational damage that legal disputes can entail.

Appendix A exploits court documents and other sources to show how litigating creditors disrupted market access in Panama, Peru and Argentina. In these and other cases, creditors have succeeded in interfering with bond payments and other transactions flowing through international financial centers. The attachment attempts curtailed the planned issuance of new bonds or blocked contractually scheduled payments on performing debt, thus potentially forcing the sovereign into a default. Litigating creditors have also been lobbying for legislation that would deny foreign governments access to US capital markets in case of outstanding judgments in US courts (Securities and Exchange Commission, 2011). The anecdotes suggest that the disruption of market access has been a deliberate strategy of distressed debt funds to extract favorable settlements. To our knowledge, however, there has not yet been a systematic assessment on the link between legal disputes and sovereign access to capital markets. We therefore formulate and test the following hypothesis:

*H*1 Creditor litigation and attachment attempts results in a loss of access to international capital markets.

A second potential externality of creditor litigation is the disruption of trade, as famously proposed by Bulow and Rogoff (1989a). In their model, creditors react to a default by imposing legal sanctions which reduce a country's gains from trade in financial and goods markets. Trade financing could be cut off and countries may need to trade in roundabout ways to avoid seizures. Rose (2005) was the first to bring this idea to the data, showing that defaults are indeed associated with decline in trade, although he does not analyze the underlying channel.[30]

Case studies from Ecuador, the Republic of Congo, and Zambia in Appendix A illustrate how sovereign debt lawsuits can disrupt international trade. A frequently applied strategy by creditors was to seize or block the proceeds from commodity exports such as oil and copper. Creditor threats of seizing trade shipments go back to the 1980s,

[30]Diaz Alejandro (1983) and Mitchener and Weidenmier (2010) provide evidence that sanctions and military interventions ("supersanctions") by creditor countries had adverse effects on international trade.

when Brazil prepared its 1987 moratorium by ordering "Brazilian oil tankers to sail from foreign ports to avoid sequestration" (Financial Times, 23 February 1987). A more recent case is Iraq after 2003, when the country faced pending lawsuits on defaulted Saddam-era debt in US courts. The threat of creditor attachments on its oil exports was perceived as being so severe, that the UN Security Council issued a special resolution to make Iraq's petroleum exports immune from "any form of attachment, garnishment, or execution" (UN Resolution 1483, 22 May 2003; Buchheit et al. (2013b)). Despite these examples, no paper has yet studied the link between trade flows and legal disputes systematically. This brings us to our second testable hypothesis:

*H*2 Creditor litigation and attachment attempts result in a decline in international trade.

The third potential externality studied is delay in crisis resolution. Creditor coordination problems have been an important concern in the policy debate on sovereign debt over the past 20 years (Roubini and Setser, 2004; Bolton and Jeanne, 2007). (Shleifer, 2003, p. 87), for example, emphasizes that creditor litigation may induce significant "delays [in] settlement, possibly prolonging recessions and raising the cost of IMF programs". Recent policy reports such as Gianviti et al. (2010), Buchheit et al. (2013b) and IMF (2013) also describe litigation and holdouts as a main stumbling block for quick and efficient debt workouts. Pitchford and Wright (2007) and Pitchford and Wright (2012) formalize these concerns in the framework of a dynamic bargaining model, in which delay arises because holdout creditors refuse to settle in order to extract better terms. Here, we aim to shed new light on whether this type of delay is empirically relevant.

Appendix A provides anecdotal evidence on how legal disputes contributed to delays in debt restructurings of the 1980s, 1990s and 2000s. One explanation is that "vulture" creditors often enter the scene only in the last stage of a restructuring process, just before a final agreement is reached with banks or bondholder groups.[31] The entry of professional distressed funds can alter the bargaining setting and disrupt the closure of the deal, even if such delays are not explicitly intended by the "vulture" investors themselves. The case studies show that holdout litigation can cause delay for a variety of reasons: (i) governments may refuse to continue negotiating if creditors litigate or threaten to litigate; (ii) minimum participation threshold may no longer be reached if too many investors decide to follow the strategy of "vulture" funds and other holdouts; (iii) and creditor committees may no longer be sufficiently representative. The deadweight losses resulting from these delays can be costly ex-post, both to the government and to the majority of creditors. Based on these insights and the received literature, we therefore formulate and test our third hypothesis:

*H*3 Litigation can result in delay in sovereign debt renegotiations and settlement.

[31] Jay Newman, a senior portfolio manager of the distressed debt fund Elliott, made clear that their "approach has always been to look for countries with a good prospect of renegotiating debt" (The Sunday Times, 15 June 2008).

In the empirical analysis we rely on three measures of creditor litigation against sovereigns. The first variable, denoted as "any litigation", is a dummy capturing whether the government faced at least one sovereign debt lawsuit in a given year (in London or New York). The second measure captures the scope of litigation, computed as the share of litigated claims in total debt restructured. Third, we use an "attachment" dummy capturing whether the sovereign faces ongoing attachment proceedings and, thus, immediate threats of asset seizures.

### 3.4.2 Litigation and bond market access

#### Access: empirical approach and preliminary analysis

To test Hypothesis $H1$, we need a measure of government bond market access in international markets. For this purpose, we rely on the most comprehensive database on sovereign primary market issuance, namely the Dealogic dataset (formerly Bondware), which is used by the IMF and many other financial institutions to track global issuance patterns.[32]

A key challenge for any empirical analysis of market access is to disentangle (i) supply effects due to foreign credit rationing and (ii) demand effects, i.e. a lack of demand for foreign credit by the government. It is difficult to judge whether a country is "excluded" at a given point in time, or whether it freely chooses not to issue debt. As discussed in Gelos et al. (2011), this identification problem can be mitigated by restricting the sample to capital-scarce countries, for which neoclassical growth theory predicts a high and continuous demand for foreign financing. We therefore focus on developing and emerging market countries and drop advanced economies who do not usually face credit constraints (at least before 2010).[33] For further robustness, we also drop all developing countries classified as "net creditors" by the IMF's World Economic Outlook publication of 2000 or 2010, which includes oil exporters and a few other resource-rich countries. Moreover, we check the results if we exclude years with a budget surplus, since this will reduce the government's demand to borrow in international markets.

To measure debt issuance, we retrieve data on 4,091 international sovereign bonds issued between 1980 and 2010 by central governments across 101 countries worldwide (most issuances are in London or New York). For robustness, we also retrieve bonds issued by public or publicly guaranteed firms (28,484 bonds worldwide), as well as on sovereign loans syndicated in international markets (2,564 loans by central governments and 12,192 loans by public or publicly guaranteed firms). We then aggregate the micro data on an annual basis.

The main dependent variable for market access is a dummy which takes the value 1 if the government placed a bond in international financial markets in that year and

[32] Gelos et al. (2011), in their study on sovereign market access between 1980–2000, also use the Dealogic dataset.

[33] Accordingly, we also drop territories in a union with an advanced country, e.g. Greenland (of Denmark), Puerto Rico (of the USA) or French Polynesia (of France).

0 otherwise.[34] Table 3.4 shows summary statistics on sovereign bond issuance with and without litigation. In non-crisis times, bond placements occur in only 13% of all country-year observations between 1980 and 2010. This low ratio is partly due to the fact that more than half of all sovereigns in our sample never tapped international bond markets between 1980 and 2010.

The probability of issuing bonds internationally is significantly lower in years with litigation, compared to years without lawsuits. In total, we observe litigation in 189 country-year events. Out of these, there are only 12 years with an external sovereign bond placement, a ratio of 6.3%. The difference is even more pronounced if litigation exceeds 1% of the debt under renegotiation (three issuance years out of 107 events with significant litigation) and in years with outstanding attachment proceedings (two issuance years out of 109). There are interesting time trends in the data, too. External bond issuances increase substantially in the recent decade, with a nearly 100% increase in the number of access events. But this is only true in the absence of litigation. Indeed, between 2000 and 2010, we could not identify a single case in which governments tapped external bond markets in a year in which they also faced creditor litigation.

We next look at post-crisis episodes, in particular on those 58 yearly cases in which creditors continued to litigate (with attachment proceedings) after the debt crisis formally ended. Out of the 58 post-restructuring spells with attachment attempts we find only one case with a successful bond placement (1.7%).[35] This is despite that fact that post-crisis years are usually periods of heightened sovereign issuance activity, as shown in Table 3.4. Indeed, the probability of issuing a sovereign bond in the three years following a debt crisis is 18.4% in case of no litigation (excluding bonds issued in a debt restructuring). This is more than 10 times the probability of bond issuance than in post-crisis years with attachment litigation.

The stark differences in borrowing patterns with and without litigation are further illustrated in Figures 3.4 and 3.5. Figure 3.4 plots the distribution of bond issuances for the entire dataset, which shows that very few bonds have been issued while litigation was pending, and those that could be observed were comparatively small in size. Figure 3.5 focuses on the case of Argentina after its 2001 default. The country was among the most active emerging market sovereign bond issuers during the 1990s, but it has not placed a single sovereign bond in international markets between its moratorium of January 2002 and December 2013, a spell of 12 years. The private sector, in contrast, has re-accessed foreign bond markets on a regular basis starting in late 2003, when economic conditions improved.

Did Argentina's government voluntary abstain from foreign markets? Until the

[34] Contrary to Gelos et al. (2011), we explicitly include issuances that merely roll-over debt coming due (evergreening), i.e. access years in which the country is effectively repaying and not borrowing. This is because we are broadly interested in market access (and the loss of it) both for the purpose of refinancing as for new borrowing. However, we do exclude all bonds and loans issued in the context of a debt restructuring.

[35] The event are two foreign bonds issued by Ecuador for a total of USD 500m in 1997, one year prior to its default, at an interest rate above 10%.

mid-2000s, the answer is probably yes. The country achieved substantial debt relief in its 2005 debt exchange (involving a 75% haircut) and also succeeded in borrowing on domestic markets as well as bilaterally, from countries such as Venezuela. But in recent years, the government has run substantial deficits and repeatedly signaled its willingness to return to foreign bond markets.[36] Indeed, market observers, the financial press and US officials all share the view that "holdout lawsuits have effectively barred the Government of Argentina from international markets, just as its financing needs are expected to spike during 2009-2011".[37]

Summarizing, the descriptive evidence suggests a strong negative correlation between sovereign bond issuances and the occurrence and intensity of sovereign debt litigation in US and UK courts.

To account for country-specific effects as well as time-varying determinants of market access, we next run fixed effects panel regressions following Gelos et al. (2011). As above, our main dependent variable is an "access" dummy capturing whether the country issued one or more sovereign bonds in a given year. In the robustness section, we also create alternative access measures, in particular (i) a dummy that also accounts for sovereign syndicated loans signed in that year (bond *or* loan placement), (ii) a dummy also capturing bond issuance by public or publicly guaranteed firms (sovereign *or* public sector access), (iii) a dummy measuring "full access", defined as 1 for those years in which sovereign bond issuances exceed 1% of GDP, and (iv) a continuous measure of sovereign bond issuance to GDP (in per cent). We estimate the following equation:

$$\begin{aligned} &\text{logit}(Prob(Access_{it}=1)) = \\ &\beta_1 ShareLit_{it} + \beta_2 log(GDP/capita)_{it-1} + \beta_3 Debt/GDP_{it-1} + \beta_4 Reserves/Imports_{it-1} \\ &+ \beta_5 Short/Total_{it-1} + \beta_5 \delta GDP_{it-1} + \beta_6 Trade/GDP_{it-1} + \beta_7 PolRisk_{it-1} + \beta_8 IMF_{it-1} \\ &+ \beta_9 Default_{it-1} + \beta_{10} Default3Yr_{it} + \alpha_i + \theta_t + \epsilon_{it} \end{aligned} \tag{3.1}$$

where $Prob(Access = 1)$ denotes the probability that government $i$ had foreign bond market access in year $t$. After a standard logit transformation we can estimate the corresponding coefficients. Specifically, we include measures of solvency (Debt/GDP), liquidity (share of short-term debt, reserves to imports), GDP per capita and the real growth rate, a measure of economic openness (imports plus exports to GDP) a proxy for political risk as well as crisis-related variables, in particular whether the country signed an IMF rescue program and whether the country is (or has been recently) in default. In addition, we include proxies for the severity of the debt crisis, in particular the size of haircuts from Cruces and Trebesch (2013) and a continuous credit rating measure by the Institutional Investor magazine (we use the rating residual to avoid multicollinearity). Table 3.3 describes the set of time-varying control variables, which are all lagged by one

[36] See e.g. MercoPress, 4 August 2009, "Argentina pays bond and seeks to return to global capital markets", or Bloomberg, 5 December 2013, "Argentina's return to bond market seen in Blejer road map".

[37] US embassy cable, 23 September 2008, released by Wikileaks.

year.

For reasons of data availability we drop small countries with a population of less than one million (in 2010). This yields a final panel of 133 developing countries, of which only 66 issued a sovereign external bond in our sample. The inclusion of country fixed effects implies that our analysis focuses on this subset of 66 market access countries, which experience both spells of access and of non-access (exclusion) over our sample period. We also include year fixed effects, to account for shocks such as the Mexican crisis of 1995 or the global financial crisis after 2008. Identification thus comes from the within-country variation in litigation events after accounting for global trends.

**Access: estimation results**

Table 3.6 shows our main result: legal disputes are a significant negative predictor of foreign bond market access by developing countries.[38] The plain litigation indicator is not significant, but the continuous measures of litigated claims to total debt restructured and the dummy for attachment attempts are significant throughout. This is true after controlling for country and year fixed effects, time varying macroeconomic and political conditions and current and lagged default. Litigation thus appears to play a role above and beyond the debt crisis effect per se. The relevance of our finding in non-crisis times is further confirmed in column (4) which excludes all default years according to Standard & Poor's (2006, 2011). The main results also hold when we restrict the sample to the period after 1992, when "vulture funds" entered the scene and bond issuance became the main vehicle of sovereign lending (column 5). Moreover, our findings hold if we drop resource-rich countries classified as "net creditors" (column 6), and if we drop years in which the government had an overall budget surplus and may therefore not have wanted to borrow abroad (litigation remains significant at the 10% level).

The estimated coefficients are economically large. The predicted probability of bond market access in our benchmark models in column (2) and (3) drops from 19.1% to 0.7% once a country faces litigation with attachment attempts.[39] At the average share of litigated claims (3.3% of restructured debt in this sample), the predicted probability of access is only 1.7% in a given year. This probability drops to virtually zero once we increase the scope of litigation by half a standard deviation above the mean (to 6.5% of restructured debt).

We next account for the fact that litigation may not occur randomly, but could be correlated with "tough" defaults with high haircuts. Columns (7) and (8) address this potential selection effect into litigation. Column (7) includes a credit rating residual capturing creditworthiness beyond macroeconomic conditions, which we obtain by regressing the Institutional Investor credit rating (ranging from 0 to 100) on the other

[38] The empirical specification closely follows Gelos et al. (2011), except for the litigation measures and the fact that we expand their panel by 10 years, until 2010. . We find very similar results, e.g. on Debt/GDP, the default dummies and ratings.

[39] This translates into an average marginal effect of -0.42, assuming $\alpha_i = 0$.

macroeconomic control variables contained in the model. In column (8) we then replace the binary default dummies (current and lagged) with a variable that captures the size of haircuts (in %), assigned for each year in the respective debt restructuring spell, as well as a 3-year haircut lag. The results confirm the finding of Cruces and Trebesch (2013) in that higher haircuts are associated with a lower probability of regaining market access. Moreover, litigation remains significant with a slightly lower marginal effect. The same is true if we account for the widely used country credit ratings by the Institutional Investor magazine, which have the most comprehensive coverage in our sample.

For the regressions in columns (9)-(11), we use foreign bond placement data from Bloomberg as an alternative source to Dealogic. We find our results to be very similar when using Bloomberg, which suggests that our findings do not hinge on the data source employed.

In Table 3.7, we use a set of alternative dependent variables. In column (1) we show that the results hold when using an access dummy that accounts for issuances by public or publicly guaranteed firms. This is important since sovereigns may issue debt via state owned companies to reduce the risk of litigation and attachment. Column (2) also considers bank loans to sovereigns in the form of syndicated lending agreements (based on Dealogic data). Litigation remains significant, but only at the 10% level and with a smaller marginal effect. Column (3) uses a dummy of "full access", while columns (4) and (5) use bond issuance to GDP as a dependent variable. In each case litigation remains a significant predictor. This is also true when dropping the three main countries affected by sovereign legal disputes: Argentina, Brazil and Peru.

For robustness, we also run a placebo test using private sector foreign bond issuance to GDP, in the spirit of Figure 3.5. To construct this additional dependent variable, we again rely on Dealogic and retrieve details on all 4,764 externally issued bonds by corporations across 70 developing countries between 1980 and 2010, and counting only issuances by domestic firms not owned by a foreign mother company. Column (6) shows that our litigation measure is insignificant and has a much smaller coefficient than with respect to government borrowing. We conclude that legal disputes over sovereign debt matter only for the government's market access, but not for external bond issuance of the private sector.

Finally, we consider domestic debt placements, to understand the dynamics of where governments borrow when facing litigation (at home or abroad). The left hand side variable in columns (7)-(9) is the share of bonds issued domestically to total bond borrowing, by country and year. Domestic borrowing is not threatened by creditor litigation or seizure, since a government can always introduce legislation and immunize its domestic debt against attachment. Thus, if litigation deters countries from issuing debt abroad, we should see an increase in the share of domestic bond issuance relative to foreign borrowing. Since this variable is a fraction bounded between 0 and 1, we run a fractional response model as suggested by for instance Papke and Wooldridge (2008). The results confirm our priors: we find a positive correlation of litigation with the

share of domestic bonds to total bonds. The average marginal effects reported imply a considerable quantitative effect: in years with litigation or attachment proceedings, the predicted share of domestic bonds relative to foreign bonds rises from 20 to more than 80%. These findings further strengthen our conclusion that pending creditor litigation deters governments from issuing debt abroad.

### 3.4.3 Litigation and international trade

#### Trade: empirical approach and preliminary analysis

To test Hypothesis *H*2, on the effects on international trade, we build on the widely-used empirical framework by Rose (2005) and Martinez and Sandleris (2011).[40] They employ a standard gravity model of international trade using the average value of annual real bilateral exports and imports (in logs) as the dependent variable and bilateral default indicators as main explanatory variable. Specifically, Rose (2005) exploits information on Paris Club renegotiations of official (government-to-government) debt between developing country debtors and about 20 creditor governments, which yields a country-pair measure of default. To test for the general decline in trade after default, Martinez and Sandleris (2011) control for an additional variable indicating if *any* Paris Club debt was rescheduled in a given year, not only via-á-vis the bilateral trading partner. Both studies find a strong and long-lasting negative correlation of sovereign defaults and trade, but neither of the two tests for a channel underlying the decline in trade.

Here we test the proposition of Bulow and Rogoff (1989a) that litigating creditors are capable of disrupting trade flows, thus contributing to the observed decline in trade volumes after a default. In line with Bulow and Rogoff (1989a) we focus the analysis on litigation cases that involve attempts to attach debtor country assets, also because litigation without the threat of asset seizures should not matter for trade in goods. Attachment attempts could disrupt trade directly, since they reduce the observable payment and export flows, or indirectly, due to the anticipated effects of legal action on future goods exchange. Empirically, we employ the same benchmark model as the aforementioned studies, but augment it with indicators for legal creditor action:

$$ln(Trade_{ij,t}) = \gamma AttachLit_{ij,t} + \beta X_{ij,t} + \sum_{n=0}^{N} \phi Restr_{ij,t-m} + \epsilon_{ij,t} \tag{3.2}$$

where $Trade_{ijt}$ denotes the mean of the export and import flows between countries $i$ and $j$ in year $t$, $AttachLit_{ij,t}$ is coded as 1 if one of the countries faces creditor litigation with attachment attempts in year $t$ and 0 otherwise, $Restr_{ij,t}$ is an indicator which captures bilateral default (Paris Club restructurings) involving $i$ and $j$, and $N$ represents a number of lags of the default indicator. $X_{ij,t}$ is a vector of the standard gravity controls used in

[40] Additional papers on the link between trade and default include Borensztein and Panizza (2009) and Kohlscheen and O'Connell (2006) who focus on trade credits, as well as Borensztein and Panizza (2010) and Zymek (2012) who use industry-level data.

previous studies. $\epsilon_{ij,t}$ is an error term containing a time-varying random part which is zero in expectation and a country-pair specific constant.

The main coefficient of interest is $\gamma$, which captures the additional impact of creditor attachment attempts. If attachments disrupt trade we expect $\gamma$ to be negative and significant.

As in section 3.4.2, we use the same data and estimations as previous papers. Specifically, we build on Rose (2005) and expand his dataset until 2007 for 207 countries and territories (building on Agronovsky and Trebesch, 2009). Bilateral trade volumes come from the IMF's Direction of Trade Statistics (as of May 2008), while the data on restructurings are taken from the Paris Club website (as of December 2008). We also include a control variable for the onset of an IMF program (from the IMF website), real GDP in levels and per capita from the World Development Indicators, colonial relationships from the CIA World Factbook, currency unions from Glick and Rose (2002), and regional trade agreements from the WTO (the latter three variables are taken from the original Rose dataset). Country- and dyad-specific factors such as distance, common borders, and further time-invariant variables are absorbed by the dyad fixed effects and thus not explicitly included. Our main explanatory variable ($AttachLit$) indicates whether litigating creditors filed enforcement proceedings or launched attachment attempts against the defaulting country in a given year.

Table 3.5 shows summary statistics on the relationship between litigation and international trade, where trade is measured as average imports plus exports between two countries (in per cent of their average GDP). In a first step, we divide the sample into normal times (non-crisis years) and crisis years (with at least one country in the dyad being in a debt crisis). For the sake of this Table, default is captured by Paris Club restructurings and includes the immediate post-default episode (three year lag). In line with Rose (2005) and Martinez and Sandleris (2011) we find that trade is significantly lower during and after sovereign defaults. The mean bilateral trading volume in normal times is ca. 0.5% of average GDP, compared to less than 0.2% in default episodes. In a second step, we compare years with and without pending attachment proceedings by litigating creditors. We find significant differences, as bilateral trade is less than half during years with attachment attempts. This result, however, may be due to the fact that most litigation cases occur during debt crises, when trade is generally lower. In a last step, we therefore focus on post-crisis episodes (outside default) and compare years with and without ongoing attachment attempts. The results confirm that trade is significantly lower if creditors continue to litigate aggressively in the aftermath of debt crises.

**Trade: estimation results**

The results from equation 3.2 are reported in Table 3.8. All estimates include country-dyad fixed effects, $N = 10$ lags for the restructuring indicator, and show standard errors clustered on country-pair level. The main insight is that legal creditor action is a

significant predictor of trade flows. While the plain litigation dummy is not significant (column 1), the continuous measure on the share of debt litigated is significant with a sizable negative coefficient (column 2). As expected, the results are strongest when including the indicator of litigation with attachment attempts. Indeed, attachment attempts are associated with a decline in bilateral trade of about 11 percent over and above the impact of a default per se (column 3). This is an economically very large effect. All other findings are similar to Rose (2005). In particular, we find that a debt rescheduling between two countries is associated with a 6 percent reduction in trade between these countries. Put differently, we find that legal disputes are a more important factor to explain trade during crises than default events per se.

In Column (4) we show that the result is robust when following the model by Martinez and Sandleris (2011), which includes a general restructuring indicator as well as the bilateral dummy used by Rose. Like Martinez and Sandleris (2011) we find the general restructuring variable and its lags to have more explanatory power, while the bilateral restructuring dummy turns insignificant. However, the dummy for attachment attempts is large and statistically significant in both models, so that we can confirm that countries facing seizure proceedings see a decline in their trade of more than 10%.

As before, we also account for the possibility that litigation is itself the consequence of particularly severe defaults with high haircuts. We therefore augment the specification by including the size of haircuts in years with a restructuring with private (not Paris Club) creditors as well as by adding a three-year haircut lag (using data by Cruces and Trebesch (2013)). Column (5) shows that the results on litigation hold and that creditor losses appear to be relevant: a one-percentage point increase in haircut size is associated with a 0.6% decline in trade - over and above the Paris Club restructuring effect.

The remainder of Table 3.8 shows results of additional robustness checks: column (6) includes decade fixed effects, column (7) restricts the sample to post 2000 years, column (8) drops Argentina, Brazil and Peru, the debtor countries facing most creditor litigation cases in our sample, while column (9) includes the Institutional Investor ratings (we again use residuals to account for multicollinearity). Our main finding holds when dropping the three most affected countries and when controlling for ratings, but we no longer find attachment attempts to be significant once we control for time trends or year effects. Nevertheless the sign and size of the coefficient remains large. In a final step, we check in how far the results hold in various subsamples. We find the model to be rather sensitive to the time period chosen. Most importantly, we find that the link between default and trade is no longer significant in the 2000s. However, attachment litigation continues to show a large marginal effect and remains significant, albeit only at the 10% level (column 7).

Overall, our results provide supportive evidence on *H2*, but the estimated coefficients are less robust than with regard to market access. In particular, we find litigation to turn insignificant once we account for time trends in the data.

### 3.4.4 Litigation and restructuring delay

**Delay: empirical approach and preliminary analysis**

To analyze delays in debt crisis resolution ($H3$) we draw on a new monthly dataset by Trebesch (2013), who codes the process of debt restructurings between sovereigns and foreign commercial creditors in the period 1970-2010 (based on qualitative sources and using the sample of Cruces and Trebesch 2013). Our main period of interest is the debt renegotiation period - from the start of talks between creditors and the government[41] until the final debt restructuring, which is observed for 131 restructurings in our sample.[42] We thus drop the starting phase of a debt crisis and, thus, years of unilateral default without negotiation. This helps us in several respects. First, the starting phase of default without negotiations can be very long (on average more than a third of total duration) and these initial delays may be intended by debtor governments that have no ability or willingness to resume payments.[43] Dropping years of unilateral default will also allow us to address concerns of reverse causality, since protracted defaults can motivate creditor lawsuits in the first place. One such example is the case of Peru in the early 1990s, where creditors filed suit with the explicit purpose of forcing the government to the negotiation table after five years of unilateral default.[44] We therefore focus on those (sub-)episodes in which both the government and creditor representatives clearly signaled their willingness to engage in serious debt restructuring talks. Nevertheless, we will also show that the results hold when using total restructuring duration, defined as the month from the start of the crisis (default or the announcement of a debt exchange) until the final restructuring.

When matching the duration data with our measures of litigation we automatically constrain the analysis to pre-restructuring litigation, meaning lawsuits or attachment proceedings that are initiated prior to the official closure of the debt restructuring. In line with Hypothesis $H3$ we therefore disregard all lawsuits that are initiated only after the conclusion of the restructuring (43% of all), since they can no longer cause delays in concluding a debt settlement with the majority of creditors.

The resulting summary statistics show that negotiations take significantly longer to conclude when creditors litigate in London or New York. On average, the period from the start of negotiations until the key debt settlement takes 32 months without litigation, but 74 months with litigation, more than twice as long. These patterns are confirmed when plotting non-parametric Kaplan-Meier survival estimates. The resulting statistic

[41] The start of debt negotiations is the month of the first formal meeting with the bank advisory committee (for bank deals of the 1980s and 1990s) or the first meeting with bondholder representatives for the sake of debt restructuring (for bond deals).

[42] the final debt restructuring date is defined as the month of the official debt exchange/settlement (for bond deals) or the month of the final agreement (for commercial bank deals).

[43] Bi (2008) and Benjamin and Wright (2009) show that both countries and their creditors can benefit from "waiting for a larger cake", thus postponing debt renegotiations until the economy recovery.

[44] Between 1990 and 1993, the Fujimori administration refused to start debt negotiations or resume payments, stating that it intended to wait until the economy had improved. The debt restructuring process was initiated only in late 1993.

reports the compound probability of not having finalized a restructuring for each month after the start of negotiation. Figure 3.6 shows that, at each point in time, negotiations involving creditor lawsuits show a lower probability of being concluded, with differences significant at the 10% level.

To assess the determinants of restructuring duration more systematically, we next estimate a semi-parametric Cox proportional hazard model which can deal with the problems of censored observations and multiple events. For this model, the hazard rate for the $i$th individual (or $i$th negotiation episode) can be written as

$$H_i(t) = h_0(t)\exp(\beta z) \tag{3.3}$$

where $h_0(t)$ is the baseline hazard function, $z$ a set of covariates and $\beta$ a vector of regression coefficients. A main advantage of the Cox model is that it is not necessary to specify a functional form of the baseline hazard rate $h_0(t)$. Instead, the shape of $h_0(t)$ is assumed to be unknown and is left unparameterized. Accordingly, we estimate reduced form models via partial likelihood and allow the functional form of the hazard function to be explained by the data. To avoid misleading inference due to repeated events (multiple restructurings of the same country), we rely on the variance correction method proposed by Lin and Wei (1989).

The Cox model is also advantageous since it allows us to include time varying litigation measures. The dummy variables on litigation and attachment proceedings can be switched on (and off) in those months in which they are initiated (or ended). More importantly, we can now measure the continuous "share of claims in total debt restructured" at monthly frequency, thus capturing the scope of debt under litigation at each point in time. We expect the scope of litigation to matter most for negotiation delays, since more (expected) holdouts will reduce creditor participation and potentially undermine any agreement reached between governments and creditor representatives. The share of debt litigated is therefore our main variable of interest.

All specifications include year fixed effects and a set of control variables, which is important since the same factors causing settlement delays could also cause litigation to occur. Specifically, we account for creditor characteristics, in particular a dummy for bond restructurings and a dummy capturing whether creditors organized themselves into a committee that was officially recognized by the debtor government (both from Trebesch, 2013). We also account for debtor country characteristics, in particular whether restructuring was under the umbrella of the HIPC initiative or otherwise supported by the World Bank's debt relief initiative for the poorest countries, as well as a (monthly) dummy variable capturing whether the country was currently under an IMF program (from the IMF website). We also include a proxy for global interest rates for risky borrowers (using the monthly Baa Corporate Bond Yield index by Moody's) and a variable on the number of previous restructurings since 1970 to explicitly account for restructuring experience.

Furthermore, in the robustness analysis, we control for the size of haircuts implied in

each of the restructurings (from Cruces and Trebesch (2013)), for Institutional Investor country credit ratings (available at semi-annual frequency), for per capita GDP (annually at PPP, from the World Development Indicators) as well as for a monthly measure of economic growth forecasts, namely the ICRG indicator on the "risk to real GDP growth". Table 3.3 describes each variable in detail.

**Delay: estimation results**

Table 3.9 shows the results for various specifications of the Cox proportional hazard model. A positive coefficient indicates that higher values of that variable are associated with quicker settlement relative to the baseline, while negative coefficients indicate longer negotiation duration.

The main finding is that our litigation indicators show a negative and statistically significant coefficient throughout. The baseline coefficient of -0.40 in column (3) implies that a one percentage point increase in litigated claims (to total debt restructured) can be associated with a 34% lower likelihood of successful renegotiation in any given month. The occurrence of pre-restructuring litigation per se (column 1) appears to lower the probability of settlement by 60%. Columns (4) and (5) show that litigation remains significant when dropping the three main countries affected by litigation (Argentina, Brazil and Peru) and when restricting the sample to crises starting after 1992 Ű with a somewhat higher quantitative effect.

The results are qualitatively similar when we account for potentially important confounders. In column (6) we add the country credit rating variable, which has little impact on the estimates. Column (7) shows that litigation remains significant when controlling for haircut size, although the estimated litigation coefficient is notably reduced. In contrast, the litigation coefficient actually doubles when we control for income levels and growth prospects in column (8). This is surprising and may be due to the considerably smaller sample in this specification.[45] In a final step, we show that litigation also remains significant when considering total duration instead of only the duration of negotiations (see column (9)).

Taken together, the evidence supports Hypothesis $H3$ suggesting that legal disputes do indeed result in delays in debt settlements. Nevertheless, our empirical approach does not allow us to fully rule out the possibility of reverse causality or of a confounding factor driving both delay and litigation intensity. Our main result should therefore not be interpreted as a causal effect, but rather as a strong conditional correlation.

[45] If our empirical model is misspecified, this result might also be driven by multicollinearity. Indeed, we find that the ICRG indicator of growth prospects is highly correlated with our measure of share litigated, with a correlation coefficient of 0.43. This suggests that legal action is more likely in good times, which is in line with the strategy of major distressed debt funds. Elliot manager Jay Newman, for example, explained in a 2008 interview that "we do not acquire the debt of countries that have no means to pay." (15 June 2008, The Sunday Times).

## 3.5 Conclusion

This paper shows that legal disputes between creditors and governments have become an important ingredient of sovereign debt markets, in particular during crisis times. Sovereign debt is still far from being easily enforceable in court, as attachment and debt collection remains very difficult and costly for creditors. But our case studies and econometric results indicate that legal disputes can cause significant economic costs for the sovereign, by impeding government external borrowing, by disrupting international trade, and by delaying crisis resolution. These findings stand in contrast to the view that holdout litigation is nothing more than a minor nuisance (e.g. Roubini, 2002; Moody's, 2013).

The empirical results have implications for theory. Most importantly, they are consistent with the idea that creditors can retaliate against defaults via legal means and by "throwing sand in the wheels" of the economy in defaulting countries. We thus provide empirical support for models assuming legal sanctions or related deadweight costs of default, e.g. Bulow and Rogoff (1989a), Bolton and Jeanne (2007). The findings also suggest that litigation is one channel explaining *why* governments are excluded from foreign credit markets during and after sovereign defaults (in line with Pitchford and Wright, 2012). In the literature, it is commonly assumed that defaulters loose market access, but there is little empirical evidence on the underlying channel. More generally, if the trends we describe continue, and if our findings are confirmed in future research, they could have important implications for sovereign borrowing. The threat of disruptive litigation may give sovereigns a new commitment device, with repayment becoming more credible when debt is issued under English or New York law (see the discussion in Shleifer, 2003).

Looking forward, there are few reasons to assume that the ex-post cost of legal disputes will decrease anytime soon. Collective action clauses, in particular, are unlikely to prevent litigation and holdouts in future debt crises. For example, the newly introduced Euro-CACs are no "wonder-clause", but likely to disappoint the high hopes that some place on them, as explained by Gelpern and Gulati (2013), IMF (2013) and Zettelmeyer et al. (2013).[46] We therefore see the need for more research on sovereign debt disputes.

Several questions remain open. What explains the rise of creditor litigation and the variation across cases? What are the welfare effects of the developments we describe? And has the "legal threat" affected sovereign lending or government willingness to pay? Answering these questions is challenging and goes beyond the scope of this paper. What we can say with some certainty, however, is that the risk of litigation has influenced

[46] Euro-CACs have high voting thresholds and their design will make it relatively easy for creditors to reject a restructuring, hold out, or go to court. Despite these limitations, the International Capital Markets Association (ICMA), an influential trade body, recently suggested to adopt a similar design as the standard in sovereign bond issues worldwide. Besides, it takes time until any new contractual clause becomes effective in the entire outstanding debt stock. Even if the Euro-CACs were to be modified, we will have to wait 5 to 10 years until the new bonds become the dominant type of sovereign debt outstanding in the Eurozone.

the way debt crises have been resolved in recent years, in particular the design of debt exchange offers and the treatment of holdout creditors. An important example is the Greek debt restructuring of 2012. At the time of writing, Greece continues to pay holdout creditors of 'old' English-law bonds in full and on time, i.e. 100% of face value. Reportedly, concerns of litigation in the UK have been a main reason why Greece decided not to impose a haircut on its English-law holdouts, thus foregoing EUR 4.1 bn in additional debt relief (more than 2% of Greek GDP, see Zettelmeyer et al. (2013)). On a broader level, Buchheit et al. (2013b) argue that the fear of litigation and holdouts is an important explanation why we have seen so few sovereign debt restructurings in Europe. To avoid a "messy" default à la Argentina, policymakers may have become more prone to official sector bailouts.

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# Figures

Figure 3.2: The rise of creditor litigation (case number and amounts)

The bars show the number of outstanding creditor lawsuits against sovereigns in US and UK courts for each year between 1976 and 2010 (pending cases, left axis). The blue line reflects the total amount under litigation in 2005 USD excluding accrued interest or penalty interest (face value, right axis). The figure shows a strong increase in case numbers and case volumes over the past decades.

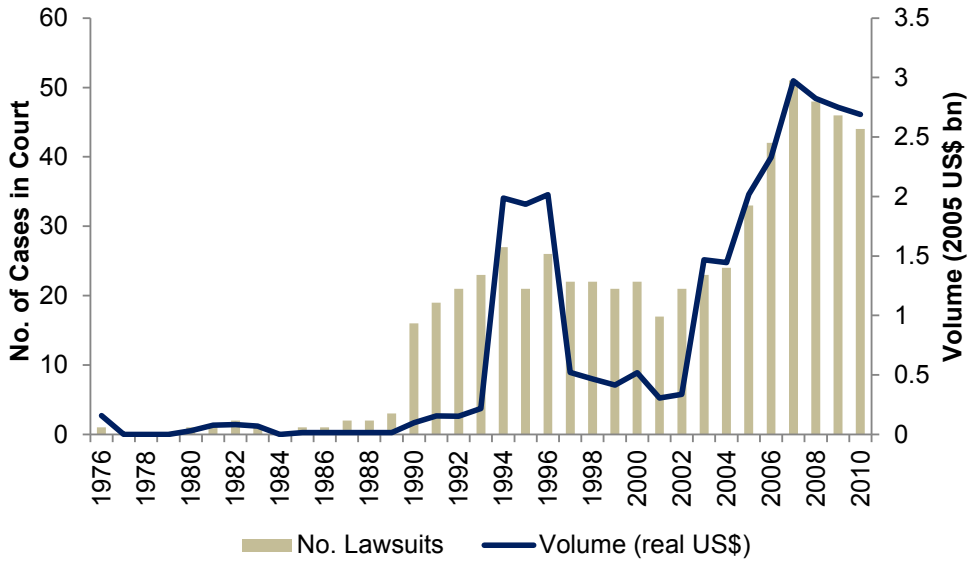



Figure 3.3: Restructurings with and without litigation

The figure shows the number of sovereign debt restructurings implemented in each year (left axis, light bars) and the subset of these restructurings that were affected by at least one creditor filing suit in a US or UK court (dark bars). The red line depicts the five-year moving average of the ratio of debt restructurings affected versus those not affected (share affected in %, right axis).

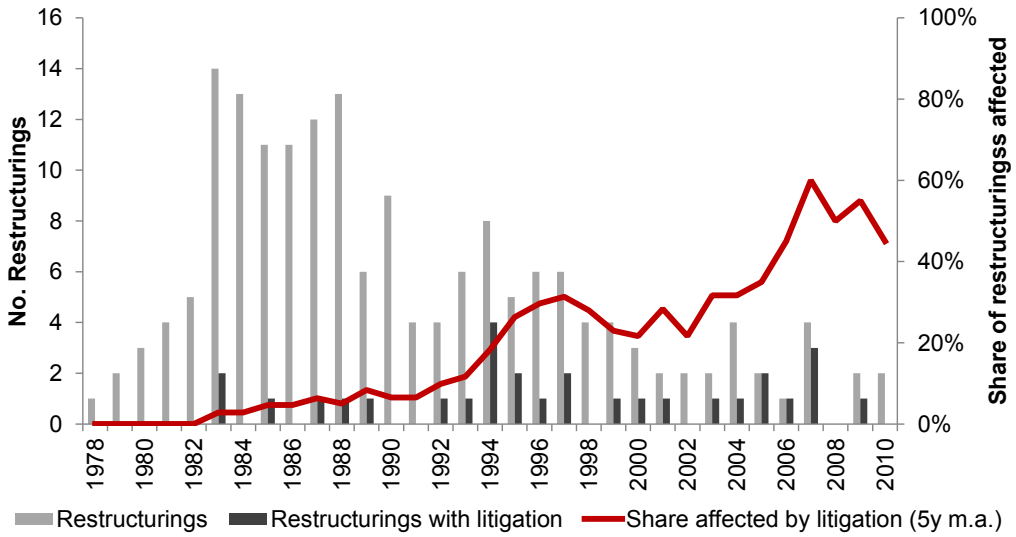


Figure 3.4: Bond market access with and without litigation

The figure shows histograms on the frequency and amounts of sovereign external bond issuances. The sample is divided into the subset of country-years with litigation (red bars, right axis) and without litigation (blue bars, left axis). The figure shows statistics only for those years with bond issuance.. The data show that only very few bonds are issued while governments face litigation (including crisis years and non-crisis years).

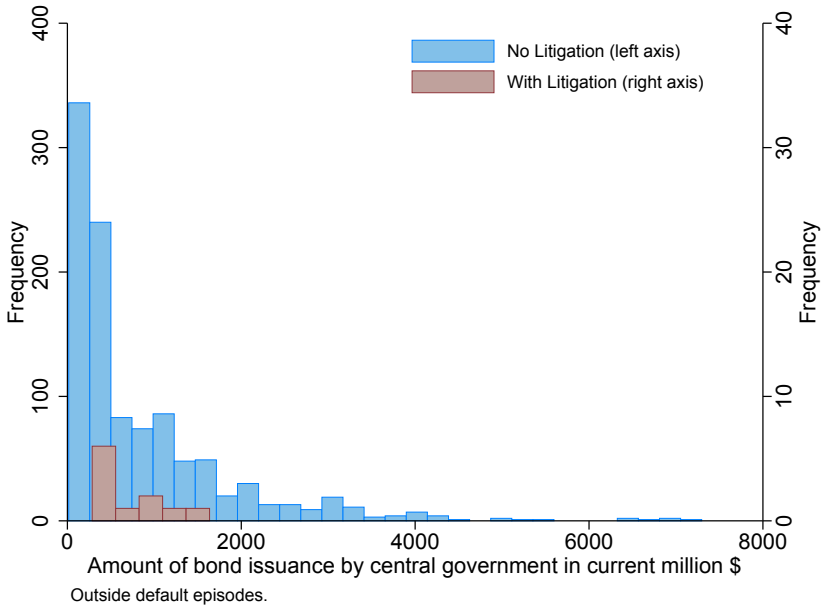



Figure 3.5: Foreign borrowing in Argentina: sovereign vs. corporate

The figure plots the volume of bonds placed by the Argentine government (dark bars) and private Argentine companies (light grey bars) between 1997 and 2013. Both the government and private firms were active borrowers in the 1990s. After the 2001 default, only the private sector returned to issuing bonds internationally. The loss of market access by the Argentine government coincides with more than 40 lawsuits filed by private creditors over the past decade.

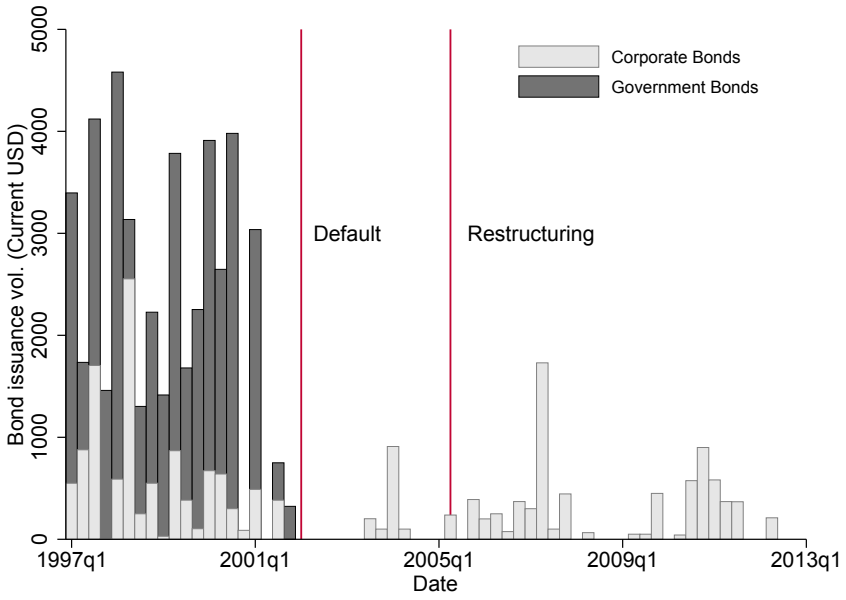
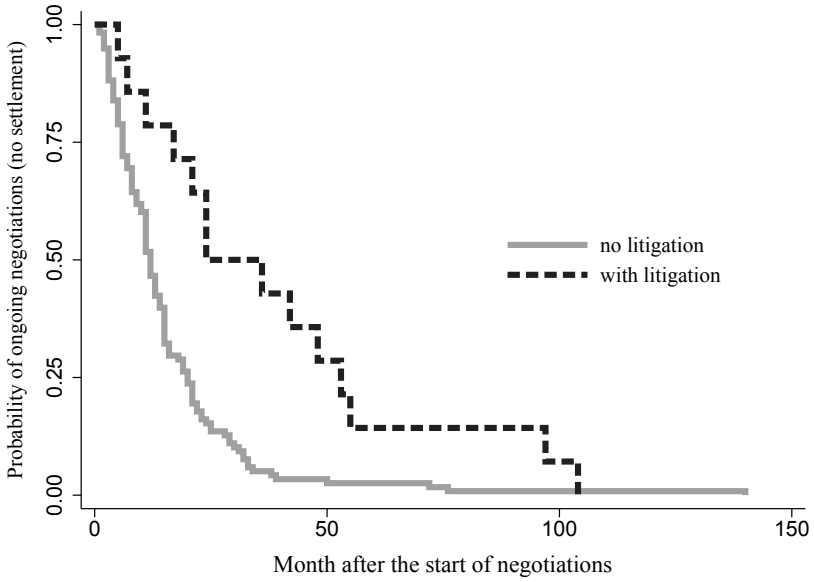


Figure 3.6: Duration of negotiations with and without litigation

This figure plots two survival functions of restructuring negotiations with and without creditor litigation. The vertical axis shows the Kaplan-Meier survival estimate for each function, which represents the unconditional joint probability that negotiations continue for each month after the start of the negotiations (horizontal axis). The estimates show that restructuring negotiations without creditor litigation are mostly concluded after three years, while those involving litigation have a more than 25% probability of exceeding four years. The differences are significant at the 10% level.



# Tables

Table 3.1: Litigation cases by decade, region and type of creditor

| | | All Cases | | Cases excluding Argentina 2001-10 | |
|---|---|---|---|---|---|
| Total cases | | 120 | | 79 | |
| Debtor countries | | 25 | | 25 | |
| HIPC cases | | 21 | | 21 | |
| | | Number | Percent | Number | Percent |
| Decade | 1970 | 2 | 1.7% | 2 | 2.5% |
| | 1980 | 6 | 5.0% | 6 | 7.6% |
| | 1990 | 51 | 42.5% | 51 | 64.6% |
| | 2000 | 55 | 45.8% | 16 | 20.3% |
| Region | Africa | 27 | 22.5% | 27 | 34.2% |
| | Americas | 79 | 65.8% | 38 | 48.1% |
| | Asia | 12 | 10.0% | 12 | 15.2% |
| | Europe | 2 | 1.7% | 2 | 2.5% |
| Type of creditor | Bank | 30 | 25.0% | 28 | 35.4% |
| | Fund | 63 | 52.5% | 26 | 32.9% |
| | Other | 21 | 17.5% | 19 | 24.1% |
| | Unknown | 6 | 5.0% | 6 | 7.6% |
| Jurisdiction | US | 102 | 85.0% | 61 | 77.2% |
| | UK | 15 | 12.5% | 15 | 19.0% |
| | Arbitration | 3 | 2.5% | 3 | 3.8% |
| Outcome | Judgment Satisfied | 13 | 10.8% | 13 | 15.5% |
| | OCS | 48 | 40.0% | 47 | 59.5% |
| | Failed | 4 | 3.3% | 3 | 3.8% |
| | Pending | 41 | 34.1% | 2 | 2.5% |
| | Unknown | 14 | 11.7% | 14 | 17.7% |

# Table 3.2: List of creditor litigation cases, by restructuring event

| Restruct. Event | Debtor | Plaintiff | Type of Creditor | Suit Filed | Outcome | Jurisdiction | Face Value (Mn USD) |
|---|---|---|---|---|---|---|---|
| *2005* | *Argentina* | *41 institutional plaintiffs (plus 13 class action suits)* | *fund, other* | *2002-2010* | | *United States* | 2868.6 |
| | | **[For brevity, we omit the detailed information on the lawsuits filed against Argentina after its 2001/02 default.]** | | | | | |
| 1987 | Argentina | Weltover, Springdale Enterprises, Bank Cantrada | other | 18/10/1989 | OCS | United States | 1.3 |
| 1987 | Argentina | Sayal | . | 18/05/1992 | OCS | United States | . |
| 1994 | Bulgaria | A.I. Trade Finance | other | 15/03/1996 | Judgment satisfied | Arbitration | 12.0 |
| 1993 | Bolivia | Woodstead Associates | . | 17/05/1993 | OCS | United States | 0.9 |
| 1994 | Brazil | CIBC Bank And Trust Company | fund | 28/06/1994 | OCS | United States | 1400.0 |
| 1998 | Cote d'Ivoire | Water Street Bank & Trust | fund | 04/04/1994 | OCS | United States | 8.0 |
| 2003 | Cameroon | Del Favero | other | . | . | United Kingdom | 2.9 |
| 2003 | Cameroon | Winslow Bank and Trust | fund | . | OCS | United Kingdom | 9.9 |
| 1989 | Congo, Dem. Rep. | Red Mountain Finance | fund | 31/12/1997 | OCS | United Kingdom | 8.6 |
| 1988 | Congo | National Union Fire Insurance of Pittsburgh | other | 15/07/1987 | Judgment satisfied | United Kingdom | . |
| 2007 | Congo | AF-CAP and Connecticut Bank of Commerce | fund | 1985 | OCS | United States | 6.5 |
| 2007 | Congo | National Union Fire Insurance of Pittsburgh and C ITOH Middle East | other | 1990 | OCS | United States | 10.4 |
| 2007 | Congo | Commisions Import Export | other | 2000 | pending | Arbitration | 83.6 |
| 2007 | Congo | Water Street Bank & Trust | fund | 18/03/1994 | OCS | United States | . |
| 2007 | Congo | FG Hemisphere Associates | fund | 26/09/2001 | OCS | United States | 35.9 |
| 2007 | Congo | Kensington International | fund | 14/10/2002 | OCS | United Kingdom | 20.8 |
| 2007 | Congo | Walker International Holdings | fund | . | OCS | United States | . |
| 1983 | Costa Rica | Libra Bank, Banque Rotschild, National Bank of Washington, and 5 further banks | bank | 14/09/1981 | OCS | United States | 40.0 |
| 1983 | Costa Rica | Allied Bank International | bank | 02/1982 | OCS | United States | 5.2 |
| 2004 | Dominica | The Export-Import Bank of The Republic of China | bank | 07/2005 | OCS | United States | 11.3 |
| 1995 | Ecuador | Weston Compagnie de Finance et D'Investissement | fund | 26/04/1993 | OCS | United States | 20.8 |
| 1995 | Ecuador | Water Street Bank & Trust | fund | 14/07/1995 | OCS | United States | 6.0 |
| 1995 | Ecuador | Banco del Pacifico and two further banks | bank | 12/03/1996 | Judgment satisfied | United States | 9.7 |
| 1995 | Ecuador | Asociacion Fe Y Alegria, HSBC, and 11 further banks | bank | 07/12/1998 | . | United States | . |
| 2000 | Ecuador | Libra Bank | bank | 23/12/1998 | OCS | United States | . |
| 2000 | Ecuador | Bank of America | bank | 27/02/2001 | unsuccesful | United States | 5.0 |
| 2005 | Grenada | The Export-Import Bank of The Republic of China | bank | 29/03/2006 | pending | United States | 20.3 |
| 1992 | Guyana | Green Mining and Export Services | other | 1992 | OCS | United States | 14.1 |
| 1999 | Guyana | Booker | . | 18/09/2001 | OCS | Arbitration | 10.5 |
| 2006 | Iraq | First City, Texas-Houston | bank | 15/11/1990 | OCS | United States | 49.9 |
| 2006 | Iraq | Commercial Bank of Kuwait | bank | 26/09/1991 | . | United States | 33.0 |
| 2006 | Iraq | The Bank of New York | bank | 24/07/1992 | . | United States | . |
| 2006 | Iraq | National Bank of Kuwait | bank | 17/05/1993 | . | United States | 20.0 |
| 2006 | Iraq | Alahli Bank of Kuwait, Lazard, and 14 further banks | bank | 22/09/1995 | . | United States | . |
| 2006 | Iraq | Arab American Bank | bank | 11/12/1995 | Judgment satisfied | United States | . |
| 2006 | Iraq | Midland Bank, Barclays, RBS, BNP, and 8 further banks | bank | 05/1996 | . | United Kingdom | . |
| 2006 | Iraq | Alahli Bank of Kuwait | bank | 04/09/1996 | OCS | United States | 23.7 |
| 2006 | Iraq | Hyundai Corporation, Hyundai Engineering & Construction | other | 02/12/1997 | unsuccesful | United States | . |
| 2006 | Iraq | Agrocomplect | other | 23/01/2007 | unsuccesful | United States | 47.5 |
| 1985 | Jamaica | A.I. Credit Corporation | other | . | . | United States | 10.0 |

*continues on next page*

Table 3.2: List of creditor litigation cases, by restructuring event (continued)

| Restruct. Event | Debtor | Plaintiff | Type of Creditor | Suit Filed | Outcome | Jurisdiction | Face Value (Mn USD) |
|---|---|---|---|---|---|---|---|
| 2009 | Liberia | Taiyo Kobe Syndicate | bank | 2008 | OCS | United Kingdom | . |
| 2009 | Liberia | Colonial Bank | bank | 2008 | OCS | United Kingdom | 5.8 |
| 2009 | Liberia | Chase Manhattan, Citibank, Bank of Tokyo, UBS, and 10 further banks | bank | 12/12/1990 | OCS | United States | . |
| 2009 | Liberia | Meridien International Bank Limited | bank | 10/01/1991 | OCS | United States | 12.1 |
| 2009 | Liberia | Liberian National Petroleum Company | other | 21/02/1991 | . | United States | . |
| 2009 | Liberia | Continental Grain Company | other | 30/06/1994 | Judgment satisfied | United States | . |
| 2009 | Liberia | Hamsah Investments and Wall Capital | fund | 15/02/2002 | OCS | United States | 6.5 |
| 2009 | Liberia | Montrose Capital | fund | 07/01/2005 | . | United States | 26.0 |
| 2009 | Liberia | JP Morgan Chase | bank | 18/05/2006 | OCS | United States | . |
| 1983 | Nigeria | Texas Trading & Milling Corp. | other | 1976 | . | United States | 56.0 |
| 1983 | Nigeria | Verlinden | other | 1980 | . | United States | 14.4 |
| 1983 | Nigeria | Trendtex Trading Corporation | other | 04/11/1975 | . | United Kingdom | 14.0 |
| 1995 | Nicaragua | LNC Investments | fund | 22/08/1996 | OCS | United States | 26.3 |
| 1995 | Nicaragua | International Bank of Miami, ANZ Banking Group, Swiss Bank, and 8 further banks and funds | fund | 22/07/1997 | OCS | United States | 175.0 |
| 1995 | Nicaragua | GP Hemisphere Associates | fund | 06/10/1999 | Judgment satisfied | United States | 30.9 |
| 1995 | Nicaragua | Van Eck Emerging Markets Opportunity Fund and Greylock Global Opportunity Fund | fund | 03/08/2000 | Judgment satisfied | United States | 13.0 |
| 2007 | Nicaragua | 14 Octobar Krusevac, and 4 further commercial creditors | other | 04/04/2007 | OCS | United States | 9.3 |
| 1996 | Panama | Water Street Bank & Trust | fund | 12/04/1994 | unsuccesful | United States | . |
| 1996 | Panama | Elliott Associates | fund | 15/07/1996 | OCS | United States | 28.7 |
| 1997 | Peru | Bank of America, Citibank, Chase Manhattan, Bank of Tokyo, and 9 further banks | bank | 02/03/1990 | OCS | United States | . |
| 1997 | Peru | European American Bancorp | bank | 07/03/1990 | OCS | United States | . |
| 1997 | Peru | Financial Overseas Holding | fund | 08/03/1990 | OCS | United States | . |
| 1997 | Peru | Bankers Trust Company | bank | 09/03/1990 | OCS | United States | . |
| 1997 | Peru | Morgan Guaranty Trust Company of NY | bank | 15/03/1990 | OCS | United States | . |
| 1997 | Peru | Wells Fargo Bank, DG Bank, and two further banks | bank | 15/03/1990 | OCS | United States | . |
| 1997 | Peru | Mellon Bank | bank | 23/03/1990 | OCS | United States | . |
| 1997 | Peru | American Home Assurance Company, National Union Fire Insurance, and 8 further insurance companies | other | 30/03/1990 | OCS | United States | . |
| 1997 | Peru | International Commercial Bank | . | 18/05/1990 | OCS | United States | . |
| 1997 | Peru | American Security Bank | bank | 20/07/1990 | OCS | United States | . |
| 1997 | Peru | Pravin Banker Associates | fund | 07/01/1993 | Judgment satisfied | United States | 1.4 |
| 1997 | Peru | Banco Cafetero (Panama) | bank | 16/05/1994 | Judgment satisfied | United States | 5.0 |
| 1997 | Peru | Elliott Associates | fund | 21/10/1996 | Judgment satisfied | United States | 20.7 |
| 1994 | Poland | Water Street Bank & Trust | fund | 04/06/1994 | OCS | United States | 3.7 |
| 1993 | Paraguay | Banque de Gestion Privée-SIB | bank | 25/11/1991 | OCS | United States | . |
| 1997 | Vietnam | Abbotsford Investments | fund | 07/1995 | OCS | United Kingdom | 1.5 |
| 2001 | Yemen | Cardinal Financial Investment Corporation | fund | 2000 | OCS | United Kingdom | 8.2 |
| 1994 | Zambia | Camdex International | fund | 26/05/1995 | OCS | United Kingdom | 61.5 |
| 1994 | Zambia | Plenum Financial and Investments | fund | 21/09/1995 | OCS | United States | . |
| 1994 | Zambia | AN International Bank | bank | 30/08/1996 | . | United Kingdom | . |

This table shows a list of creditor lawsuits, organized by plaintiff-defendant pairs from our database. The "type of creditor" (bank, fund, etc.) reflects the primary business activity of the plaintiff. "Suit filedŠŠ denotes the date when the plaintiff's action was filed with the court. "Outcome" shows the outcome of cases, distinguishing between out-of-court settlements (OCS), voluntary dismissals of the case, satisfaction of judgment, or rejections/discontinuations of the case. "Jurisdiction" is classified according to where the primary suit was conducted, i.e. where the subject matter was tried, irrespective of potential further proceedings related to mere enforcement of a judgment. Face value gives the nominal value of the debt under dispute in current USD, irrespective of potential accrued or past due interest or principal, penalties, legal costs etc.

Table 3.3: Summary statistics of variables used in the regressions

| Variable | Mean | Std. Dev. | Min. | Max. | Source |
|---|---|---|---|---|---|
| **Market access regressions** | | | | | |
| Sovereign Bonds Access (dummy) | 0.13 | 0.34 | 0 | 1 | Dealogic |
| Sovereign Debt (Bonds and Loans) Access (dummy) | 0.26 | 0.44 | 0 | 1 | Dealogic |
| Sovereign Debt Issuance to GDP | 0.64 | 2.53 | 0 | 72.66 | Dealogic |
| Private Bonds to GDP | 0.16 | 0.9 | 0 | 25.71 | Dealogic |
| Sovereign Debt Placement $>$ 1% GDP (dummy) | 0.14 | 0.34 | 0 | 1 | Dealogic |
| Domestic Bonds/Total Bonds Issued | 0.26 | 0.41 | 0 | 1 | Dealogic |
| Sovereign Bonds Access (dummy) | 0.12 | 0.32 | 0 | 1 | Bloomberg |
| Any litigation (dummy) | 0.04 | 0.2 | 0 | 1 | Own dataset |
| Attachment attempt (dummy) | 0.03 | 0.16 | 0 | 1 | Own dataset |
| Litigation (claims to total debt restructured) | 0.13 | 1.4 | 0 | 48.56 | Own dataset |
| Debt/GDP | 68.35 | 67.25 | 0.61 | 2092.92 | Abbas et al. (2010) |
| Short term/total debt | 21.8 | 53.74 | 0 | 1185 | WDI |
| Reserves/Imports | 83.36 | 1783.81 | 0 | 93981.02 | WDI |
| GDP growth (real, yoy) | 3.46 | 6.83 | -51.03 | 106.28 | WDI |
| Trade/GDP | 63.93 | 49.76 | 4.95 | 986.65 | WDI |
| Political Risk (ICRG) | 58.79 | 13.34 | 8.5 | 89.12 | ICRG |
| GDP/capita (log) | 7.08 | 1.33 | -1.25 | 11.37 | WDI |
| IMF program (start) | 0.15 | 0.36 | 0 | 1 | IMF Website |
| Default (ongoing) | 0.23 | 0.42 | 0 | 1 | Standard & Poor's (2006, 2011) |
| Haircut size (for entire default spell) | 8.54 | 23.26 | -9.8 | 97 | Cruces and Trebesch (2013) |
| II Rating Residual | 0 | 9.33 | -25.54 | 40.08 | Institutional Investor |
| **Trade regressions** | | | | | |
| Real trade (Log, average) | 14.02 | 3.77 | -6.56 | 25.63 | IMF Directory of Trade Statistics |
| Any litigation (dummy) | 0.05 | 0.22 | 0 | 1 | Own dataset |
| Litigation (average share of restructured debt) | 0.1 | 0.87 | 0 | 32.39 | Own dataset |
| Attachment attempt (dummy) | 0.02 | 0.13 | 0 | 1 | Own dataset |
| Debt restructuring (bilateral) | 0.01 | 0.09 | 0 | 1 | Paris Club |
| Debt restructuring (general) | 0.11 | 0.31 | 0 | 1 | Paris Club |
| IMF agreement pair | 0.23 | 0.45 | 0 | 2 | IMF Website |
| Real GDP (Log of product) | 47.56 | 3.3 | 34.15 | 60.13 | WDI |
| Real GDP/capita (Log of product) | 16.27 | 1.93 | 9.04 | 21.67 | WDI |
| Haircut (Average) | 5.61 | 14.01 | -5 | 94.85 | Cruces and Trebesch (2013) |
| II rating (Residual, log of product) | 0 | 0.52 | -3.05 | 2.81 | Institutional Investor |
| Current colony | 0 | 0.02 | 0 | 1 | Rose (2005) |
| Currency union | 0.01 | 0.11 | 0 | 1 | Rose (2005) |
| Regional trade agreement | 0.02 | 0.13 | 0 | 1 | Rose (2005) |
| **Delay regressions** | | | | | |
| Duration of negotiations (months) | 38.87 | 36.11 | 1 | 140 | Trebesch (2013) |
| Any litigation (dummy) | 0.1 | 0.3 | 0 | 1 | Own dataset |
| Attachment attempt (dummy) | 0.05 | 0.21 | 0 | 1 | Own dataset |
| Litigation (claims to total debt restructured) | 0.14 | 0.88 | 0 | 7.95 | Own dataset |
| IMF program (ongoing) | 0.64 | 0.48 | 0 | 1 | IMF Website |
| Recognized Creditor Committee | 0.93 | 0.25 | 0 | 1 | Trebesch (2013) |
| Bond restructuring | 0.07 | 0.26 | 0 | 1 | Trebesch (2013) |
| Previous restructuring | 1.4 | 1.68 | 0 | 7 | Trebesch (2013) |
| HIPC and World Bank supported restructuring | 0.1 | 0.31 | 0 | 1 | Trebesch (2013) |
| Global interest rate (Moody's corporate yields) | 9.82 | 2.4 | 5.36 | 16.25 | Moody's |
| Haircut size | 39.32 | 24.92 | -9.8 | 92.7 | Cruces and Trebesch (2013) |
| GDP growth forecast (ICRG monthly index) | 4.6 | 1.49 | 0.5 | 10 | ICRG |
| GDP/Capita (Log) | 7.36 | 0.94 | 5 | 9.02 | WDI |
| II Rating | 22.34 | 8.75 | 5.2 | 62.8 | Institutional Investor |

Table 3.4: Descriptive statistics on $H1$: Litigation and foreign credit

This table reports summary statistics on bond issuances by developing and emerging market borrowers between 1980-2010 in different subsamples. The second column reports the absolute number of observations in the subsamples denoted in the leftmost column. The second and third column show the total number of country-year events with bond issuances, and the mean amount of issuances, respectively. The fourth column reports the share of years with issuance for each subsample. Stars indicate significance levels of $t-$tests of this share against the following benchmarks: row 1, observations with litigation against observations without; row 2, observations with litigation exceeding 1% of the restructured debt against observations without; row 3, observations with litigation against without since 2000; row 4, observations with attachment against without; row 5, observations with attachment against without, excluding years in which a country was in default. All tests indicate that the probability of issuing new bonds in any of the subsamples with litigation is significantly smaller than in those observations without legal action. The lower part of the table reports summary statistics for two benchmark samples without litigation proceedings.

| | Country-Year Events (total) | Years with bond issuance | Amount borrowed (m USD, average) | Share of years with issuance |
|---|---|---|---|---|
| *Bond market issuances with litigation:* | | | | |
| Any Litigation | 189 | 12 | 80.5 | 6.3%** |
| Share of litigation >1% of debt | 107 | 3 | 32.7 | 2.8%*** |
| Litigation in the 2000s (after 1999) | 77 | 0 | 0.0 | 0.0%*** |
| With attachment proceedings | 109 | 2 | 10.1 | 1.8%*** |
| Post-crisis years, with attachment | 58 | 1 | 8.6 | 1.7%** |
| *Benchmark years:* | | | | |
| Post-crisis years (3 year lag), no attachment | 223 | 41 | 193.8 | 18.4% |
| Normal times (no default or post-default years) | 4005 | 522 | 206.9 | 13.0% |

$^{**}p < 0.05,^{***}p < 0.01$

Table 3.5: Descriptive statistics on $H2$: Litigation and international trade

The table reports summary statistics on bilateral trade between 1970 and 2007. The second column shows the mean bilateral trade to GDP between country pairs for each subsample denoted in the left column. Bilateral trade is significantly lower during default episodes (years in default and three years after a restructuring). It is even lower in years with litigation involving attachment attempts, both during and in the aftermath of debt crises. The right column reports the respective $t-$tests.

| | Bilat. Trade/GDP (%) | Difference > 0? | |
|---|---|---|---|
| Outside default episode | 0.053 | 44.454 | $t$-statistic |
| In default episode | 0.018 | 0.000 | $p$ |
| Without pending attachment case | 0.038 | 9.572 | $t$-statistic |
| With pending attachment case | 0.014 | 0.000 | $p$ |
| Without pending attachment case (outside crisis episode) | 0.053 | 5.459 | $t$-statistic |
| With pending attachment case (outside crisis episode) | 0.016 | 0.000 | $p$ |

## Table 3.6: Estimation results on $H1$: Litigation and foreign credit (I)

This table shows results on the determinants of market access following equation 3.1 and including country and year fixed effects. The results presented are coefficients from a logit fixed effects model using a bond issuance dummy as dependent variable (by year). Columns (1)-(3) show the baseline results with three different measures of creditor litigation – a simple litigation dummy, a dummy for pending attachment attempts and the share of litigated claims to total restructured debt (in %). Column (4) focuses on non-crisis years by dropping all years in default according to Standard & Poor's (2006, 2011). Column (5) restricts the sample to the period after 1992, when distressed debt investors entered the scene and bonds became the main vehicle for sovereign borrowing. Column (6) drops countries coded as "net creditors" by the IMF to mitigate concerns about demand effects (voluntary abstention from borrowing). To account for the severity of default, column (7) includes the credit rating residuals and column (8) controls for the size of haircuts for each year of the respective debt renegotiation spell. Columns (9)-(11) show results from the baseline model, using a binary access indicator based on issuance data from Bloomberg.

| | Dependent variable: bond market access (dummy) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | Baseline (dummy) | Baseline (attachment) | Baseline (share) | Normal times | Post 1992 | Without creditor countries | With credit ratings | With haircuts | Bloomberg (dummy) | Bloomberg (attachment) | Bloomberg (share) |
| Any litigation (dummy) | -0.511 | | | | | | | | -0.914 | | |
| | (0.681) | | | | | | | | (0.726) | | |
| Attachment attempt (dummy) | | -4.008*** | | | | | | | | -3.140** | |
| | | (1.341) | | | | | | | | (1.258) | |
| Litigation (claims to total debt restructured) | | | -0.733*** | -1.103* | -1.086** | -0.991*** | -0.714*** | -0.603** | | | -0.840** |
| | | | (0.261) | (0.659) | (0.440) | (0.307) | (0.261) | (0.276) | | | (0.372) |
| GDP/capita (log) | 0.663 | 0.312 | 0.285 | 0.562 | 0.280 | 0.241 | 0.373 | 0.231 | 1.081** | 0.826 | 0.767 |
| | (0.500) | (0.522) | (0.520) | (0.553) | (0.647) | (0.736) | (0.526) | (0.517) | (0.540) | (0.554) | (0.557) |
| Debt/GDP | -0.018** | -0.015* | -0.016** | -0.017* | -0.035*** | -0.039*** | -0.017** | -0.017** | -0.013 | -0.011 | -0.011 |
| | (0.008) | (0.008) | (0.008) | (0.009) | (0.010) | (0.012) | (0.008) | (0.007) | (0.008) | (0.009) | (0.008) |
| Reserves/Imports | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | -0.007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.004) | (0.000) | (0.008) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Short term/total debt | -0.767 | -0.610 | -0.680 | -0.563 | -1.278** | -1.135** | -0.610 | -0.687 | -0.990* | -0.894* | -0.909* |
| | (0.486) | (0.468) | (0.471) | (0.478) | (0.545) | (0.564) | (0.474) | (0.478) | (0.539) | (0.527) | (0.523) |
| GDP growth (real yoy) | -0.007 | -0.008 | 0.001 | 0.005 | -0.012 | 0.038 | -0.007 | 0.011 | 0.003 | 0.001 | 0.007 |
| | (0.031) | (0.031) | (0.031) | (0.035) | (0.036) | (0.036) | (0.031) | (0.030) | (0.030) | (0.030) | (0.030) |
| Trade/GDP | -0.043*** | -0.044*** | -0.044*** | -0.044*** | -0.009 | -0.038*** | -0.045*** | -0.047*** | -0.029*** | -0.030*** | -0.029*** |
| | (0.010) | (0.010) | (0.010) | (0.011) | (0.013) | (0.014) | (0.010) | (0.010) | (0.011) | (0.010) | (0.011) |
| Political Risk (ICRG) | 0.002 | 0.002 | -0.004 | 0.009 | -0.038 | -0.004 | -0.002 | 0.006 | 0.003 | 0.004 | 0.001 |
| | (0.021) | (0.022) | (0.022) | (0.024) | (0.031) | (0.032) | (0.022) | (0.021) | (0.021) | (0.021) | (0.022) |
| IMF program (start) | -0.062 | -0.101 | -0.122 | -0.289 | -0.061 | -0.298 | -0.078 | -0.204 | -0.029 | -0.066 | -0.076 |
| | (0.296) | (0.301) | (0.300) | (0.339) | (0.334) | (0.351) | (0.302) | (0.289) | (0.301) | (0.304) | (0.303) |
| Default (ongoing) | -1.755*** | -1.908*** | -2.004*** | | -1.271** | -2.453*** | -2.013*** | | -2.075*** | -2.216*** | -2.440*** |
| | (0.507) | (0.527) | (0.535) | | (0.625) | (0.820) | (0.536) | | (0.543) | (0.552) | (0.578) |
| Default (lag for years 1 to 3 after) | -0.827** | -0.782** | -0.857** | -0.857** | -0.649 | -0.620 | -0.809** | | -0.645* | -0.634* | -0.751** |
| | (0.383) | (0.391) | (0.381) | (0.410) | (0.417) | (0.470) | (0.384) | | (0.374) | (0.374) | (0.368) |
| II Rating Residual | | | | | | | -0.032 | | | | |
| | | | | | | | (0.023) | | | | |
| Haircut size (for entire default spell) | | | | | | | | -0.036*** | | | |
| | | | | | | | | (0.012) | | | |
| Haircut size (lag for years 1 to 3 after) | | | | | | | | -0.029*** | | | |
| | | | | | | | | (0.011) | | | |
| Adj. Pseudo R2 | 0.32 | 0.34 | 0.33 | 0.24 | 0.20 | 0.43 | 0.33 | 0.32 | 0.34 | 0.35 | 0.35 |
| Obs | 954 | 954 | 954 | 746 | 663 | 773 | 949 | 988 | 895 | 895 | 895 |
| No. Countries | 43 | 43 | 43 | 41 | 40 | 35 | 43 | 44 | 40 | 40 | 40 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

## Table 3.7: Estimation results on $H1$: Litigation and foreign credit (II)

This table shows results on the determinants of market access following equation 3.1 and including country and year fixed effects. Columns (1)-(3) report coefficients from logit fixed effects models. Column (1) uses a bond issuance dummy that includes government-owned companies and agencies. Column (2) uses an indicator that also includes sovereign syndicated bank loans. The "full access" dummy used in column (3) is coded as 1 if the volume of bonds issued in that year exceeds 1% of GDP (and 0 otherwise). The specifications in columns (4)-(6) show OLS regression results using bond issuance to GDP (in %) as dependent variable. Column (4) reports the results in the full sample, column (5) excludes Argentina, Brazil, and Peru and column (6) focuses on corporate bond issuance to GDP. Columns (7)-(9) report results from a fractional response model including country and year fixed effects (see Papke and Wooldridge (1996, 2008), displayed are average marginal effects). The dependent variable in these regressions is the ratio of the volume of domestic bonds issued to the total volume of bonds issued (domestic and foreign) per year; the columns show results for the binary litigation indicator, the indicator for pending attachment proceedings, and the share of debt litigated relative to debt restructured.

| | Alternative dependent variables on market access | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | Incl. access by public firms | Bonds or loans | Full access (> 1% GDP) | Issuance to GDP | Without Arg, Bra, Per | Access by private firms | Domestic Bonds/ Total Issuance | Domestic Bonds/ Total Issuance | Domestic Bonds/ Total Issuance |
| Any litigation (dummy) | | | | | | | 0.514*** | | |
| | | | | | | | (0.120) | | |
| Attachment attempt (dummy) | | | | | | | | 1.661*** | |
| | | | | | | | | (0.328) | |
| Litigation (claims to | -0.697*** | -0.296* | -0.588** | -0.047*** | -0.041*** | -0.002 | | | 0.940** |
| total debt restructured | (0.269) | (0.171) | (0.277) | (0.009) | (0.008) | (0.003) | | | (0.456) |
| GDP/capita (log) | 1.850*** | 1.234*** | 0.110 | 0.684** | 0.613** | 0.188** | 0.025 | 0.026 | 0.039 |
| | (0.562) | (0.404) | (0.451) | (0.261) | (0.255) | (0.085) | (0.064) | (0.078) | (0.068) |
| Debt/GDP | -0.005 | -0.005 | -0.010* | 0.001 | 0.001 | 0.000 | -0.003 | -0.004* | -0.002 |
| | (0.008) | (0.004) | (0.006) | (0.001) | (0.001) | (0.000) | (0.002) | (0.002) | (0.002) |
| Reserves/Imports | 0.000 | 0.000 | -0.001 | -0.000*** | -0.000*** | 0.000** | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.004) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Short term/total debt | -0.152 | -0.558* | -0.233 | -1.310** | -1.322** | -0.071 | 0.109 | 0.073 | 0.124 |
| | (0.426) | (0.310) | (0.370) | (0.550) | (0.546) | (0.054) | (0.080) | (0.071) | (0.083) |
| GDP growth (real yoy) | 0.002 | 0.008 | 0.029 | -0.022 | -0.023 | -0.007* | 0.003 | 0.004 | 0.003 |
| | (0.030) | (0.021) | (0.026) | (0.015) | (0.016) | (0.004) | (0.004) | (0.004) | (0.004) |
| Trade/GDP | -0.031*** | -0.014* | -0.025*** | -0.009 | -0.009 | 0.001 | -0.001 | -0.001 | -0.002 |
| | (0.010) | (0.007) | (0.008) | (0.007) | (0.007) | (0.003) | (0.001) | (0.002) | (0.002) |
| Political Risk (ICRG) | 0.054** | 0.021 | 0.009 | 0.013 | 0.012 | 0.004 | 0.013*** | 0.015*** | 0.013*** |
| | (0.021) | (0.015) | (0.019) | (0.012) | (0.012) | (0.003) | (0.004) | (0.004) | (0.004) |
| IMF program (start) | -0.046 | 0.062 | 0.392 | -0.024 | -0.033 | 0.089 | -0.067 | -0.079 | -0.044 |
| | (0.302) | (0.217) | (0.250) | (0.119) | (0.125) | (0.107) | (0.058) | (0.061) | (0.069) |
| Default (ongoing) | -2.983*** | -1.761*** | -2.209*** | -0.459** | -0.412* | -0.210** | 0.103 | 0.042 | 0.078 |
| | (0.574) | (0.333) | (0.456) | (0.217) | (0.234) | (0.095) | (0.110) | (0.179) | (0.115) |
| Default (lag for years | -1.160*** | -0.786*** | -1.208*** | -0.218 | -0.184 | -0.036 | 0.103 | 0.147** | 0.068 |
| 1 to 3 after) | (0.423) | (0.298) | (0.357) | (0.168) | (0.174) | (0.048) | (0.070) | (0.073) | (0.072) |
| Constant | | | | -3.344 | -2.594 | -1.258 | | | |
| | | | | (2.214) | (2.153) | (0.913) | | | |
| Adj. Pseudo R2 | 0.36 | 0.23 | 0.23 | | | | 0.55 | 0.57 | 0.56 |
| Adj. R2 | | | | 0.08 | 0.08 | 0.02 | | | |
| Obs | 964 | 1258 | 1146 | 1531 | 1455 | 1531 | 414 | 414 | 414 |
| No. Countries | 43 | 58 | 54 | 78 | 75 | 78 | 47 | 47 | 47 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Note: $^{*}p < 0.1$,$^{**}$ $p < 0.05$,$^{***}$ $p < 0.01$. Standard errors clustered on country where applicable.

## Table 3.8: Estimation results on *H*2: Litigation and international trade

This table shows the results from the trade gravity model of equation 3.2, including country fixed effects. The dependent variable is the annual average real bilateral trade between two countries. All regressions include lags of the debt restructuring and IMF agreement variables, although their coefficients are not reported for the sake of brevity. Columns (1)-(3) show results in the baseline model using three different measures of creditor litigation – a dummy for any litigation, the share of litigated claims to total debt restructured (in %), and a dummy for pending attachment attempts, which is the most relevant variable in the context of international trade as we explain in the paper. Column (4) adds a general indicator of debt restructurings, in addition to the bilateral restructuring measure. Column (5) accounts for the severity of the default by including the size of haircuts towards foreign banks and bondholders. Column (6) includes decade fixed effects to capture time trends. Column (7) restricts the sample to the period after 2000, and column (8) excludes Argentina, Brazil and Peru. The model in column (9) controls for the rating residual.

| | Dependent variable: Log(Average bilateral trade) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | Baseline (dummy) | Baseline (share) | Baseline (attachment) | Martinez/ Sandleris | With haircuts | Decade FE | Post 2000 | Without Arg, Bra, Per | With credit ratings |
| Any litigation (dummy) | -0.030 | | | | | | | | |
| | (0.030) | | | | | | | | |
| Litigation (average claims to total debt restructured, in %) | | 0.023*** | | | | | | | |
| | | (0.007) | | | | | | | |
| Attachment attempt (dummy) | | | -0.111*** | -0.115*** | -0.095** | -0.036 | -0.201* | -0.110*** | -0.226*** |
| | | | (0.041) | (0.042) | (0.041) | (0.041) | (0.115) | (0.041) | (0.044) |
| Debt restructuring (bilateral) | -0.057*** | -0.056*** | -0.058*** | 0.018 | -0.030* | -0.060*** | 0.032 | -0.058*** | -0.002 |
| | (0.016) | (0.016) | (0.016) | (0.019) | (0.016) | (0.015) | (0.027) | (0.016) | (0.016) |
| IMF agreement pair | -0.080*** | -0.081*** | -0.080*** | -0.062*** | -0.067*** | -0.073*** | -0.045*** | -0.080*** | -0.081*** |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.016) | (0.008) | (0.009) |
| Real GDP (log of product) | 0.023 | 0.004 | 0.026 | 0.051 | -0.005 | 0.271*** | 1.785*** | 0.025 | 0.229*** |
| | (0.047) | (0.047) | (0.047) | (0.048) | (0.048) | (0.049) | (0.139) | (0.047) | (0.055) |
| Real GDP/capita (log of product) | 0.617*** | 0.640*** | 0.613*** | 0.588*** | 0.635*** | 0.459*** | -0.609*** | 0.613*** | 0.501*** |
| | (0.061) | (0.061) | (0.061) | (0.062) | (0.061) | (0.061) | (0.168) | (0.061) | (0.071) |
| Current colony | 0.597** | 0.600** | 0.595** | 0.602** | 0.577** | 0.565** | | 0.595** | |
| | (0.261) | (0.262) | (0.260) | (0.259) | (0.262) | (0.242) | | (0.260) | |
| Currency union | -0.129** | -0.131** | -0.128** | -0.128** | -0.109* | -0.127** | | -0.127** | -0.123*** |
| | (0.059) | (0.059) | (0.059) | (0.059) | (0.059) | (0.058) | | (0.059) | (0.043) |
| Regional trade agreement | 0.245*** | 0.243*** | 0.246*** | 0.246*** | 0.240*** | 0.260*** | 0.172*** | 0.242*** | 0.270*** |
| | (0.048) | (0.048) | (0.048) | (0.049) | (0.048) | (0.047) | (0.033) | (0.049) | (0.039) |
| Debt restructuring (general) | | | | -0.088*** | | | | | |
| | | | | (0.013) | | | | | |
| Haircut (Average) | | | | | -0.008*** | | | | |
| | | | | | (0.001) | | | | |
| Haircut (Average, 3 year lag) | | | | | -0.003*** | | | | |
| | | | | | (0.001) | | | | |
| Decade Fixed Effects | | | | | | Yes | | | |
| II rating (residual, log of product) | | | | | | | | | 0.503*** |
| | | | | | | | | | (0.022) |
| Constant | 2.474* | 2.979** | 2.420* | 1.624 | 3.584*** | -6.753*** | -64.15*** | 2.426* | -5.169*** |
| | (1.306) | (1.313) | (1.309) | (1.320) | (1.316) | (1.420) | (4.076) | (1.309) | (1.572) |
| *Debt restructuring (bilateral) 10 Lags* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Debt restructuring (general) 10 Lags* | | | | Yes | | | | | |
| *IMF agreement pair 5 Lags* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R2 | 0.20 | 0.17 | 0.20 | 0.23 | 0.16 | 0.47 | 0.47 | 0.20 | 0.44 |
| Obs | 214072 | 214072 | 214072 | 214072 | 214072 | 214072 | 61250 | 213988 | 156036 |
| Country pairs | 11992 | 11992 | 11992 | 11992 | 11992 | 11992 | 10920 | 11989 | 10224 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$. Standard errors clustered on country dyad.

Table 3.9: Estimation results on *H*3: Litigation and negotiation delays

The table reports coefficients from a Cox proportional hazard model described in equation 3.3. The left panel focuses on the duration of negotiations, ranging from the start of negotiations until the final debt exchange. All models are estimated using monthly data and include year fixed effects. Columns (1)-(3) show results in our baseline model and three different measures of creditor litigation – a dummy for any litigation, a dummy for pending attachment attempts, and the share of litigated claims to total debt restructured. Columns (4) restricts the sample to the period after 1992, while column (5) excludes Argentina, Brazil and Peru. Column (6) includes the haircut suffered by investors in the respective restructuring. Column (7) includes the country credit ratings. Column (8) controls for GDP per capita and includes a proxy for GDP growth forecasts. The last specification in column (9) uses total restructuring duration, from start of distress (month of default or announcement of debt restructuring) until the final debt exchange

| | Negotiation Duration | | | | | | | | Total Duration |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | Baseline (dummy) | Baseline (attachment) | Baseline (share) | Post 1992 | Without Arg, Bra, Per | With haircuts | With ratings | Growth & GDP/capita | Baseline (dummy) |
| Any litigation (dummy) | -0.91*** | | | | | | | | -0.94** |
| | (0.32) | | | | | | | | (0.39) |
| Attachment attempt (dummy) | | -0.98** | | | | | | | |
| | | (0.46) | | | | | | | |
| Litigation (claims to total debt restructured, in %) | | | -0.41*** | -0.44*** | -0.19** | -0.40*** | -0.37*** | -0.86** | |
| | | | (0.09) | (0.14) | (0.08) | (0.09) | (0.12) | (0.42) | |
| IMF Program (ongoing) | 0.07 | 0.04 | 0.08 | -0.01 | 0.14 | 0.06 | 0.63 | 0.67* | 0.67*** |
| | (0.25) | (0.24) | (0.24) | (0.43) | (0.29) | (0.26) | (0.45) | (0.34) | (0.24) |
| Recognized Creditor | -0.86** | -0.71* | -0.74** | -0.95*** | -0.36 | -0.69* | -0.48 | -0.63 | -0.40 |
| Committee | (0.42) | (0.38) | (0.37) | (0.28) | (0.41) | (0.38) | (0.33) | (0.52) | (0.35) |
| Bond restructuring | 0.11 | 0.12 | -0.10 | 0.21 | 0.16 | -0.08 | -0.04 | -0.47 | 0.18 |
| | (0.43) | (0.42) | (0.38) | (0.37) | (0.37) | (0.38) | (0.34) | (0.50) | (0.45) |
| Previous restructuring | 0.13** | 0.11** | 0.11** | -0.13 | 0.12* | 0.12** | 0.00 | 0.05 | 0.18*** |
| | (0.05) | (0.05) | (0.06) | (0.11) | (0.07) | (0.06) | (0.09) | (0.09) | (0.05) |
| HIPC and World Bank | -0.91 | -0.91 | -0.91 | 0.16 | 0.11 | -0.87 | 0.32 | -0.99 | -1.34*** |
| supported restructuring | (0.66) | (0.67) | (0.66) | (0.80) | (0.68) | (0.64) | (0.71) | (0.71) | (0.20) |
| Global interest rate | -0.04 | -0.06 | -0.07 | 0.11 | -0.05 | -0.10 | 0.17 | 0.06 | -0.06 |
| (Moody's corporate yields) | (0.19) | (0.19) | (0.19) | (0.49) | (0.18) | (0.20) | (0.42) | (0.29) | (0.16) |
| Haircut size | | | | | -0.03*** | | | | |
| | | | | | (0.01) | | | | |
| Country Credit Rating (II) | | | | | | | 0.06* | | |
| | | | | | | | (0.03) | | |
| GDP growth forecast (ICRG monthly index) | | | | | | | | 0.27** | |
| | | | | | | | | (0.11) | |
| GDP/Capita (Log) | | | | | | | | 0.20 | |
| | | | | | | | | (0.17) | |
| Pseudo R2 | 0.07 | 0.06 | 0.07 | 0.19 | 0.09 | 0.07 | 0.14 | 0.11 | 0.08 |
| Obs | 2390 | 2390 | 2390 | 763 | 2390 | 2263 | 1171 | 1624 | 7230 |
| Log Likelihood | -474.11 | -475.17 | -473.35 | -85.01 | -464.43 | -451.80 | -133.59 | -236.86 | -683.70 |
| BIC | 1220.49 | 1222.60 | 1218.97 | 302.76 | 1208.91 | 1173.96 | 436.75 | 688.11 | 1731.72 |
| p>Chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PH-Test | 0.91 | 0.94 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.50 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$. Standard errors clustered on country.

# Appendix

## A Case studies on the cost of litigation

### (i) Case studies on $H1$: disruption of market access

- **Argentina 2002-2013:** Argentina's 2002 default triggered dozens of creditor lawsuits and related attachment attempts. One important consequence of these ongoing legal disputes is that the government is effectively excluded from foreign bond markets, a major source of government financing during the 1990s (see e.g. Reuters, 07 November 2006; Euroweek, 20 July 2007; Dow Jones International News, 13 January 2009; The Economist, 20 October 2011). For more than 10 years now, Argentina has mostly borrowed domestically and did not place a single sovereign bond in financial centers such as London or New York (Securities and Exchange Commission, 2011, p. 155).

  Argentina's bond market access was first disrupted in the spring of 2005, when the government attempted to resolve its debt crisis with a global bond restructuring offer. The offer was accepted by bondholders holding instruments worth USD 62.3bn and the exchange was scheduled to close on 01 April 2005. However, litigating creditors obtained attachment orders on those bonds tendered in the exchange (in the amount of USD 7bn), which prevented Argentina from exchanging the tendered bonds and making any payments on newly restructured bonds (see S.D.N.Y., 02 Civ. 3804, 29 March 2005). Settlement was only possible 3 months later, in June 2005. Ever since, Argentina would have to expect to face similar attachment attempts on any new bond issuances it would attempt in New York (Euromoney, 1 July 2005).

  Most recently, in 2012, a group of creditors obtained a court order which, if upheld, will prevent Argentina from servicing its existing bonds (and, by extension, also any new bonds issued). Specifically, the order blocks Argentina from using US-based payment agents to repay its bonds unless it also repays the litigating holdouts at the same rate (S.D.N.Y., 09 Civ. 1708, 23 February 2012; 2nd Circ., 12 Civ. 105, 26 October 2012). The former IMF first deputy managing director Anne Krueger expressed in her opinion to the court that the "ratability requirements would certainly delay the point at which the country could re-access the private international capital market, because the costs of any new borrowing would include payments under ratability to holdouts." (2nd Circ., 12 Civ. 105, 4 January 2013 (Amicus Brief by Anne Krueger)).

  Besides court action, litigious bondholders have also coordinated themselves to lobby for new laws that would legally restrict Argentina's bond market access. One example is the "Judgment Evading Foreign States Accountability Act" (introduced in the US Congress under S.912 and H.R.1798 in May 2011). The Act would disallow debt issuances by foreign states that face US court judgments totaling more than USD 100m (SEC 2011, Argentina Annual Report, 18-K). So far, Congress has not taken action on this and similar proposals.

- **Peru 1997-2000:** Between 1996 and 2000, Peru's bond issuance plans were severely disrupted by a series of judgments and attachment attempts. The dispute goes back to 1995, when Peru initiated its Brady debt restructuring and the distressed debt fund Elliott started to purchase Peruvian debt worth USD 20.6m on the secondary market. Shortly before the scheduled settlement of the Brady exchange

in October 1996, "Elliott filed suit [...] in New York Supreme Court and sought [...] prejudgment attachment." (2nd Circ., 98 Civ. 9268/9319, 20 October 1999). As a result, the exchange and issuance of the new bonds were delayed, but the restructuring could eventually be closed in March 1997.

However, even after the restructuring the lawsuit continued to endanger Peru's bond market access. In October 1999, Elliott obtained the right to collect the full amount claimed and it received an attachment order one month later (2nd Circ., 98 Civ. 9268/9319, S.D.N.Y. 96 Civ. 7916). The case became even more disruptive for Peru's capital market access when US-based banks were temporarily prohibited from transferring interest payments due on Peru's newly issued Brady bonds (S.D.N.Y. 96 Civ. 7916, 25 September 2000). Being unable to pay its creditors via the US, Peru missed a scheduled coupon payment in early September 2000 and also failed in its attempt to transfer payments through the Belgium-based Euroclear instead (Hof van Beroep te Brussel, A.R. Nr. 2000/QR/92, 26 September 2000; own translation).

To avoid an outright default, Peru therefore decided to settle with Elliott, which allowed the government to resume payments on the Brady bonds only days before the bonds grace period ended in late September (Reuters, 29 September 2000). During the legal dispute, Peru did not issue any new sovereign bonds, despite earlier plans to do so (15 January 1997, Reuters, Investment Dealers Digest, 26 July 1999, "Peru eyes Morgan and BancBoston to lead bond deal"). It was only in 2002 that Peru started to regularly place sovereign bonds in international markets again.

- **Panama 1996-1997:** In Panama litigating creditors explicitly targeted the proceedings from a sovereign bond issuance in 1997, thus disrupting a public offering that was about to be launched. The dispute goes back to the mid-1990s when the distressed debt fund Elliott purchased USD 28.8m of debt on the secondary market in 1995 (96 Civ. 5295, 96 Civ. 5514). Panama successfully closed its Brady deal in April of 1996, but Elliott refused to participate and filed two suits in New York in July 1996.

  Panama publicly announced to re-access international capital markets soon after the Brady restructuring (Reuters, 17 April 1996). It did so successfully in February 1997 with a debut USD 500m bond placement (Emerging Markets Debt Report, 10 February 1997 and LatinFinance, April 1997). However, the placement of a second global bond, planned for September 1997, was effectively blocked by litigation (Dow Jones Newswires, 18 September 1997). The reason were two judgments in favor of Elliott in May and September 1997 (N.Y. Sup. Ct. No. 603615/1996, 15 May 1997, S.D.N.Y., 96 Civ. 5514, 18 September 1997). To avoid disruptions, Panama appealed and even posted a *supersedeas bond* with the court over the full amount.[47] However, Elliott still threatened to obtain restraining and attachment orders specifically targeted at the September bond offering. The orders could have allowed Elliott to prevent bond settlement or to seize its proceedings (S.D.N.Y., 96 Civ. 5514, 23 September 1997; Dow Jones Newswires, 18 September 1997; Sturzenegger and Zettelmeyer 2007).

  In light of this situation, Panama dropped its appeal and settled with Elliott in early October (S.D.N.Y., 96 Civ. 5514, 7 October 1997). Some reports suggest a

[47] A supersedeas bond is collateral that must be posted with the court by the defendant if he appeals and does not want to satisfy the judgment before the final ruling.

payment of up to USD 71m, much more than the original judgment claims obtained by Elliott (Dow Jones Newswires, 6 October 1997; Cymrot (2002)).

### (ii) Case studies on *H2*: disruption of international trade

- **Republic of Congo 2006-2007:** Since the early 2000s, several US-based debt funds have sued the Republic of Congo for repayment on its defaulted debt and launched a series of attachment attempts. The main target of seizures has been the crude oil trade, the country's main export and most important source of foreign exchange. In response to the lawsuits in New York and London, the Congolese government set up a network of subsidiary companies in several countries so as to conceal its oil transactions and prevent attachment. In early 2006, Congo's Prime Minister Isidore Mvouba openly admitted to the press that the government has been hiding oil revenues from the litigating creditors and resorted to "slightly unorthodox" accounting methods for this purpose (Global Insight Daily Analysis, 23 January 2006).

  However, Congo's strategy to shield its assets did eventually not succeed. In 2006 litigating creditors achieved a victory in a Houston court when garnishment orders on more than 500,000 barrels of oil were issued against several public and private companies dealing with Congo's oil exports in the US and abroad (TX.S.D., 02 Civ. 4261, 5 April 2006; Platts, 7 April 2006). The orders effectively blocked Congo from receiving royalties or export revenues from its oil trade. One plaintiff, Kensington International, a fund controlled by Elliott, went one step further. It filed corruption charges against one of Congo's main relationship banks, BNP Paribas in New York, claiming that the bank had helped to set up a money laundering scheme to shield oil revenues from attachment (05 Civ. 5101 S.D.N.Y.; Euromoney, September 2006). BNP denied these claims, but the development significantly hampered Congo's relationship with foreign banks and the execution of its international oil sales.

  In 2007 and 2008, after more than six years of legal disputes, Congo gave in and agreed to out-of-court settlements with FG Hemishphere, Walker International, Kensington and other litigating creditors (The Sunday Times, 15 June 2008). The payment amounts have remained confidential, but the terms are estimated to have been more favorable than the 85.8% haircut faced by creditors who agreed to participate in Congo's 2007 buy back, which was administered and financed by the World Bank's Debt Reduction Facility (American Lawyer, 1 September 2008)

- **Ecuador 1993:** Ecuador is a second case in which litigating creditors successfully attached revenues from the country's oil trade. The case was initiated by Weston Compagnie de Finance et d'Investissement, a Swiss investment fund, which purchased defaulted Ecuadorian debt on the secondary market and filed suit in April 1993 (S.D.N.Y., 93 Civ. 2698). Weston immediately obtained a pre-judgment attachment order, and successfully froze funds by Flota Petrolera Ecuatoriana, a state-owned company that is responsible for shipping the country's petroleum exports abroad. The funds remained frozen for more than four months in Flota's Citibank account in the United States (S.D.N.Y., 93 Civ. 2698; Reuters, 30 April 1993, LDC Debt Report, 2 August 1993). The seizure ended when Ecuador settled with Weston in late July of 1993 (LDC Debt Report, September 7, 1993).[48]

[48]The outcome of the settlement is undisclosed. Ultimately, however, the judge appears to have freed the funds and Weston seems to have backed away without receiving any cash, according to reports by LDC Debt Report of 25 October 1993 and 1 November 1993. This is in line with Buchheit (1999), who states that the case ended with a lifting of the pre-judgment attachment order.

- **Zambia 1995-1997:** In Zambia during the mid-1990s, a litigating creditor successfully seized revenues from the country's main international trade: copper. Camdex International, a distressed fund, had purchased defaulted Zambian debt on the secondary market and filed suit against the country's central bank in May 1995 in the UK. Four months later, Camdex obtained a summary judgment, and later on also attachment orders on revenues by Zambia Consolidated Copper Mines (ZCCM), a government-owned mining company and the "most important, if not the only, source of foreign exchange for the Zambian economy" (UK Queen's Bench Division, 24 May 1996 Judgment; see also: S.D.N.Y., 96 Civ. 7034). The attachment orders blocked the transfer of ZCCM's payments to Zambia's government accounts at Central Bank of Zambia (UK Court of Appeal (Civil Division), 17 January 1997). Ultimately, however, the UK orders were dismissed, and Camdex moved on to US courts, where it filed suit in 1996. The second, New York-based case ended with an out-of-court settlement in June 1997 (S.D.N.Y., 96 Civ. 7034, 4 June 1997).

### (iii) Case studies on *H3*: restructuring delay

- **Costa Rica 1981-1983:** Costa Rica's first debt rescheduling in the early 1980s took more than two years to conclude, from the start of negotiations in September 1981 until September 1983. This delay is unusually long for a London Club deal of the early 1980s, when most governments successfully rolled over their debt in less than a year. Indeed, Costa Rica's debt restructuring is the one with the longest duration among 20 other sovereign debt restructurings that were concluded in 1982 and 1983 Trebesch (2013). An important reason for the unusual delay was a lawsuit filed by Libra Bank of London, National Bank of Washington and six further banks in November of 1981. The litigating banks sought an attachment order on assets of the state owned Banco Nacional de Costa Rica, which was granted in June of 1982 (S.D.N.Y., 81 Civ. 7624, 08 July 1983). In addition, a second lawsuit was filed in February 1982 by a group of 39 banks, this time headed by Allied Bank.

  Press reports at the time describe that the two lawsuits resulted in a deadlock in the negotiations and significantly "hampered" settlement efforts in late 1981 and throughout 1982 (FT, 30 Sept. 1981; NYT, 11 Dec. 1981; FT, 2 Nov. 1982; FT, 2 Nov. 1982; FT, 25 Jan. 1983; Latin American Weekly Report, 13 Nov. 1982; FT, 25 Jan. 1983; Latin American Weekly Report, 5 Febr. 1983; FT, 22 Febr 1983). Costa Rica eventually managed to reschedule its debt in September of 1983, but only after both lawsuits came to an end, at least temporarily. The government settled with all litigating banks in the Libra case shortly before the restructuring (Zaitzeff and Kunz, 1985, p.470), while the Allied lawsuit was rejected in the New York district court in July 1983 (S.D.N.Y., 82 Civ. 0664, 8 July 1983).[49]

- **Peru 1990-1994:** The implementation of Peru's Brady deal in the mid-1990s took more than five years, and this delay can be partly attributed to creditor lawsuits. A first lawsuit on USD 1.2 bn was filed in March 1990 by a group of major international banks, led by Bank of America (S.D.N.Y., 90 Civ. 1409). Shortly afterwards, more than 30 additional banks and other investors filed lawsuits (alone or as plaintiff groups). The initial purpose of these suits was to increase pressure on Peru to start

[49] One bank, Fidelity Trust Union, appealed this ruling and continued to litigate until 1985, eventually overturning the district court ruling and achieving a judgment in its favor (2nd Circ., 83 Civ. 7714, 18 March 1985; Finnigan (1986).

negotiations (American Banker 1990, 7 May 1990), but the litigation quickly turned into a major obstacle for a debt restructuring agreement, resulting in more, instead of less, delay (Reuters, 6 July 1993): Between 1992 and 1994, the government and Peru's Bank Advisory Committee (BAC) decided to postpone a compromise on the ongoing lawsuits five times in a row (Reuters, 13 September 1994). During this period, Economy Minister Jorge Camet took a strong stance and asked the litigious banks to drop their lawsuit as a condition for starting serious negotiations with the rest of the committee ("We would not want to sit down and negotiate with creditors with whom we have matters pending in court", Reuters, 6 October 1994). To resolve the deadlock, most banks finally agreed to discontinue their lawsuits as of December 1994 (Reuters, 16 December 1994, S.D.N.Y., 90 Civ. 1409, 15 December 1994). This was seen as removing the "final obstacle for talks on restructuring the country's commercial debt" (Reuters, 16 December 1994). Indeed, a few months later, in September of 1995, the London Club and Peru agreed on a principal agreement on debt restructuring, the first such compromise since the country's debt moratorium of 1985.

- **Dominica 2003-2006:** Dominica's debt restructuring of 2004 is regarded as one of the few "messy" sovereign bond exchanges of the past decade (Moody's, 2013). The deal took more than a year to finalize, despite the fact that Dominica adopted a very creditor-friendly stance and engaged with its major creditor banks and bondholders early on (Das et al., 2012). The government officially announced its restructuring plans in December 2003 and then launched a preemptive debt exchange offer in April of 2004, with the intention of avoiding a payment default. The restructuring was officially closed in mid-June of 2004. By that time, however, only 72% of creditors had agreed to participate, a rate which is lower than in most other restructurings since the mid-1990s. The offer was therefore unofficially opened again and negotiations with non-participating creditors continued (IMF Country Report No. 04/286).

  Three large commercial creditors, including the Export-Import Bank of Taiwan, could however not be convinced and continued to hold out (IMF Country Report No. 04/286; IMF Country Report No. 05/384). In accordance with the terms of the debt restructuring offer, Dominica stopped interest payments on its "old" creditors in June 2004, channeling the foregone payments into an escrow account instead.

  In reaction to the technical default, Exim Bank filed suit in New York in July 2005 (S.D.N.Y., 05 Civ. 6698), a step that was seen as considerably delaying Dominica's exit from its debt crisis. The IMF, which is typically cautious on matters of sovereign debt litigation, went as far as noting that the "debt restructuring [has] been stymied" by Exim's "problematic" litigation (IMF Country Report No. 06/291). In September 2006, more than two years after the official closure of the deal, Dominica and Exim Bank finally reached a settlement to end the dispute (S.D.N.Y., 05 Civ. 6698, 22 September 2006), a "significant progress" that brought Dominica's debt troubles to an end (IMF Country Report No. 07/1).

# B Creditor returns to litigation

This Appendix lists selected litigation cases that have been (i) particularly lucrative for litigating creditors, or (ii) litigation failures, meaning that lawsuits resulted in a loss for the plaintiffs. The reported figures should be taken with care, as they are not based on official court documents only (our main source in the rest of the paper), but also on anecdotes and rumors mentioned in the financial press and previous research. Importantly, the returns do not account for procedural costs, in particular funding costs and legal costs.

**(i) Selected litigation successes:**

- In 1996, *Elliott* purchased USD 28.8m of *Panama*ian debt for USD 17.6 m and filed suit in New York (96 Civ. 7917, 7 August 1998). The final judgment amounted to USD 26.3m (full principal amount less interim payments), which was paid in full (96 Civ. 5514, Pacer History). This implies a gross return of 60% on investment.
- In early 1996, *Elliott* bought *Peru*vian debt with face value of USD 20.7 m for USD 11.3m. (96 Civ. 7917, 7 August 1998). The final judgment amounted to USD 56.3m (96 Civ. 7917, September 9, 2000). Facing impending attachments, Peru settled at the full amount (Sturzenegger and Zettelmeyer, 2006), which implied a gross return of 400% for Elliott.
- In 1996, *Abbotsford Investment* bought USD 1.5m of defaulted sovereign loans issued by *Vietnam*, which traded at 60-75 cents on the dollar (Financial Times 25 January 1996; Far Eastern Economic Review, 14 December 1995). Reportedly, Vietnam settled out of court at 100 cents on the dollar, thereby upsetting the London Club negotiations (Dow Jones Newswires, 12 April 1996). These press-reported figures imply a gross return of between 33 and 40%.
- During the 1990s, *Kensington* bought USD 13.5m of a defaulted loan to the *Republic of Congo*, dating back to 1984. After multiple demands to obtain payments, Kensington filed suit in England in October 2002 and obtained a judgment over USD 56m two months later (03 Civ. 4578 29 March 2007). The case was continued in the US, and in February 2008, Kensington reported the judgment as fully satisfied (03 Civ. 4578, Pacer History).
- In 2000, *Cardinal* Financial Investment Corporation bought promissory notes issued by *Yemen* with a face value of USD 8.2m on the secondary market, allegedly for 12 cents on the dollar (EWCA, Case No: A3/2000/0433). In 2001 Cardinal settled out of court, against a reported payment of USD 2.7m. If both figures are correct, the gross return would have been 270% (sources: Singh, 2003; Alfaro, 2007; Gueye et al., 2007).
- In 2001, *FG Hemisphere* filed suit against the *Republic of Congo* in 2001. The original claim amounted to USD 35.9m (IMF 2006). In 2002, FG was awarded a judgment amounting to USD 151.9 m (01 Civ. 8700, Pacer History). In April 2007, FG reported full satisfaction of the judgment (01 Civ. 8700, 12 April 2007).

**(ii) Selected litigation failures:**

- In 1986, *LNC Investment* bought bank loans by *Nicaragua* with face value totaling USD 26.3 m for a market value of USD 1.1m (96 Civ. 6360, 19 February 1999). LNC filed suit in 1996 and obtained a judgment over USD 86.9m in 1999 (96 Civ. 6360, Pacer History). Ten years later, the case was settled under Nicargua's debt relief initiative (IMF 2008), and was subsequently designated as closed (96 Civ. 6360, Pacer History). It can be assumed that LNC received the same terms as other creditors participating in the donor-funded buyback, ca. 4.5 cent on the dollar. This implies a modest gross return of 7% after 20 years of litigation.

- In the early 2000s, *SIFIDA and FH International* bought *Liberia*n debt with a face value of about USD 6.5m (BBC, 26 November 2009). The creditors filed suit in New York in 2002 and soon thereafter, a judgment of USD 18.4m was awarded (02 Civ. 1246, Pacer History). After multiple re-assignments of the claims, Hamsah Investment and Wall Capital continued the case, which was settled in December 2010 (02 Civ. 1246, Pacer History). Press reports suggest that the settlement terms were no better than the HIPC buy back terms of 3% of face value, despite 8 years of litigation (BBC, 23 November 2010).

- After *Argentina*'s default of 2001, *Vegas Game*, an Italian corporation, bought Argentine bonds worth USD 2.4m for about 31 cents on the dollar (06 Civ. 13084, 9 November 2006; Bloomberg). After the restructuring offer in 2005, Vegas joined a large number of litigating creditors and filed suit. However, after three years of fruitless litigation, Vegas abandoned the case even before Argentina re-opened its offer at the original terms in 2010 (06 Civ. 13084, 21 January 2009).

## C How can litigation occur in equilibrium?

Why do we observe litigation at all, when governments can anticipate "legal punishment" by creditors? One reason why litigation can occur in equilibrium is that governments can only make a single take-it-or-leave it offer to all creditors at the same time. If there is heterogeneity among the creditors, some of them will find it optimal to go to court, while others will accept the restructuring. This section gives a simple formulation of our argument, inspired by the frameworks in Cooter and Rubinfeld (1989); Spier (2007); Bolton and Jeanne (2007); and Bolton and Jeanne (2009).

Suppose a government owes an aggregate debt of $D$. For some exogenous reason, e.g. a negative income shock, the government defaults and needs to restructure its debt, which implies an exchange offer to reduce the outstanding debt by a haircut $h \in [0,1]$ to $(1-h)D$. Crucially, the government can only make *one unique* offer $h$ to *all* creditors, and not discriminate among them by offering individual haircuts.

The government proposes the haircut to $n$ distinct creditors. After receiving the offer, creditors have a choice: they can either accept the haircut or they can reject it and try to recover the full claim by legal means. Litigating involves legal costs, which differ across creditors. For instance, highly specialized distressed investors might have more experience in suing debtor governments and in locating attachable assets, and thus face lower costs of rejecting the offer. The individual litigation cost is defined as $c_i \in [\underline{c}, \bar{c}]$. $f(c)$ and $F(c)$ describe the density and cumulative distribution functions of $c$, respectively, and creditors are denoted by subscript $i$. Every creditor holds an identical part of the aggregate debt $d = D/n$.

Accepting the restructuring offer lowers the claim of individual creditors to the recovery value $(1-h)d$, which will be paid out for sure. Rejecting the offer means litigating against the government for full repayment. A lawsuit succeeds with probability $p \in [0,1]$ to return the full claim $d$. If the lawsuit fails, the creditor receives nothing, which occurs with probability $(1-p)$. Independently of the lawsuit's outcome, creditors have to pay the litigation cost proportional to their claims, $c_i d$. A creditor thus only goes to court if

$$pd - c_i d \geq (1-h)d \tag{3.4}$$

Conditional on $h$ and $p$, there can be a creditor for which equation (3.4) holds with equality. This marginal creditor, $i^*$, is indifferent between litigating and accepting the haircut so that:

$$c_i^* = p - (1-h) \tag{3.5}$$

The intuition is that for this marginal creditor, the probability of winning has to exactly offset the loss from accepting the offer, in order to induce him to be indifferent between his two options.

In case $c_i^* < \underline{c}$, it is not optimal for any existing creditor to file suit, resulting in full participation. However, if there is a $c_i^* \geq \underline{c}$ such that equation (3.5) is fulfilled, there will also be a non-negative share of litigating creditors. This creditor group, with costs smaller than the marginal creditor $i^*$, is equal to $Prob(c_i \leq c_i^*) = F(c_i^*) \equiv \phi$. Put differently, $\phi$ is the share of creditors that will reject the restructuring offer and litigate instead, while $(1-\phi) = Prob(c_i > c_i^*)$ is the share of creditors that accept the haircut.

Litigation is not only costly for creditors, but also inflicts a cost on the government. Besides legal fees, these might result from losing access to international capital markets, delay in crisis resolution, or as a result of asset seizures abroad (see main paper). The

government incorporates these costs $c_g$ as well as the creditors' reaction when choosing the optimal haircut to offer its creditors. Its objective is given by maximizing the available resources:

$$\begin{aligned}\max_h \; y - D\Big( \underbrace{\int_{\underline{c}}^{c_i^*} f(c)p \, \mathrm{dc}}_{\substack{\text{Repayment} \\ \text{to holdouts}}} - \underbrace{\int_{\underline{c}}^{c_i^*} f(c)c_g \, \mathrm{dc}}_{\substack{\text{Gov't cost} \\ \text{of litigation}}} - \underbrace{\int_{c_i^*}^{\bar{c}} f(c)(1-h) \, \mathrm{dc}}_{\substack{\text{Repayment to} \\ \text{participants}}} \Big) \\ = y - D\left(\phi(p + c_g) - (1-\phi)(1-h)\right) \end{aligned} \tag{3.6}$$

where $y$ denotes the government's exogenous income. The second term in equation (3.6) represents the combined expected repayments resulting from litigating creditors (consisting of the probability of full repayment plus the litigation expenses) and participating creditors (who accept the haircut).

The cost from litigating creditors is unanimously increasing in the haircut $h$. This is the result of an increase in the share of holdout creditors $\phi$ if the offer becomes less attractive. Here, the government wants to *decrease* $h$, in order to avoid spending money on repaying an increasing share of holdouts.

The cost from repaying participating creditors is characterized by two opposing effects: on the one hand, the government wants to *increase* $h$ in order to maximize its "savings" from repaying less to the participating creditors. But on the other hand, an increase in $h$ will also decrease the share of creditors who accept the haircut $\phi$, and thus reduce the share of debt to which the restructuring terms can be applied.

Solving a parametrized version of this problem for the optimal haircut $h$ allows interior solutions in which a non-negative share of creditors litigate in equilibrium.

# Chapter 4

# Coordination Problems in Sovereign Debt Restructurings: Holdouts and Litigation in Argentina[1]

The 2001/02 Argentine default and the resulting "rush to the courthouse" by some creditors have triggered many calls for a fundamental reform of the international financial architecture. I argue that the decisions about participating in a restructuring offer and litigating for full repayment need to be analyzed separately, thus requiring more careful policy prescriptions. A newly coded dataset of participation and litigation rates in the Argentine 2005 restructuring reveals two stylized facts: (i) holdout rates were particularly high in securities targeted at retail investors (ii) litigation efforts were strongly concentrated on a small set of specialized investors. Only 12 plaintiffs held more than 70% of the litigated debt, and focused on securities sold mostly to institutional investors. I explain these findings with a simple model of heterogeneous speculation in distressed markets and provide empirical evidence consistent with its predictions. These findings have implications for the design of government bonds by debt managers.

*Keywords: Sovereign default; Argentina; Litigation; Creditor coordination*

*JEL classification: F34, K12, H63*

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*We note that Argentina has made many contributions to the law of foreign insolvency through its numerous defaults on its sovereign obligations, as well as through what we might term a diplomacy of default.*

EM Ltd. v. Republic of Argentina, 473 F.3d 463 (2d Cir.)

## 4.1 Introduction

The Republic of Argentina has a long history of defaults on its public financial liabilities. Reinhart and Rogoff (2009) count seven separate incidents of external default between 1827 and 2002. On July 30, 2014, the eighth addition to this inglorious list arrived – provoked by a failure to comply with judgments in lawsuits related to its previous default in 2001/02. While the Second Circuit Court of Appeals acknowledged the already significant implications of previous legal battles with creditors for the law of public debt and sovereign insolvency,[2] the "massive litigation" (Shleifer, 2003) that followed the country's 2001/02 default proved to be exceptional even by Argentina's standards. The "diplomacy of default" between Argentina and its creditors at times looked just shy of legal warfare, when creditors seized the nation's warships in foreign ports, and the president claimed that the suing bondholders were seeking "financial world domination, forcing people to their knees" and committing "economic terrorism" on her country.[3]

Creditor coordination problems have been at the core of many recent policy discussions on reforming the international framework for sovereign debt restucturings (Gianviti et al., 2010; UNCTAD, 2012; Mody, 2013; Buchheit et al., 2013; Fuest et al., 2014; Pâris and Wyplosz, 2014). While some observers have argued that creditor coordination is less problematic than commmonly thought and participation rates in debt restructurings have generally been very high (Bi et al., 2011; Moody's, 2013), recent empirical evidence shows that investor litigation has been on the rise (Schumacher et al., 2014a,b).

These seemingly contradictory findings may partially be explained by the fact that rejecting a sovereign debt restructuring offer and litigating for full repayment are distinct decisions. In Argentina, the legal actions of the most aggressive creditors are hardly representative of those 24% of all creditors who did not accept the initial debt exchange offer in 2005. Most holdout creditors did not engage in litigation, but were betting on a better deal from subsequent negotiations with Argentina out of court. On the other hand, some investors who bought Argentine bonds immediately filed suit without waiting for negotiations to come under way. The decisions to hold out and to litigate were driven by

[2]Most notably the case *Weltover v. Republic of Argentina*, in which issuing sovereign debt on US capital markets was recognized as a commercial activity under the Foreign Sovereign Immunities Act (FSIA). Even broader than this, the mere denomination of defaulted debt in USD was argued to be sufficient to grant US courts jurisdiction over foreign governments.

[3]"Está claro que se está convalidando una forma de dominación mundial financiera de derivados para arrodillar a los pueblos", own translation from Cristina Fernández de Kirchner's speech, 16 June 2014, available at http://www.presidencia.gob.ar/discursos/27626-mensaje-por-cadena-nacional-palabras-de-la-presidenta-de-la-nacion; and "[t]hose 'vulture funds' [amount] to economic terrorism", speech at the 68th UN General Assembly, available at http://www.un.org/en/ga/69/meetings/gadebate/24sep/argentina.shtml.

different factors, but are likely confused in the public debate.

This paper makes two main contributions. It first aims at providing a more objective and quantitative perspective on the conflict between Argentina and its creditors. I provide a unique new dataset of the bond-by-bond participation and litigation rates related to Argentina's exchange offers. Two main stylized facts emerge from the data. First, participation was especially low in securities that were targeted at retail investors. Using different bond characteristics to distinguish between "retail" and "professional" bonds, I find that participation in the retail bonds was on average 72.1%, while 82.9% of the professional bonds were tendered on average (difference significant at 1% level). Second, the data reveal that only a small subset of investors was responsible for the overwhelming majority of the lawsuits. Only 12 investors held more than 70% of the litigated bonds, and focused on only 12 securities (out of 145 restructured bonds).

The second contribution is to provide a more general understanding of the determinants of holdouts and litigation. Debt managers need to find an optimal trade-off between minimizing borrowing costs by yielding attractive creditor rights as well as appealing to different investor groups on the one hand, against safe-guarding debt instruments against coordination problems in case of defaults on the other. The empirical evidence from Argentina suggests that bonds tailored to the demands of retail investors were more likely to see low participation rates, but were less likely to be litigated. Bonds marketed to professional investors, and those governed by US and English law, had higher participation rates, but also a higher probability of being subject to holdout litigation. Beyond the empirical evidence, I rationalize these findings in a simple model of heterogeneous speculation in distressed sovereign debt markets. Extending the framework in Schumacher et al. (2014b) by a dimension of heterogeneous beliefs as, for instance, in Kandel and Pearson (1995) or Harris and Raviv (1993),[4] I show that especially less sophisticated (or very optimistic investors) would have been induced to hold out from a debt exchange offer. This is true even if they would not want to litigate against the government in case they do not receive a better offer. Investors with a more realistic valuation, on the other hand, are less likely to hold-out, since they are better at anticipating the outcome of future negotiations. But conditional on having refused the initial offer, they are more likely to file a lawsuit.

Keeping in mind the limitations of a case study approach, these results can have implications for the design of sovereign bonds and public debt management. While targeting the sale of government debt to retail investors may open up additional sources of funding, these bonds might be harder to coordinate into a restructuring. This finding may be especially relevant for future debt restructurings in the Eurozone, in which many governments have marketed their bonds specifically to retail investors.

[4]See Hong and Stein (2007) for a survey.

**Related literature** A considerable theoretical literature has analyzed the creditor coordination problem in sovereign debt restructurings.[5] Miller and Zhang (2000) argue that mandatory payment moratoria should be imposed in the case of liquidity crises. Ghosal and Miller (2003), Weinschelbaum and Wynne (2005), Haldane et al. (2005), and Lanau (2011) analyze the effects of contractual innovations (specifically *collective action clauses*, CACs) and statutory solutions (insolvency regimes) to minimize coordination problems. Engelen and Lambsdorff (2009) tailor their model to the Argentine restructuring's characteristics and analyze the effects of a most-favored creditor clause and a significant "sweetener" (GDP-linked warrants). Bi et al. (2011) argue that the use of exit consents and minimum participation constraints should suffice to eliminate coordination problems in most circumstances, making the use of CACs unnecessary. In an elaborate model of strategic delay, Pitchford and Wright (2012) argue that CACs can even aggravate coordination failures. The papers by Bolton and Jeanne (2007, 2009), taking into account the *ex ante* incentives of coordination problems, find that excessively "hard-to-restructure" debt may be counter-productive and that a statutory insolvency regime could improve welfare. This stands in contrast to the policy papers by Dooley (2000) and Shleifer (2003) who argue that coordination problems are a necessary default penalty in sovereign debt markets. In the toy model in Schumacher et al. (2014b), this default penalty leads governments to impose lower losses on creditors, even though some creditors may not be prevented from holding out. However, none of these papers makes a distinction between creditors holding out, and litigating for full repayment. This paper contributes a small model in which creditors take these decisions separately and sequentially.

In contrast to this rich theoretical literature, empirical evidence on the topic is scarce. Schumacher et al. (2014a) show that creditor litigation has risen significantly since the 1980s, but do not distinguish between participation and litigation. They find that while the frequency of litigation has significantly increased, the involved amounts are still relatively small – on average, legal disputes accounted for only about 3% of restructured debt in the 2000s. More empirical evidence exists in the corporate finance literature. A fundamental difference to sovereign debt restructurings is that companies in many jurisdictions have the option to restructure their debt under orderly bankruptcy proceedings, such as Chapter 11 in the US. In these instances, a stay on creditor litigation is imposed and workouts become binding, effectively eliminating coordination problems. But bankruptcy proceedings can be costly, and companies frequently offer voluntary debt exchanges instead, with similar incentives for participating or holding out as in the sovereign context. Asquith et al. (1994) find that the capital structure of companies is an important determinant of the choice between bankruptcy and exchange offers, and that the presence of large bondholders and the legal subordination of holdouts increases the chances of a successful exchange. Further factors increasing the risk of holdouts are presented by Gilson et al. (1990) who show that holdout problems are less severe if

[5] General analyses of the problem can be found in Grossman and Hart (1980), Gertner and Scharfstein (1991), and Detragiache and Garella (1996).

the creditor structure contains more banks, and a lower number of separate securities, while Chatterjee et al. (1995) find that holdout problems are less severe in buyback offers, compared to debt exchanges. Daniels and Ramirez (2007), in a sample of more than 2,000 voluntary debt exchanges by US firms between 1986-97, provide evidence that restructurings with a high risk of holdouts are more likely to be designed with legally coercive elements such as exit consents. This paper is the first to offer a systematic empirical assessment of the holdout and litigation decisions in the context of one of the largest sovereign debt restructurings in history.

Finally, Argentina is one of the most widely used cases in models of sovereign default. Among many others, Arellano (2008), Mendoza and Yue (2012), Sandleris and Wright (2014), and Asonuma and Trebesch (2014) use Argentine macroeconomic data to calibrate their models. While macroeconomic data is publicly accessible, little systematic data has been available on the also widely researched creditor coordination problem. This paper fills a gap in documenting investor decisions on a granular level for one of the most widely-researched government debt restructurings.

## 4.2 Background: default and restructuring offers[6]

### 4.2.1 The financial crisis and default

How did Argentina become a "uniquely recalcitrant debtor" (*NML Capital v. Argentina*, 12-105, 2nd Circ.), mired in decade-long litigation across the world? For much of the 1990s, Argentina was seen as an exemplary success story of financial globalization. The country had emerged from the Latin American debt crisis of the 1980s with two major policy initiatives. First, it introduced a fixed exchange rate of the Argentine Peso (ARS) to the USD at a rate of 1:1 in 1991. This rigid currency peg, a monetary policy turned into public legislation with the "convertibility law", helped to persistently bring down inflation rates to single-digit levels. Second, it negotiated a 33% reduction of its USD 28bn external debt (in net present value terms) under the Brady initiative in April 1993 (Cruces and Trebesch, 2013). These successful financial policies, coupled with a set of economic liberalization policies, helped Argentina to sustain high economic growth for a large part of the 1990s. The average annual GDP growth rate amounted to 5.9% between 1991-1998 (see Figure 4.1).

The country's fiscal policy, however, was marked by an average overall deficit of 2.5% even in this expansionary period. The debt/GDP ratio moved back to the level from before the sweeping debt restructuring of 1993.[7] Much of the public deficit was bridged

[6]For the summary of the Argentine crisis, this section relies on the detailed case descriptions in Hausman and Velasco (2003); Independent Evaluation Office (2004); Blustein (2006), and Sturzenegger and Zettelmeyer (2006). All macroeconomic data are from the IMF World Economic Outlook database, except where otherwise noted.

[7]It should be noted that the increase was also partially caused by judicial decisions increasing the government liabilities to pensioners (Blustein, 2006, p. 47-49).

by borrowing in foreign currencies, turning Argentina into the largest emerging market borrower by issue volume.

Figure 4.2 shows the issuance of the more than USD 90bn foreign bonds that eventually ended up in default after 2001. Except for a brief period around the Mexican currency crisis ("Tequila crisis") in December 1994, Argentina continuously issued foreign bonds, mostly at favorable conditions: the spread over US treasuries was below a "critical" level of 1,000bps (Pescatori and Sy, 2007) until the end of 2000, despite the fact that early signs of a looming crisis had become evident in the late 1990s. Growth slowed down, and the financial crises in Asia and Russia of 1997-98 increased investors' awareness of the risks in emerging economies' debt markets (Dell'Ariccia et al., 2006).

In February 1998, Argentina acknowledged this risk by entering a precautionary credit line in form of an Extended Fund Facility with the IMF (worth USD 2.8bn). But the recession continued and, in light of the worsening fiscal position, default could only be averted through additional borrowing at increasingly punitive rates (see Figure 4.2), and a significant IMF Standby Arrangement worth USD 22.8bn.[8]

The government implemented various "voluntary" debt exchanges and further financially repressive policies in the second half of 2001 to avoid default. But the IMF refused to transfer a scheduled loan disbursal in December over the failure to achieve sufficient policy progress under the program's conditionality. In light of increasing social unrest, including the deaths of numerous protesters, Argentina announced a unilateral moratorium on its sovereign debt on 24 December. The first missed payment was a coupon due in January 2002, and the USD/ARS exchange rate was floated shortly after.

### 4.2.2 Restructuring offers and creditor participation

The restructuring negotiations between the Argentine government and its private creditors turned out exceptionally harsh. Enderlein et al. (2012), who measure the "coerciveness" of sovereign debt renegotiations, find that Argentina was the most aggressive debtor of 31 defaulting countries between 1980 and 2010. Negotiations did not start until March 2003 (Sturzenegger and Zettelmeyer, 2006), and the terms of the first, informal bond exchange offer (presented at the World Economic Forum in Dubai) proposed a net present value reduction (NPV) of 90% (Hornbeck, 2004, p. 7). While the final offer, published in November 2004, had more creditor-friendly terms, the average NPV haircut for investors was still estimated at between 71-77% (Sturzenegger and Zettelmeyer, 2006; Cruces and Trebesch, 2013).

The submission period for tendering bonds into the proposed exchange was scheduled from 14 January through 25 February 2005. The implementation of the exchange, originally set for 1 April, was delayed until 10 June (IMF, 2005): NML Capital, a hedge fund that had already initiated legal proceedings against Argentina and obtained a

[8]The SBA for Argentina, agreed in March 2000 and increased in January 2001, marked one of the IMF's largest exposure to a single country, on par with the programs for Turkey and Brazil during the 2000s. The largest IMF programme to date is the USD 40.4bn package to Greece, decided in May 2010.

judgment, tried to attach the bonds that participating creditors had delivered to Bank of New York, the bank serving as exchange agent for the offer, in order to receive the exchange bonds (*NML Capital v. Rep. of Argentina*, SDNY, 03 Civ. 8845, order signed 21 March 2005). NML's attachment attempts were subsequently overturned in the same district court and the vacatur confirmed on appeal (*EM & NML Capital v. Republic of Argentina*, 131 Fed. Appx. 745; 2nd Circ., 05 Civ. 1525), so that the exchange could be completed with three months delay.

An important legal feature of the debt exchange was that it explicitly promised to make any future offers available to *all* creditors if they contained better terms than the 2005 deal. This promise, valid until 31 December 2014, should increase the incentives to participate in the first offer ("rights upon future offers", or RUFO, clause).[9] Furthermore, domestic legislation was passed to bind future governments to the non-negotiation stance, the so-called "Lock law" (Hornbeck, 2013). Combined, these measures should reassure creditors that they could not be better off by rejecting the offer. Nevertheless, the aggregate participation rate amounted to only 76.2% (Sturzenegger and Zettelmeyer, 2006, p. 192).

In 2010, Argentina did indeed make a second offer to the remaining holdout-creditors, to further decrease the amount of outstanding debt in default. However, the offer came with the identical terms as in 2005. This ensured that neither the RUFO clause in the exchange bonds, nor the "Lock law" were violated. A significant share of the holdout creditors accepted the second offer, bringing the overall participation rate to more than 92.6%; but even with this combined figure, the Argentine exchanges achieved one of the lowest participation rates in bond restructurings since 1997 (Moody's, 2013, p. 9).

## 4.3 The ensuing litigation: Data and descriptive statistics

The following section presents a new micro-level dataset on the Argentine debt restructuring process. The two main variables of interest are the bond-by-bond participation and litigation rates. All data were coded from two main primary sources: the appendices to the offer memoranda of the 2005 and 2010 exchange offer, and the complaints filed by creditors litigating in the US Federal District Court for the Southern District of New York (SDNY).

The sample of bonds includes 145 distinct securities.[10] Of these, 16 bonds were completely tendered into the exchange offer, meaning that no principal was outstanding in 2010. Table 4.4 provides the list of bonds included in the analysis.

[9] While not common under New York law, similar provisions had come up in some of the Brady exchanges in the 1990s (e.g. in Poland, see Buchheit, 2002). More recently, Belize included similar "Most Favored Creditor" clauses in its debt restructurings in 2007 and 2013 (Government of Belize, 2006, 2013, p. 11, 12).

[10] From the 315 eligible securities registered with an ISIN that are listed in the restructuring offers, I exclude 170 "exotic" instruments. The vast majority of these dropped securities (156) are stripped coupons and stripped amortization payments, where I only keep the "mother" bond in my sample to avoid double-counting. The remainder are securities for which no information is available on Bloomberg or Datastream.

46% of the bonds were denominated in USD, and 24% in EUR; the remaining bonds were issued in JPY, GBP, CHF, and pre-Euro national currencies. 90 bonds had fixed coupons, 40 bonds had floating rates, and 14 were zero coupon bonds. The average principal per bond eligible for tender in the exchange offer was USD 650m. The earliest maturity dates affected by the default had been bonds due in February 2002, and the longest-running defaulted bonds had an original maturity date in June 2031. 47 of the defaulted bonds were placed under the laws of the State of New York, 34 under English law, 28 under Argentine law, and the remainder under German, Japanese, Italian, Swiss, Luxembourg, or Spanish law.

One reason for this large variance in structure and currency is the government's aim to reach different investor groups. In particular, the Argentine government designed a subset of their bonds with the explicit intent to broaden their creditor structure by appealing to retail investors (Blustein, 2006, p. 74). The bonds can be categorized into "retail" and "professional" bonds using two different definitions: first, if the bonds are denominated in currencies other than USD *and* have a fixed rate coupon; and second, if the bonds are denominated in currencies other than USD *and* the minimum denomination unit is USD 10,000 or less. The rationale behind the first retail indicator is that fixed coupon bonds sold in currencies such as JPY, EUR, or CHF were particularly attractive for investors who wanted to achieve relatively high yields while at the same time limiting exchange rate and interest rate risk. The indicator based on the minimum denomination unit captures the fact that bonds with low minimum investment amounts allowed retail creditors to invest in Argentine bonds even with relatively small amounts. Since I could only gather data on the minimum denomination units on a subset of the full sample of bonds from Bloomberg, and not from primary documents (bond prospectuses or exchange offers), I use the currency and coupon based retail indicator as the benchmark definition unless otherwise noted (all results are very similar using either definition).

**Participation** The 2005 holdout rates for each bond could be imputed from the fact that the first exchange offer of 2005 was re-opened in 2010. Each of these two offer documents contains a detailed list of eligible securities, including data on the outstanding eligible principal amounts ($EA$) before the respective offers opened. By definition, the outstanding amount eligible for the 2010 offer ($EA_{2010}$) must reflect the face value of the bonds not tendered into the 2005 exchange. The non-participation rate for each bond in the initial 2005 offer can thus be computed as $EA_{2010}/EA_{2005}$. Further data on bond characteristics, such as the currency denomination, maturity, and coupon rates were also coded from the exchange offers.[11]

The median non-participation (holdout) rate by bond was 16.2% (mean 21.9%), and 62 bonds had hold-out rates exceeding 25%. This implies that even if these bonds had contained standard non-aggregation collective action clauses, the participation rate

[11] A cross-check with Bloomberg reveals a significant degree of errors, especially with respect to coupon rates for floating-rate instruments and some maturity dates.

would not have cleared the often-used voting threshold of 75% needed to wipe out the claims of any non-participating creditors. While data on recent bond exchanges has indicated that aggregate participation rates were high enough to clear typical voting thresholds in collective action clauses (Moody's, 2013), some observers have already noted that lower instrument-specific participation rates could still endanger the successful implementation of an exchange (Gelpern and Gulati, 2013; Zettelmeyer et al., 2013). The data for Argentina clearly supports this view. Assuming the observed participation rates, the overall participation rate under the standard CACs with bond-by-bond voting and a 75% threshold would have reached only 83% (see Figure 4.3). Under a two-limb voting procedure, with a bond-specific 50% threshold and an aggregate majority of 66 2/3%, a significantly higher share of more than 98% could have been restructured. Finally, a voting procedure with a required 75% majority on aggregate would have been sufficient to wipe out the claims of all holdout creditors. This is what the IMF (2014) and the International Capital Markets Association (2014) have suggested as standard clauses for future bond documentation.

Participation was significantly lower in retail bonds than in professional bonds. The average hold-out rate in retail bonds of 27.9% compares to 17.1% for professional bonds; the difference is even more pronounced when comparing median values (32.7% to 10.9%) This skew suggests that while the holdout rate among professional investors was concentrated on a few bonds, it was a much more widely distributed phenomenon among retail investors.

**Litigation** The litigation rates were coded from a collection of all cases filed in the SDNY between 1 January 2002, and 31 July 2014. All cases were obtained by searching the Public Access to Electronic Court Records (PACER) database for cases in which the Republic of Argentina or the provinces of Mendoza and Buenos Aires were named as defendants. For each of the 182 distinct actions such identified, I coded the initial complaint of the plaintiff, containing the creditor's claim, and the docket history which summarizes the progress of each case. Table 4.3 lists the plaintiffs, their claims, and the date they filed suit. A complaint in US litigation must contain the *cause* of the action – in this case, the precise security which was not serviced as promised – and the *damage* to the creditor, reflecting his principal investment.[12] This allows matching creditor-specific bond holdings to the bond-specific participation rates as described above.

I focus on the SDNY since it has been the predominant venue for Argentine sovereign debt litigation. Importantly, *any* defaulted Argentine bond could be litigated in the SDNY, also those issued in currencies other than the USD, or not governed by US law. Argentina's broad submission to foreign courts contained in the documents describing the defaulted bonds has been interpreted as granting US courts jurisdiction over the default even if they are not explicitly named as the appropriate venue.[13] A number of lawsuits

[12]Figure A1 in the appendix shows an example of a complaint.

[13]This decision itself was subject to litigation, but eventually affirmed by the US Court of Appeals for the

were in fact filed in other jurisdictions, including Germany, Italy, Japan, France, Belgium, Switzerland, Luxemburg, and Argentina (Securities and Exchange Commission, 2011). The only jurisdiction of these in which notable volumes were litigated was Germany, but even there the total principal under litigation was only USD 0.23bn (about 6.5% of the litigation sum in the US). Since the data quality in these jurisdictions is considerably less detailed, I only consider cases filed in the SDNY.

The data reveal a number of noteworthy stylized facts (see Table 4.1 for summary statistics):

- **Case numbers and creditor type:** Some creditors filed multiple suits, and some suits were filed by multiple creditors. There were 137 unique first-named plaintiffs, and 101 cases were filed by more than one creditor. 59 cases were filed by retail investors only, 90 cases by institutional investors (banks, hedge funds, or companies), and 26 cases by a mix of retail and institutional investors.

- **Plaintiffs:** Table 4.2 shows the largest litigating creditors, ordered by the sum of face value of all claims in their lawsuits. It shows a strong concentration on a small group of creditors: 12 investors brought more than 70% of all litigated claims. The single largest plaintiff by claim is NML Capital, with more than USD 600m, the same firm forcing Argentina into renewed default in 2014 by bringing the *pari passu* argument to court (SDNY 08 Civ. 6978, 09 Civ. 1707, and 09 Civ. 1708).

- **Volumes:** The average case volume is USD 23m, with a considerable variation and skew. The median case volume is just USD 5.3m, and 24 cases claimed a principal in excess of USD 50m. Pure retail cases had an average volume of just USD 6.1m, with the smallest claims coming from German and Italian retail investors litigating for USD 30-80,000. Institutional investors filed significantly larger claims of USD 37.3m on average. Aggregating these values confirms that the bulk of litigation came from institutional investors: bonds worth USD 2.87bn were brought to court by hedge funds and banks (83.7% of total), as opposed to USD 290m by retailers (8.5%), with the remaining 7.8% claimed in cases by a combination of the two (see also Figure 4.4).

- **Litigation rates:** The mean litigation rate per bond, defined as $\frac{\text{Volume litigated}}{\text{Original principal}}$, is 3.6%. But only about one third of all bonds were litigated at all (47 out of 145), meaning that the median bond had no litigation at all. Five bonds bonds stand out with very high litigation rates exceeding 25% of face value; all three of which are classified as bonds targeted at professional investors. On average, a lawsuit dealt with 4.1 different bonds. Institutional investors focused on slightly less securities, on average 3.2 bonds per action; the largest number of different bonds (7.8) was brought in cases litigated by both creditor types.

Second Circuit: "Section 13(4) of the offering circulars [...] clearly and unambiguously waives Argentina's 'immunity (sovereign or otherwise)' in '*any* court."' *Capital Ventures Int'l v. Republic of Argentina*, 552 F.3d 289, at 291 (2nd Circ., 07 Civ. 1551), emphasis in the original document.

- **Time of filing and duration:** The first case was filed on 6 March 2002, only 10 weeks after the government had declared the moratorium on its external debt. However, an early "rush to the courthouse" could not be observed: The vast majority of cases (78%) was filed only after the publication of the final exchange offer on 1 November 2004 (see Figure 4.5). Only 6% of all cases were brought to court before the government had published their first offer, known as the "Dubai proposal" in September 2003. The average duration of cases (as of July 31, 2014) was 3.3 years, with no significant differences between the different creditor types.

- **Outcome:** 67% of cases had been awarded a judgment by the end of the sample period. 45 cases (26%) were still pending, and 6% had either been abandoned or been voluntarily dismissed by the plaintiff. Only two cases were outright dismissed, both on jurisdictional grounds and not led against the central government, but against the Province of Mendoza, and the public energy provider Energia Argentina.

- **Law firms:** 30 different law firms (and individual lawyers) acted as litigators on behalf of the creditors; on Argentina's side, all cases were defended by Cleary Gottlieb Steen & Hamilton LLP. 5 law firms in particular shared about two thirds of the creditor mandates between them: almost exclusively on behalf of institutional creditors acted Hughes Hubbard & Reed LLP (representing the hedge funds GMO, Gramercy, and Greylock, as well as the French bank BNP Paribas); Dechert LLP (representing NML Capital, a subsidiary of Elliott Management, and EM, related to the Dart family); and Paul Weiss LLP (for Aurelius Capital). For retail investors, Dreier LLP and the independent attorney Guillermo Ariel Gleizer represented the plaintiffs in 69% of the cases involving at least one retail investor.[14]

How do the participation rates compare to litigation rates? Figure 4.6 visualizes the participation and litigation rates for all restructured bonds that had a positive amount of litigation, ordered by hold-out rates. The graph shows a significant variation in creditor decision making: few bonds had very high litigation and non-participation rates; others had high hold-out rates, but saw only very little litigation; finally, some bonds had relatively few hold-outs, but many of them went to court. The descriptive data thus reveal a considerable variation in the *participation* and *litigation* decisions between the different bonds and creditor types. While bonds targeted at retail investors had high hold-out rates, on average exceeding 25% of face value, the litigation rates were very low, at only 0.6%. On the other hand, bonds that were specifically targeted at institutional investors had significantly higher participation rates of about 83%; but also much higher litigation rates, on average 6.2% of face value. The following section uses a more systematic approach to uncover empirical regularities with respect to the participation and litigation decisions.

[14]Dreier LLP was a New York based law firm that was liquidated after its founder Marc Dreier was sentenced to 20 years in prison over financial fraud ("Argentina Debt War Lawyers Spend Decade Before Judge", Bloomberg, 19 December 2012.

## 4.4 Empirical evidence

What explains this variation in hold-out and litigation rates across debt securities? In a first step, I employ an agnostic approach and add bond-specific features to a cross-sectional regression model of the variables of interest:

$$y_i = \alpha + \beta_1 \text{Retail}_i + \beta_2 \text{Exchange}_i + \beta_3 \text{Brady}_i + \beta_4 \text{Coupon}_i + \beta_5 \text{Principal}_i + \beta_6 \text{Maturity}_i + \beta_7 \text{NY law}_i + \beta_8 \text{English law}_i + \epsilon_i \quad (4.1)$$

where $y_i$ represents the outcome variables: the hold-out rate, the litigation rate, or the ratio of the litigation rate to holdout rate (from now called *litigation ratio*), each per bond. The $\beta$s represent the coefficients of interest. "Retail" denotes the binary retail bond indicator as explained above. "Exchange" denotes if a bond was listed on an exchange or traded on private markets only. "Brady" bonds were the securities issued as part of the country's previous 1993 restructuring, whose principal was backed by collateral.[15] "Coupon" represents the coupon rate; for floating rate notes, I use the average rate until the closing of the exchange on 10 June 2005. "Principal" and "Maturity" denote the face value (in USD million) and time to maturity at the date of the exchange (note that this value can be negative for bonds that had an original maturity date between the default in 2002 and the exchange in 2005). "NY law" and "English law" are indicator variables denoting if the bond was issued under the laws of New York (32% of bonds) or England (23%). This leaves the bonds issued under the laws of "other" countries as the benchmark category against which the coefficients should be interpreted (44%), including the laws of Argentina, Germany, Japan, Italy, Switzerland, Luxembourg, and Spain.

For simplicity in a first step, I estimate the coefficients in equation (4.1) by OLS, computing Hubert-White standard errors for inference. However, since the dependent variables represent a fraction (hold-out and litigation rate per face value, and litigation rate per hold-out rate) and are thus bounded between 0 and 1, a linear model may not provide the best fit to the data. Following Papke and Wooldridge (1996), I therefore also estimate the benchmark model in a generalized linear model with a probit link function (I report average marginal effects in the tables for easier interpretation).

Table 4.6 shows results for the correlation of bond characteristics with hold-out rates. As already seen in the descriptive statistics, retail bonds had significantly lower participation rates, of about 11 percentage points (column 1). Likewise, exchange listed securities had about 11% higher holdout rates (column 2). Brady bonds, on the other hand, had a significantly higher participation rate (column 3). This is possibly due to the collateral attached to these bonds, which implied a higher recovery value independent of the restructuring. While the retail indicator alone already explains about 8% in the variation of holdout rates, standard bond characteristics including time to maturity,

[15] The bonds offered in exchange for defaulted bank debt had a (reduced) principal that was fully collateralized with US treasuries, see Sturzenegger and Zettelmeyer (2006) or Rieffel (2003).

coupon rate, and outstanding principal are virtually orthogonal to the participation rates (column 4). Similarly, taken at face value, the governing law of the bond did not play a role for the participation decision. Bonds governed by New York and English law, the two predominant places for legal sovereign debt enforcement, do not display a significantly higher holdout rate than those governed under miscellaneous other laws (column 5). However, this picture changes when controlling for all previously considered variables. Column (6) shows the results including all variables together as in equation (4.1). Bonds targeted at retail investors, listed on exchanges, and governed by US law were particularly likely to have low participation rates in the 2005 exchange. Brady bonds, on the other hand, saw relatively low levels of holdouts. Column (7) shows the results in a fractional response model (displayed are the average marginal effects). The results are quantitatively and qualitatively very similar to the OLS results, increasing the confidence in the simpler estimation technique.[16]

Table 4.7 presents the analogous results for litigation rates, expressed as the principal under litigation as a share of eligible principal in the 2005 restructuring. Column (1) presents a striking difference to the results for holdout rates: Retail bonds were significantly less likely to be litigated, on the order of ca. 6%. This implies that even though relatively more investors in these bonds rejected the proposal, they did not enter a "race to the courthouse"; on the contrary, unconditionally, these bonds were less likely to end up in court. This result is even starker in contrast to the other variables used, all of which show similar correlations as with respect to the participation decision. Exchange listed bonds were slightly more likely to be litigated (column 2), as were bonds governed by New York or English, relative to other law bonds (column 5). Brady bonds were considerably less often subject to legal actions. This finding also holds in the full model including all variables (column 6) and in the fractional response model (column 7), although the retail bond indicator does not make a significant difference here.

The results are similar when considering different types of creditors and time periods. Table 4.8 shows results from running the full model in different subsamples. Column (1) uses as the dependent variable the litigation rate accounting only for those cases filed by retail investors. It appears that for individual retail investors, the type of bond did not play a role in determining their litigation decision. This suggests that for the subset of retail investors filing suit, retail bonds were not especially sought after; if anything, the sign of the coefficient suggests that even litigating retail investors rather litigated based on bonds aimed at professional investors. Bonds that were closer to maturity at the time of restructuring, and governed by New York law, were more likely to be litigated. For institutional investors, retail bonds were signifcantly less attractive to be used for litigation (column 2). Furthermore, compared to retail investors, governing law played a much more important role for the litigation decision. The remaining estimates consider different time periods. Column (3) looks only at those cases filed prior to

[16]Note that while the main results are expressed in percent, the fractional model uses fractions, hence the coefficient magnitude is reduced by a factor of 100.

the completion of the restructuring in 2005. The model does not fit the data well in this period, suggesting that most of the pre-restructuring cases were filed with little systematic correlation with the bond characteristics. Column (4) presents evidence that the results were not driven by the new litigation instances since the October 2012 *pari passu* decision by the Second Circuit.

By definition, litigating a defaulted bond is conditional on not participating in the exchange. The results in Table 4.9 take this explicitly into account. The dependent variable in these models is the *litigation ratio*, defined as the litigation rate as a share of the holdout rate. The results are again strikingly different from the holdout rates. Retail bonds had about a 16% lower litigation ratio than other bonds (column 1). It is also worth noting that higher coupon rates, larger principals, and longer dated bonds displayed higher litigation-to-holdout ratios (column 4). The effects of the governing law on the litigation ratio, on the other hand, are consistent with the holdout rates reported in Table 4.6: the New York law governed bonds had also higher litigation ratios of about 27 percentage points, as compared to other governing laws; the comparable figure for English law bonds is a still significant 5.5 percentage point effect. The full model, reported in column (6), is mostly consistent with the individual variable regressions. Retail bonds had about a 6% lower litigation ratio. New York (English) law bonds showed a 16% (8%) higher litigation ratio. The model fit of 42% is quite considerable, especially given that it is estimated in a cross-sectional dataset. As before, the results are not dependent on the econometric model and are similar when estimated in a fractional response setting (column 7).

Looking at different subsets of lawsuit filings reveals comparable insights to the raw litigation rates (Table 4.10). Among cases filed by retail creditors (column 1), the types of bonds were not systematically differently distributed. Exchange listed bonds, for which presumably a more liquid secondary market for retail investors exists, were however slightly more likely to be litigated. New York law bonds also had a higher risk of being litigated by retail investors, although the effect is notably smaller than for institutional investors. This class of creditors (column 2), consistent with previous evidence, was significantly less likely to litigate on retail and Brady bonds. In line with the findings in the full sample, English and New York law bonds were particularly attractive for litigation by professional creditors. Generally, the model fit is much better for institutional investors (38%) than for retail investors (21%), suggesting that the litigation decision by retail investors was more noisy. Similarly, the lawsuits filed before the exchange offer in 2005 can be less well explained by the empirical model than the full sample (column 3), while excluding the post-*pari passu* time (column 4) does not change the main insights reported.

Tables 4.11 and 4.12 offer results from a range of further robustness checks. The models in Table 4.11 are equivalent to the benchmark equations in the previous tables, but use the minimum denomination unit-based indicator for retail bonds instead. All main results remain virtually equivalent.

Table 4.12 includes two additional variables. Column (1) uses an indicator if the respective bond was litigated by NML Capital, the single largest plaintiff, and changes the dependent variable to exclude all claims filed by NML. The coefficient indicates that bonds litigated by NML were also significantly more likely to be subject to other plaintiffs' legal actions. While the causality may run both ways, one possible interpretation is that other creditors exihibited free-riding on the spearheaded legal efforts by NML. Finally, column (2) shows results when controlling for the bond-specific haircut (using data from Sturzenegger and Zettelmeyer, 2005).[17] Since the "exchange menu" allowed investors only to choose between a range of bonds with two possible maturities (in 2033 or 2038), the net present value losses between different original bonds varied considerably, from 38% to more than 87%. The results in column (2) suggest for a one percentage point increase in the haircut, the litigation ratio increased by 1.3 percentage points. This is consistent with the evidence in Schumacher et al. (2014b), who find that haircuts are a significant predictor of litigation in a cross section of 176 debt restructurings.

Summarizing the stylized regressions establishes three main results. First, holdout and litigation decisions are systematically different. While retail bonds were especially likely to have high holdout rates, they were significantly less likely to be litigated. This suggests that some degree of heterogeneity exists between retail and professional investors with respect to the decisions to participate in a restructuring offer, and conditional on this decision to file a lawsuit.

Second, the empirical model explains particularly well the variation in the litigation ratio for institutional creditors. Using the model only on data on retail investors' decisions has a considerably lower explanatory power. The fact that there is more noise in the litigation ratios by retail investors may be evidence of a higher degree of uncertainty in their decision making.

Third, New York and English law bonds were especially likely to have high holdout rates, litigation rates, and litigation-to-holdout ratios. A possible explanation is that the probability of enforcement was higher for these type of bonds. While all bonds were eligible for litigation in the US, and especially in New York, legal questions about the enforceability of judgments in these jurisdictions remain.[18]

## 4.5 Theoretical framework

The following section develops a simple model to rationalize the above findings. The model relies on elements in Haldane et al. (2005) and Schumacher et al. (2014a,b) for the optimal creditor decision in defaulted sovereign debt markets, and on Kandel and Pearson (1995) for heterogeneous interpretation of uncertain signals about future payoffs.

[17] I thank Jeromin Zettelmeyer for kindly sharing this data. Note that the haircut data exist only for the subset of USD denominated bonds, which is why I cannot include the retail bond indicators in this specification.

[18] See the discussion *NML Capital v. Republic of Argentina*, SDNY 08 Civ. 6978, about the applicability of injunctions to European bondholders who do not receive their payments through US based clearing systems.

Intuitively, consider a market in which a government offers to exchange its bonds for new securities with a lower value. Creditors can either accept the offer and receive a certain payout, or hold out and wait for a revised offer. The government will certainly make a second proposal in the future, but the terms are unknown when the initial decision takes place. After the initial decision about participating in the first offer, the second "holdout" offer is revealed. The remaining holdout creditors who did not participate in the first offer now have the choice of either accepting the revised proposal, or going to court and file for their full original claim. There is a cost attached to litigating, but with a certain probability the full amount is recovered. Creditors who accepted the first offer do not have the chance to later try to receive their original claims by litigation, but they can reinvest their proceeds from the initial offer and receive interest. Figure 4.7 outlines the time-line of the model, which is solved by backwards induction.

### 4.5.1 Exogenous debt holdings

Formally, the model consists of a single sequence of three periods, $t = \{1, 2, 3\}$, where in the third period only the consumption of final accumulated wealth takes place. In $t = 1$, the government proposes its first offer. This would lower the individual claims to $1 - h_1$ for those investors who accept these terms.

There are $n$ creditors who display heterogeneity along two dimensions. The first source of heterogeneity is with respect to the legal costs of pursuing sovereign debt litigation in period 2. Every creditor draws a specific litigation cost $c_i$ from a uniform distribution bounded between 0 and 1, such that each $i$ uniquely identifies an investor on the cost dimension. Creditors differ with respect to their cost of litigation since legal challenges to sovereign debt exchanges are protracted and require expensive legal expertise, as shown by Schumacher et al. (2014a). Some investors may also be more experienced in conducting sovereign debt lawsuits and thus face lower legal costs than others.

Second, investors differ with respect to the precision of their expectations about the conditions of the second offer. All creditors know the government will return with a second "holdout" offer, but they cannot perfectly anticipate its terms. They know the distribution of $h_2$, which is uniformly distributed between 0 and 1. Furthermore, everyone observes a signal about the true future haircut $h_2$: $h_2^S = h_2 + \epsilon$, where $\epsilon$ is a measure of imprecision. While every creditor sees the same signal, they differ in its interpretation: as in Kandel and Pearson (1995), some investors are more sophisticated in the interpretation of the signal than others, which is reflected in $\epsilon \sim (\mu_i, \sigma_\epsilon)$, where $\mu_i \in [0, h_2^S]$. Creditors also know the distribution of the second offer. Hence, the expectation in period 1 about $h_2$ is given by:

$$E_1(h_2) = h_2^S - \mu_i \tag{4.2}$$

This implies that creditors with higher $\mu_i$ are less sophisticated in their expectations

about the future offer: They expect $h_2$ to be lower, and thus the recovery value to be higher, than more sophisticated creditors with a more realistic estimate in form of a lower $\mu_i$. Linking this to the empirical findings above, we may think about institutional investors as "sophisticated" creditors, with a $\mu_i$ closer to 0, as opposed to retail investors, who may have more uncertainty in estimating the future value of a defaulted bond.

In period $t = 2$, the government exchanges the bonds for the participating creditors, paying them $1 - h_1$ while holdout creditors receive nothing. It also reveals its revised "holdout" offer $h_2$. The holdout creditors can now decide whether they want to accept this second offer, or try to recover their full claim in court. The expected value of litigating, conditional on having held out in the first period, is given by $p - c_i$, where $p$ denotes the probability of winning the lawsuit and successfully enforcing it, and $c_i$ is the creditor-specific cost of going to court. Hence, creditors will go to court only if the second offer is sufficiently bad:

$$h_2 \geq 1 - p + c_i \tag{4.3}$$

If the second offer $h_2$ is sufficiently good (lower haircut, $h_2 < 1 - p + c_i$), they will accept the offer and not file a lawsuit. Hence, for any individual creditor, the probability of going to court in period 2 conditional on the realized second offer is given by $1 - Prob(h_2 < 1 - p + c_i) \equiv 1 - \varphi_i$. Even though creditors do not know the true $h_2$ in $t = 1$, they know the distribution of $h_2$. They can therefore anticipate the probability of the "cut-off" haircut after which they will go to court, conditional on their own individual litigation cost $c_i$. The game ends in period 3, when the government exchanges the bonds to the holdout creditors who want to participate in the second offer, paying them $1 - h_2$. The litigating creditors receive the expected returns of the lawsuits.

When deciding about participating or rejecting the initial offer, creditors need to compare the expected value of holding out and participating. The expected value of holding out as anticipated in period 1 is given by the weighted sum of litigating and accepting the revised offer:

$$V_i^H = (1 - \varphi_i)(p - c_i) + \varphi_i(1 - h_2) \tag{4.4}$$

Also in period 3, the creditors that participated in period 1 receive the interest $r \sim (\mu_r, \sigma_r)$ on their re-investments, which determines the value of accepting the offer in period 1:

$$V_i^P = (1 - h_1)(1 + r) \tag{4.5}$$

All creditors compare $E_1(V_i^H)$ to $E_1(V_i^P)$ in the first period to decide whether to hold out or to participate in the initial offer. Solving this comparison for the marginal creditor $c_i^*$ who is indifferent between accepting or rejecting $h_1$, defines the share of creditors who

hold out and wait for the revelation of $h_2$:

$$\Gamma(p, h_1, h_2^S, r, \mu_i) \equiv \int_0^{c_i^*} f(c_i) \ dc_i \tag{4.6}$$

**Lemma 4.1.** *More sophisticated investors are less likely to hold out, but more likely to litigate. A higher probability of success in litigation will increase both the holdout rate and the litigation ratio.*

*Proof.* See the appendix for details. The first part follows immediately from eq. (4.6), since $\frac{\partial c_i^*}{\partial \mu_i} > 0$. This implies that $\Gamma$ increases, too. The share of litigating creditors conditional on holding out is given by $(1 - \int^{c_i^*} \varphi_i dc_i)/\Gamma$, which by the same logic is decreasing in $\mu_i$. Since both $c_i^*$ and $\Gamma$ are increasing in $p$, but $\varphi_i$ is decreasing in $p$, both the holdout rate and the litigation ratio will rise with a higher litigation success probability. □

The lemma rationalizes the stylized insights from the empirical analysis. Intuitively, the decision is determined by creditors' estimated likelihood of having to go to court, and from the expected value of that possibility. If the success probability of litigation increases, the overall value of holding out in the first period rises - independent of the actual realization of the second offer. Clearly, conditional on holding out, an increase in the success probability induces more creditors to file a lawsuit rather than accepting the offer. Therefore, bonds with higher probability of successful litigation, such as those governed by US or UK law, should both have a higher share of holdouts and a larger litigation ratio. This is consistent with the empirical evidence presented above.

Sophisticated investors, who can estimate future offers of the government more precisely, can anticipate the probability with which they will rationally litigate in $t = 2$. Therefore, of the sophisticated investors, only those with relatively low litigation costs will hold out in $t = 1$. They are less afraid of the prospect of litigation since it would come at a low cost. The case is different for less sophisticated investors. In $t = 1$, they anticipate a better offer in the future, and thereby underestimate the probability with which they will rationally file a lawsuit in $t = 2$. Thus, of the less sophisticated investors, those with relatively high litigation costs will still be induced to hold out. This means that the marginal unsophisticated creditor on the litigation cost dimension who rejects the first offer has a higher cost than the marginal sophisticated creditor. If the second offer is then disappointing (relative to their imprecise estimates), litigation is an unprofitable choice and they accept the revised offer instead, even though they now realize that they would have been better off accepting the first offer.

Figure 4.8 visualizes these insights from lemma 4.1 for the specific case in which the signal $h_2^S$ promises to be slightly more creditor-friendly than the original offer (Panel A). It shows the share of creditors rejecting the first offer as a function of the probability of success in subsequent litigation and the average precision of the interpretation of the signal about the second offer. Creditors who are more sophisticated in anticipating the true second offer $h_2$ will be less likely to hold out for a given probability of successful

litigation than their less sophisticated counterparts. Formally, this is because they attach a lower probability $\varphi_i$ to the fact that they will indeed participate in the second offer, and thus discount the relevance of the success probability in case of litigation. The marginal litigation cost after which accepting the initial offer is rational is therefore higher for less sophisticated creditors.

Panel B shows the litigation decision in $t = 2$ from a revelation of the second offer that is disappointing for creditors who expected an improvement because it contains the same terms as the initial offer. Conditional on having held out in the first period, the more sophisticated creditors are *more* likely to file suit for any given probability of success. This is because of the sophisticated creditors, only those with lower costs of litigating were tempted to reject the initial offer; since they were more realistic about the possibility that they might actually be inclined to litigate, those with relatively low costs of litigating became holdout creditors. They are therefore more prone to file a lawsuit. The less sophisticated creditors, on the other hand, discounted the probability $\varphi_i$ of actually having to go to court and were therefore more likely to become holdout creditors even with high costs of litigating.

### 4.5.2 Effect of secondary markets

The previous argument assumed that despite heterogeneous valuation of the bonds, no trade could take place between creditors. If there is a secondary market for distressed bonds in $t = 1$ before creditors make their decision about accepting the first offer, they will adjust their holdings according to their respective valuation. The aggregate supply of debt on this market is zero, so that the sum of the aggregate demand schedules for holdout and participating investors must net out:

$$\Gamma d_i^H(q) + (1 - \Gamma) d_i^P(q) = 0 \tag{4.7}$$

where $d_i^j,\ j = \{H, P\}$ denotes the demand functions (positive if the agent wants to purchase bonds, and negative if she wants to sell), and $q$ represents the equilibrium price. This is derived from the agents' utility optimization. Investors have exponential utility and maximize their terminal wealth in $t = 3$ over their demand schedule $d_i^j$:

$$\max_{d_i} E_i = e^{-d_i^j (V_i^j - q)} \tag{4.8}$$

The standard optimization for exponential utility functions implies that the individual demand functions are given by

$$\begin{aligned} d_i^H = (V_i^H - q)\sigma^2_{V^h}\ , \quad d_i^P = (V_i^P - q)\sigma^2_{V^p} \\ \text{where} \quad \sigma^2_{V^h} = \varphi^2 \sigma_\epsilon^2\ , \quad \sigma^2_{V^p} = (1 - h_1)^2 \sigma_r^2 \end{aligned} \tag{4.9}$$

Inserting the demand functions into (4.7) allows solving for the market clearing price $q^*$ at which the aggregate equilibrium demands are filled. Inserting $q^*$ back into (4.9) gives the aggregate demand by holdout and accepting creditors:

$$\tilde{d_i}^H = \frac{\sigma^2_{V^h}\sigma^2_{V^p}(1-\Gamma)}{\Gamma\sigma^2_{V^h} + (1-\Gamma)\sigma^2_{V^p}}(V_i^H - V_i^P)\ , \quad \tilde{d_i}^P = \frac{\sigma^2_{V^h}\sigma^2_{V^p}\Gamma}{\Gamma\sigma^2_{V^h} + (1-\Gamma)\sigma^2_{V^p}}(V_i^H - V_i^P) \tag{4.10}$$

$\tilde{d_i}^H$ is clearly positive for holdout creditors, since for them $V_i^H > V_i^P$. Their demand will be filled by creditors who had otherwise participated in the restructuring, since $\tilde{d_i}^P$ is negative for them. The total debt holdings of the holdout creditors after these trade adjustments is then given by:

$$\Gamma^{Sec.Mkt.} \equiv \int_0^{c_i^*} f(c_i)(1 + \tilde{d_i}^H)\ \ dc_i \tag{4.11}$$

**Lemma 4.2.** *If secondary markets exist, a higher share of creditors will hold out.*

*Proof.* Only the subset of creditors with $c_i < c_i^*$ values the holdout option higher than participating in the initial offer, i.e. $V_i^H \geq V_i^P\ \forall\ c_i \leq c_i^*$. Only these creditors will have a positive demand $d_i^H \geq 0$, which will be satisfied by participants who do not want to hold out, $d_i^P \leq 0$ (eq. 4.10). This implies that $\Gamma^{Sec.Mkt.} \geq \Gamma$ (eq. 4.11) which means that the holdout rates will be larger in the presence of secondary markets. □

Note that this does not imply that nobody accepts the restructuring. The exponential functional form of investors' utility implies risk aversion, which is why holdout creditors have a limited demand. Furthermore, a simple extension that would justify limited re-allocation of bonds on secondary markets would be to impose borrowing constraints on creditors. Frictions limiting the demand for investments into defaulted bonds could come from public regulation, such as high capital weights on distressed debt, or political pressure.[19] Finally, many professional investors are prohibited by private regulations from investing too much of the assets under their management into distressed debt, further limiting demand. But as long as these restrictions do not drop demand to zero, secondary markets will increase the likelihood of holdouts.

## 4.6 Conclusion

This paper provides systematic evidence on creditor participation and litigation in one of the most widely researched sovereign debt restructurings. Using a novel dataset, it shows that while the holdout rate was relatively high, the share of creditors litigating against

[19]Gordon Brown, former UK chancellor and prime minister, publicly insulted the actions of distressed sovereign debt funds as "morally outrageous" (BBC, May 10, 2002). His US colleague Hank Paulson stated he "deplored" the business of distressed funds (Bloomberg, January 8, 2008). Political initiatives in both countries have tried to limit the profitability of investing in distressed sovereign debt (see Schumacher et al. (2014b) for details).

the government in court was significantly lower and highly concentrated. Empirical correlations show that especially bonds targeted at retail investors had high holdout, but low litigation rates. Bonds governed by US and UK law, on the other hand, were particularly likely to be kept out of the restructuring and brought to court. A highly stylized model of heterogeneous creditors can rationalize these facts.

Recent developments in one of the Argentine litigation cases have renewed interest in the legal actions by creditors. The interpretation of the *pari passu* clause in sovereign bonds as prohibiting the government from paying participating creditors' *new* claims in full if not at the same time ratably repaying holdout creditors their *old* claims in full could increase the holdout incentives for any individual investor. In the context of the model, this could be seen as a strong rise in the success probability of litigation. This would raise both the holdout rate in future restructurings, but could also have significant implications for the remaining Argentine holdout creditors: Conditional on having held out, this will increase the value of litigating vis-à-vis accepting a future offer by Argentina at the same terms as before. Hence, if the court's interpretation of *pari passu* stands, this may induce many of the remaining holdout creditors to follow the more aggressive investors' lead who have already initiated lawsuits in the past.

But the results may also have implications outside the Argentine context. Appealing diverse groups of investors may be seen as beneficial in calm times. However, it carries the risk of increased coordination problems in case a debt restructuring becomes necessary in the future. While this may be a useful commitment device to overcome the time inconsistency problem inherent in sovereign debt markets, debt managers should consider if the Argentine experience is a worthwhile way of achieving this goal.

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# Figures

Figure 4.1: Macroeconomic developments in the run-up to the crisis

The graph shows the annual growth in GDP (WEO data, left axis, in %), the structural budget balance (GFS data, left axis), and the debt to GDP ratio (Abbas et al., 2010, right axis, in %). Except for 1995, when the fallout from the Mexican "Tequila crisis" dragged down growth throughout Latin America, Argentina experienced high growth rate exceeding 4% for largest part of the 1990s. The structural budget balance, however, was negative except for one balanced budget in 1993. Not surprisingly, the debt/GDP ratio increased continuously after the debt restructuring of 1993; but the debt dynamics got especially out of hand when the country entered a recession in the aftermath of the Russian and Asian financial crises of 1997/98.

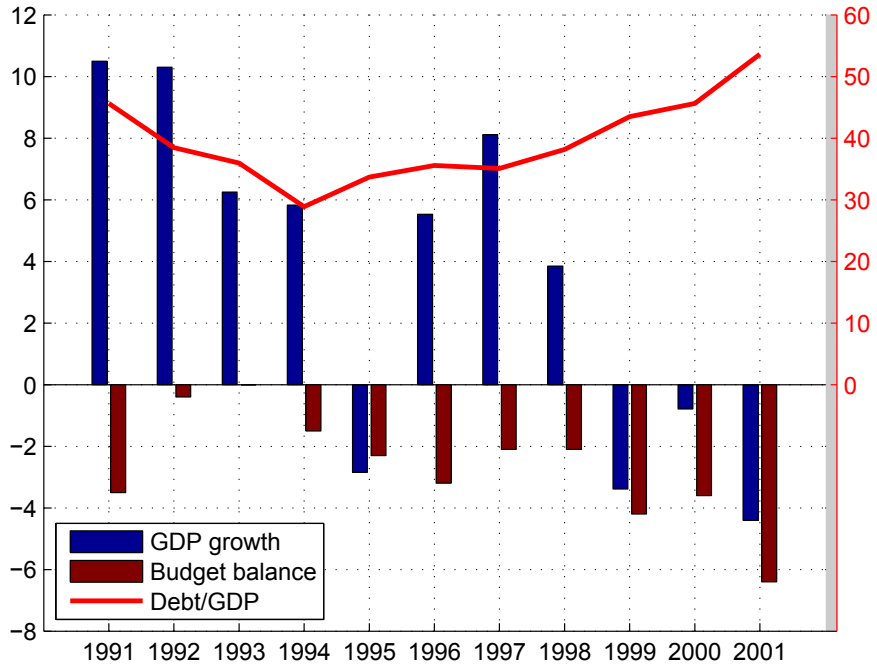


Figure 4.2: Issuance of government debt in the 1990-2000s

The graph depicts the issue dates and volumes of the sovereign bonds that were restructured in 2005/10. The three large outliers to the right are the result of the so-called "mega-swap", a voluntary exchange of bonds worth about USD 29bn for three large, consolidated bonds due in 2008, 2018, and 2031. They thus reflect only a restructuring of previously accumulated liabilities. The dark line shows the JP Morgan EMBI index for Argentina, a face value-weighted average of the spread between a basket of Argentine bonds and US treasuries (stripped of the value of collateral attached to Brady bonds).

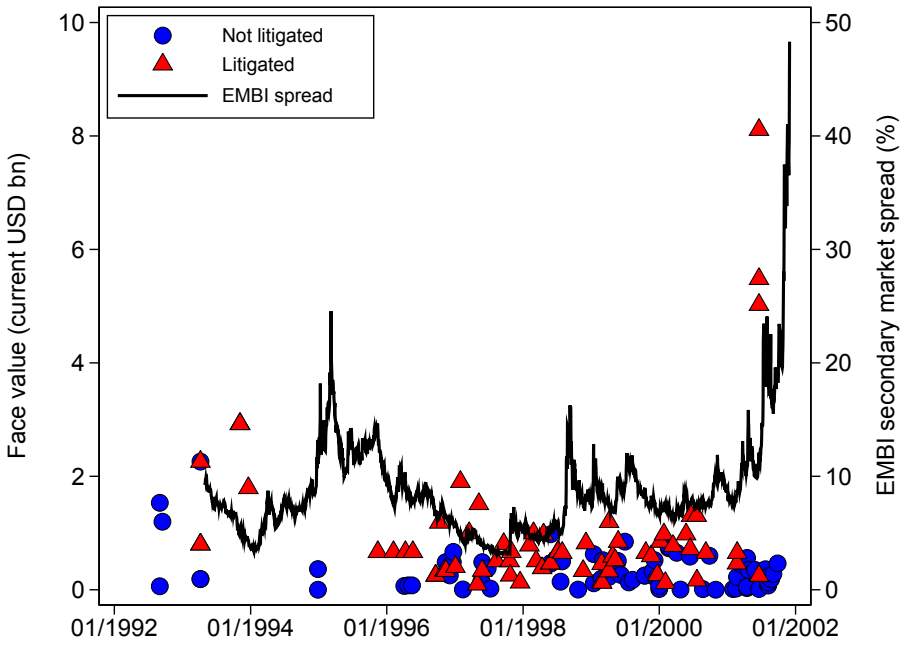


Figure 4.3: Hypothetical restructuring outcome with different CACs

The figure displays how different versions of collective action clauses (CAC) would have affected the restructuring outcome, given the observed participation rates. In the 2005 restructuring, no CACs were applied, leading to a participation rate of 76%. With a bond-by-bond specific threshold of 75% (CAC #1), 83% of the aggregate debt stock could have been exchanged. Under CAC #2, where a bond-specific majority of 50% *and* an aggregate majority of 66.67% need to be reached in order to eliminate bond-specific holdouts, 98% of the eligible debt could have been restructured. Finally, under an aggregate CAC #3, with only a single vote across all bonds and an aggregate majority requirement of 75%, the entire debt could have been exchanged.

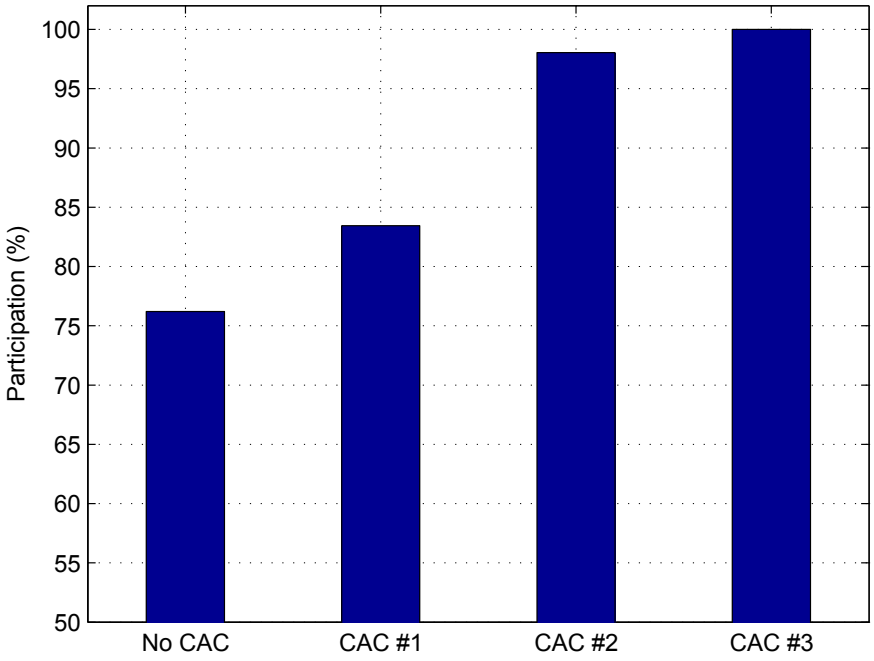


Figure 4.4: Plaintiffs with largest claims

The graph shows the 12 plaintiffs with the largest claims (by face value of disputed bonds, excluding accrued and penalty interest; blue bars, left axis). It also compares the sum of all claims by these plaintiffs with the sum of all other plaintiffs who filed lawsuits (red bars, right axis). The 12 largest plaintiffs accounted for more than 70% of the entire litigated volume, ca. USD 2.6bn out of USD 3.7bn.

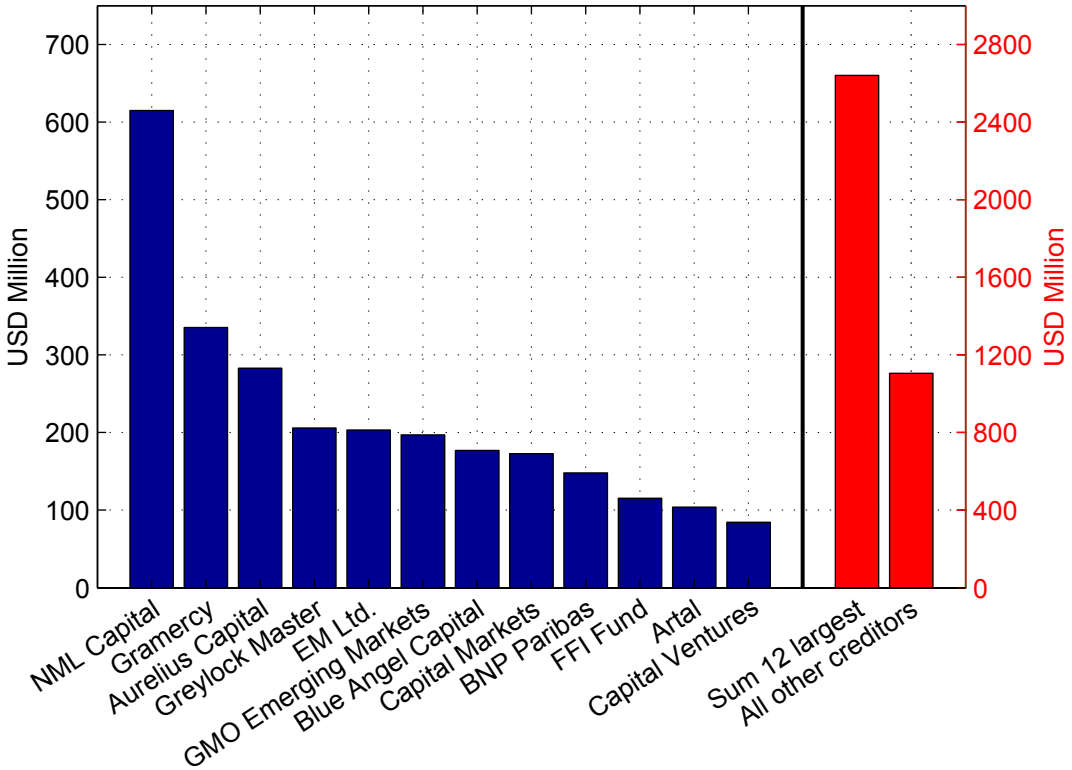


Figure 4.5: Filing of lawsuits

The graph shows the volume (face value of claims) of 182 lawsuits by date of filing. The red lines mark (1) the announcement of the first proposed restructuring terms ("Dubai proposal") in September 2003, which would have implied a NPV reduction of about 90%, (2) the eventually realized debt exchange in June 2005 with an average haircut of ca. 75% (Sturzenegger and Zettelmeyer, 2006), and (3) the affirmation of the SDNY's pari passu order by the 2nd Circuit. Almost all cases were filed after the initial Dubai proposal (94%), and the majority only after the 2005 debt exchange (65%). While a few cases stand out (notably by a small set of creditors, see also figure 4.4), 113 cases had claims of less than USD 25m. About half of all cases were filed by individual retail investors alone (59 cases) or a mix of retail and institutional investors (26 cases). These cases involved significantly lower sums of just USD 7.7m on average, as compared to USD 37.3m in those cases filed by institutional investors only.

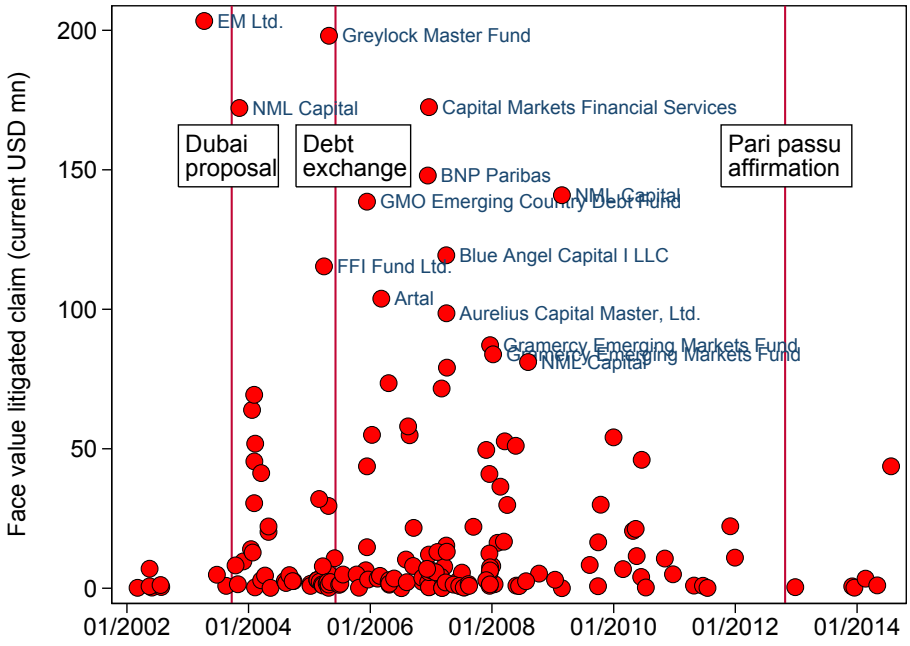


Figure 4.6: Bonds: holdout and litigation rates

The figure shows the set of bonds subject to litigation in the SDNY, ordered by the share of principal not tendered into the 2005 debt exchange. The dark blue bars indicate the share of principal not tendered into the 2005 exchange, and the turquoise bars the share of principal subject to legal actions.

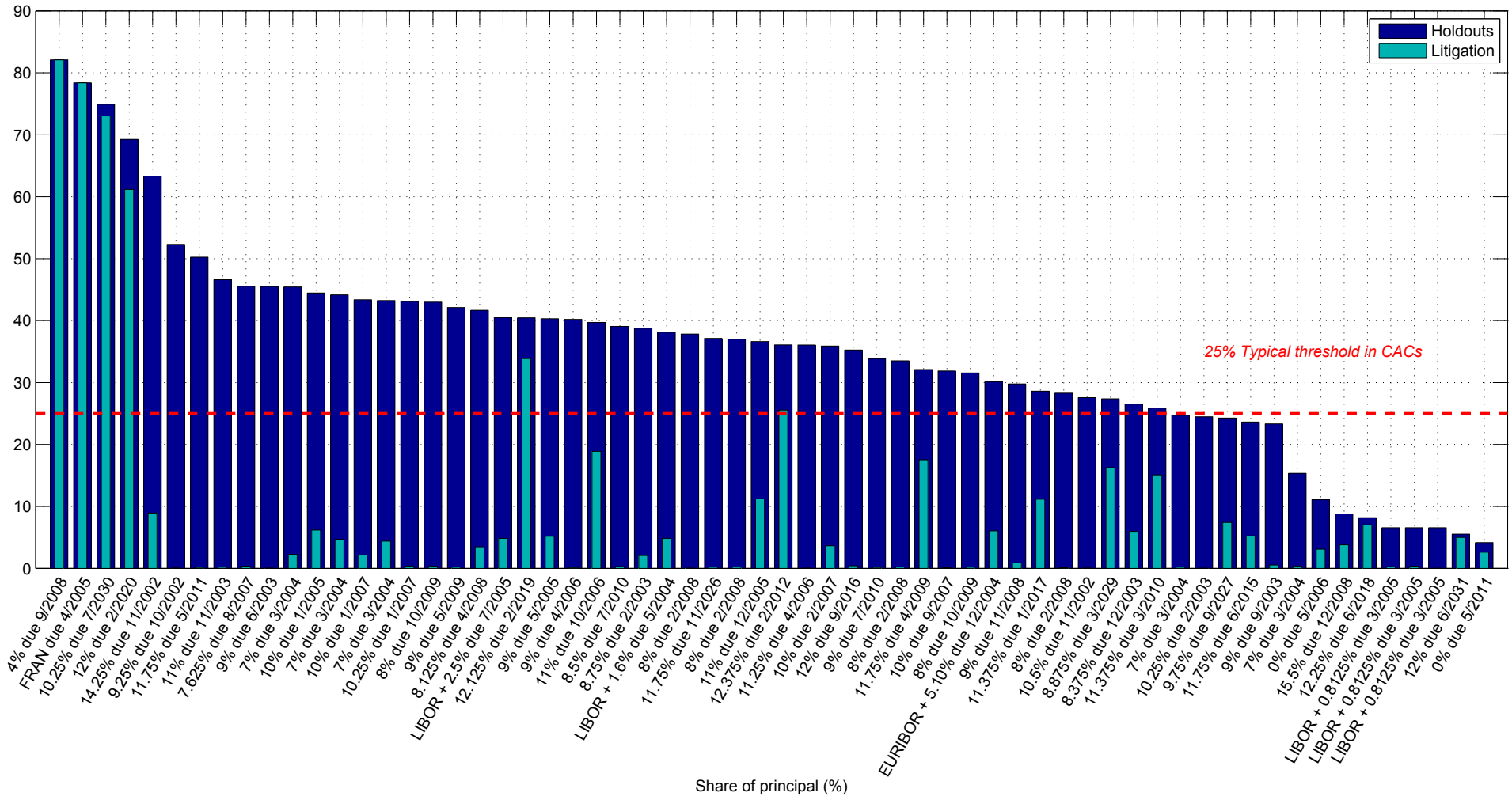


Figure 4.7: Model outline

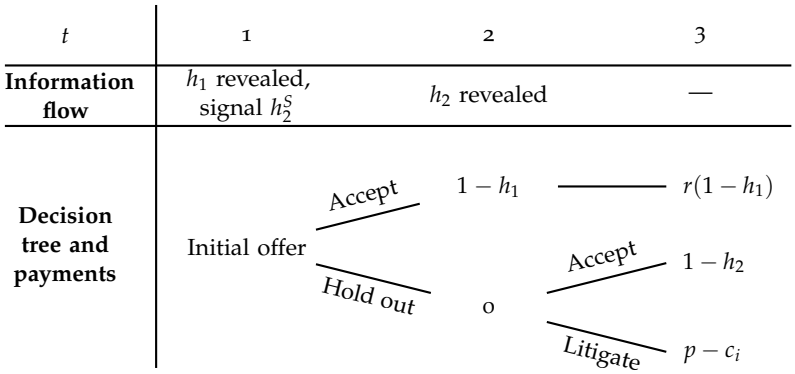
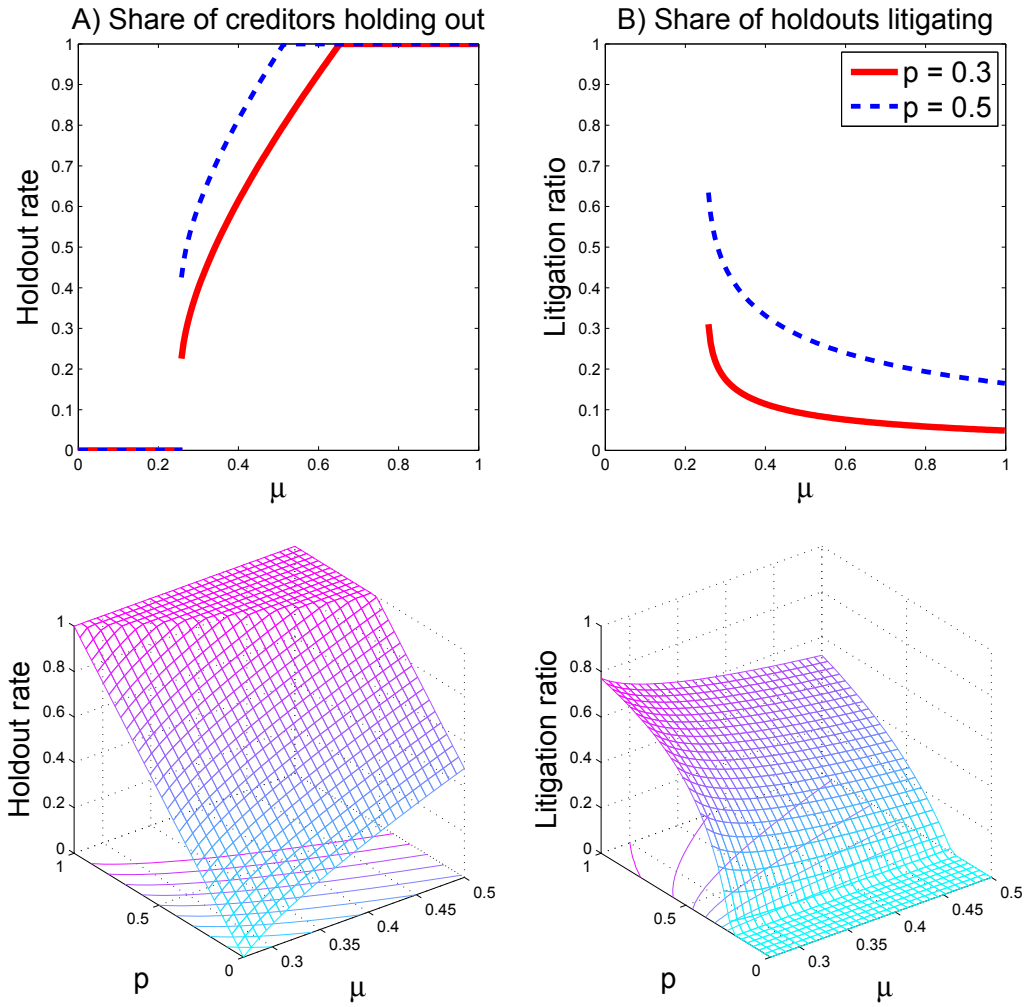


Figure 4.8: Holdout rate and litigation ratio

The graphs show the relationships between the holdout rate and litigation ratio with the precision of the signal (or sophistication of investors) $\mu$ and the probability of successful litigation $p$. Parametrical assumptions are $h_1 = 0.77$, $h_2^S = 0.5$, $h_2 = 0.77$, $r = 0.1$, and a uniform distribution of $c_i$ over [0,1]. The upper part of panel A shows the share of creditors (sorted along their cost of litigation $c_i$) who reject the initial proposal in $t = 1$ as a function of the precision of their estimate of future offers for two probabilities of success in litigation. The holdout rate is increasing in both the imprecision of the signal $\mu$ and the probability of success $p$. The lower part shows the interaction between $p$ and $\mu$ over the whole support of $p$. Panel B shows the share of litigating creditors as a proportion of holdouts (litigation ratio), again sorted along the cost of litigation. While the litigation ratio is decreasing in the imprecision of the signal $\mu$, it is still increasing in the probability of success.



## 4.7 Tables

Table 4.1: Overview case dataset

The table reports summary statistics on the cross-section of cases filed in the SDNY between 2002-14. Note that the number of actions exceeds the number of plaintiffs since some creditors filed multiple distinct cases (Notably, NML Capital, Aurelius, and Gramercy filed 12, 9, and 6 cases, respectively.) Furthermore, the case number refers to actions which sought to obtain a judgment, rather than seeking enforcement. The total volume represents the sum of the face value of claims, excluding accrued or penalty interest. The duration reflects the time from filing suit to termination of the case as indicated in the docket (typically by a judgment). Note that this variable is right-censored.

| | | | |
|---|---|---|---|
| No. actions | 182 | | |
| No. lead plaintiffs | 137 | | |
| Total volume (USD m) | 3,745.1 | | |
| | Mean | Min | Max |
| Duration of cases (years) | 3.19 | 0.02 | 12.03 |
| Number of bonds per action | 4.23 | 1 | 20 |
| Volume per action (USD m) | 22.84 | 0.03 | 203.35 |

Table 4.2: Plaintiffs with largest claims

The table lists the 12 largest plaintiffs by face value in litigation. Note that this set of creditors holds 72% of the entire litigated claims.

| Plaintiff | Volume (Mn USD) | % of total | Cumulative |
|---|---|---|---|
| NML Capital | 614.8 | 16.4% | 16% |
| Gramercy | 335.4 | 9.0% | 25% |
| Aurelius Capital | 282.9 | 7.6% | 33% |
| Greylock | 205.9 | 5.5% | 38% |
| EM Ltd. | 203.3 | 5.4% | 44% |
| GMO Emerging Country | 197.0 | 5.3% | 49% |
| Blue Angel Capital | 176.9 | 4.7% | 54% |
| Capital Markets Financial Services | 172.5 | 4.6% | 58% |
| BNP Paribas | 147.9 | 4.0% | 62% |
| FFI Fund | 115.4 | 3.1% | 65% |
| Artal Alternative Treasury Management | 103.8 | 2.8% | 68% |
| Capital Ventures International | 84.5 | 2.3% | 70% |

## Table 4.3: List of cases filed in the SDNY

The table lists all lawsuits filed by investors against the Republic of Argentina in the Southern District of New York federal district court based on the 2001/02 default between 1 January 2002 and 31 July 2014. All data were obtained from the PACER database of electronic court records. The lead plaintiff is the first named plaintiff on the docket. Creditor type was coded according to the plaintiff's complaint. The face value does not include additional damage claimed by the investors, such as past due interest, or penalty interest.

| Case number | Lead plaintiff | Date filed | Creditor type | Face value (Mn USD) |
|---|---|---|---|---|
| 08 Civ. 09506 | A. Gandola & C. S.P.A. | 11/5/2009 | Institutional | . |
| 06 Civ. 03197 | Abel Amoroso | 4/25/2006 | Retail & Institutional | 1.63 |
| 05 Civ. 00177 | Agostino Consolini | 1/7/2005 | Retail & Institutional | 1.61 |
| 06 Civ. 15393 | Agritech S.R.L. | 12/22/2006 | Institutional | . |
| 08 Civ. 04902 | Alejandro Alberto Etcheto | 5/27/2008 | Retail | 0.94 |
| 07 Civ. 07248 | Alesia Milanesi | 8/14/2007 | Retail | 1.48 |
| 04 Civ. 03314 | Alessandro Morata | 4/30/2004 | Retail & Institutional | 22.15 |
| 02 Civ. 01773 | Allan Applestein Guarantor Trust | 3/6/2002 | Institutional | 0.16 |
| 02 Civ. 04124 | Allan Applestein Guarantor Trust | 5/31/2002 | Institutional | 0.25 |
| 03 Civ. 06268 | Allan Applestein Guarantor Trust | 8/20/2003 | Institutional | 0.86 |
| 08 Civ. 00440 | Amber Reed Corp | 1/17/2008 | Institutional | 1.45 |
| 05 Civ. 02159 | Ana Laura Bonvecchi | 2/16/2005 | Retail & Institutional | 2.99 |
| 07 Civ. 05593 | Andrarex | 6/12/2007 | Institutional | 2.63 |
| 06 Civ. 03976 | Andrea Jacinto Alzugaray | 5/24/2006 | Retail | 3.49 |
| 05 Civ. 02943 | Anna Ferri | 3/17/2005 | Retail | 1.38 |
| 06 Civ. 15171 | Antonio Forgione | 12/15/2006 | Retail | 2.20 |
| 11 Civ. 04223 | Anye Salinovich | 6/21/2011 | Retail | 0.89 |
| 05 Civ. 09072 | Armando Ruben Fazzolari | 10/25/2005 | Retail | 0.19 |
| 06 Civ. 01839 | Artal | 3/8/2006 | Institutional | 103.80 |
| 07 Civ. 02715 | Aurelius Capital Master, Ltd. | 4/3/2007 | Institutional | 98.57 |
| 07 Civ. 11327 | Aurelius Capital Master, Ltd. | 12/17/2007 | Institutional | 40.97 |
| 09 Civ. 08757 | Aurelius Capital Master, Ltd. | 10/15/2009 | Institutional | 29.95 |
| 09 Civ. 10620 | Aurelius Capital Master, Ltd. | 12/31/2009 | Institutional | 54.09 |
| 10 Civ. 01602 | Aurelius Capital Master, Ltd. | 2/26/2010 | Institutional | 6.86 |
| 10 Civ. 03507 | Aurelius Capital Master, Ltd. | 4/27/2010 | Institutional | 20.57 |
| 10 Civ. 03970 | Aurelius Capital Master, Ltd. | 5/13/2010 | Institutional | 21.28 |
| 10 Civ. 08339 | Aurelius Capital Master, Ltd. | 11/4/2010 | Institutional | 10.64 |
| 06 Civ. 14339 | BNP Paribas | 12/12/2006 | Institutional | 147.94 |
| 05 Civ. 00277 | Banca Arner | 1/12/2005 | Institutional | . |
| 07 Civ. 08000 | Banca Nazionale Del Lavoro | 9/12/2007 | Institutional | 22.03 |
| 06 Civ. 03198 | Bliway International | 4/25/2006 | Institutional | 1.29 |
| 07 Civ. 02693 | Blue Angel Capital I LLC | 4/2/2007 | Institutional | 119.36 |
| 10 Civ. 04101 | Blue Angel Capital I LLC | 5/19/2010 | Institutional | 11.52 |
| 10 Civ. 04782 | Blue Angel Capital I LLC | 6/18/2010 | Institutional | 46.04 |
| 06 Civ. 15301 | Capital Markets Financial Services | 12/19/2006 | Institutional | 172.46 |
| 05 Civ. 04085 | Capital Ventures International | 4/25/2005 | Institutional | 29.50 |
| 06 Civ. 00207 | Capital Ventures International | 1/11/2006 | Institutional | 54.98 |
| 05 Civ. 04128 | Carlos Alberto Marangoni | 4/26/2005 | Retail | 0.17 |
| 05 Civ. 02521 | Carlos Alberto Martinez | 3/3/2005 | Retail & Institutional | 2.35 |
| 06 Civ. 15316 | Caronte Ltd. S.A. | 12/19/2006 | Institutional | 12.07 |
| 04 Civ. 00506 | Cesar Raul Castro | 1/22/2004 | Retail | 63.92 |
| 04 Civ. 00746 | Cesar Raul Castro | 2/2/2004 | Retail | Class action |
| 06 Civ. 13675 | Claren Corporation | 12/1/2006 | Institutional | 4.00 |
| 06 Civ. 05887 | Cordoba Capital | 8/3/2006 | Institutional | 10.29 |
| 08 Civ. 06625 | Crista Irene Brandes | 7/24/2008 | Retail | 2.51 |
| 03 Civ. 09538 | Denchu Investment Corporation | 12/1/2003 | Institutional | 9.63 |
| 05 Civ. 06599 | Diana Klein | 7/21/2005 | Retail & Institutional | 4.92 |
| 10 Civ. 01598 | Diocesi Patriarcato di Venezia | 2/25/2010 | Retail | . |
| 07 Civ. 02792 | Dralli LLC | 4/6/2007 | Institutional | 79.08 |
| 07 Civ. 04606 | Dralli LLC | 5/31/2007 | Institutional | . |
| 09 Civ. 08299 | Drawrah Ltd. | 9/30/2009 | Institutional | 16.47 |
| 03 Civ. 02507 | EM Ltd. | 4/10/2003 | Institutional | 203.35 |
| 06 Civ. 14299 | Ebrahim Tadayon | 12/8/2006 | Retail | 6.95 |
| 03 Civ. 04693 | Eduardo Andres Franceschi | 6/25/2003 | Retail & Institutional | 4.84 |
| 04 Civ. 02117 | Eduardo Puricelli | 3/17/2004 | Retail | 41.28 (class action) |
| 04 Civ. 00937 | Elizabeth Andrea Azza | 2/4/2004 | Retail & Institutional | 30.50 (class action) |
| 04 Civ. 01085 | Elizabeth Andrea Azza | 2/10/2004 | Retail & Institutional | 51.83 (class action) |

*continues on next page*

Table 4.3: List of cases filed in the SDNY (continued)

| Case number | Lead plaintiff | Date filed | Creditor type | Face value (Mn USD) |
|---|---|---|---|---|
| 04 Civ. 07056 | Elvira Dagmar Buczat | 9/2/2004 | Retail & Institutional | 4.71 |
| 05 Civ. 08687 | Emanuele Botti | 10/11/2005 | Retail & Institutional | 4.93 |
| 07 Civ. 06426 | Ernst Ritoper | 7/16/2007 | Retail | 0.26 |
| 05 Civ. 03328 | FFI Fund Ltd. | 3/29/2005 | Institutional | 115.38 |
| 06 Civ. 15300 | Fernando Crostelli | 12/19/2006 | Retail | 5.78 |
| 07 Civ. 02788 | Franco Baccanelli | 4/5/2007 | Retail | 13.10 |
| 07 Civ. 03851 | Franco Baccanelli | 5/16/2007 | Retail | 1.31 |
| 05 Civ. 10383 | GMO Emerging Country Debt Fund | 12/12/2005 | Institutional | 138.58 |
| 05 Civ. 10382 | GMO Emerging Country Debt Fund | 12/12/2005 | Institutional | 14.71 |
| 05 Civ. 10380 | GMO Emerging Country Debt Fund | 12/12/2005 | Institutional | 43.71 |
| 12 Civ. 09364 | Gerhard Tenner | 12/26/2012 | Retail | 0.39 |
| 04 Civ. 09788 | Giorgio Scappini | 12/13/2004 | Retail | Class action |
| 07 Civ. 11492 | Gramercy Emerging Markets Fund | 12/21/2007 | Institutional | 87.13 |
| 08 Civ. 00041 | Gramercy Emerging Markets Fund | 1/3/2008 | Institutional | 7.95 |
| 08 Civ. 00164 | Gramercy Emerging Markets Fund | 1/8/2008 | Institutional | 83.85 |
| 08 Civ. 01113 | Gramercy Emerging Markets Fund | 2/4/2008 | Institutional | 16.29 |
| 08 Civ. 01722 | Gramercy Emerging Markets Fund | 2/21/2008 | Institutional | 36.40 |
| 08 Civ. 02865 | Gramercy Emerging Markets Fund | 3/18/2008 | Institutional | 52.67 |
| 08 Civ. 04814 | Gramercy Emerging Markets Fund | 5/23/2008 | Institutional | 51.07 |
| 04 Civ. 07643 | Greylock Master Fund | 9/27/2004 | Institutional | 2.57 |
| 05 Civ. 04246 | Greylock Master Fund | 4/28/2005 | Institutional | 198.04 |
| 08 Civ. 08689 | Greylock Master Fund | 10/10/2008 | Institutional | 5.25 |
| 03 Civ. 09537 | Guillermo Franco | 12/1/2003 | Retail & Institutional | . |
| 02 Civ. 05699 | H.W. Urban GmbH | 7/22/2002 | Institutional | 1.15 (class action) |
| 07 Civ. 10657 | HWB Victoria Strategies Portfolio | 11/28/2007 | Institutional | 49.58 |
| 07 Civ. 11382 | HWB Victoria Strategies Portfolio | 12/19/2007 | Institutional | 5.62 |
| 04 Civ. 06137 | Hector Manuel Moldes | 8/6/2004 | Retail | 2.61 |
| 08 Civ. 05436 | Helmut Hagemann | 6/12/2008 | Retail | 0.78 |
| 07 Civ. 00098 | Hendrik Beyer | 1/5/2007 | Retail | 6.32 |
| 06 Civ. 15297 | Henry Brecher | 12/19/2006 | Retail | Class action |
| 03 Civ. 08531 | Hernan Lopez Fontana | 10/29/2003 | Retail | . |
| 04 Civ. 00936 | Hickory Sec., Ltd. | 2/4/2004 | Institutional | 69.35 (class action) |
| 07 Civ. 06231 | Hillside Ltd. | 7/5/2007 | Institutional | 5.60 |
| 07 Civ. 11457 | Horacio Alberto Crespo | 12/18/2007 | Retail | 0.89 |
| 11 Civ. 04908 | Horacio Guibelalde | 7/18/2011 | Retail | 0.12 |
| 06 Civ. 07100 | Ivelo Holding | 9/15/2006 | Institutional | 7.99 |
| 05 Civ. 03825 | Jorge Bechara | 4/14/2005 | Retail & Institutional | 1.73 |
| 03 Civ. 08120 | Jorge Marcelo Mazzini | 10/15/2003 | Retail & Institutional | 8.18 |
| 06 Civ. 01590 | Jose Pedro Angulo | 2/28/2006 | Retail | 4.44 |
| 05 Civ. 04149 | Jose Strugo | 4/26/2005 | Retail | 1.34 |
| 06 Civ. 06032 | Josef Schwald | 8/8/2006 | Retail & Institutional | 2.17 |
| 06 Civ. 01091 | Klaus Wagner | 2/14/2006 | Retail | 3.45 |
| 03 Civ. 08528 | Latinburg | 10/29/2003 | Institutional | 1.44 |
| 05 Civ. 06200 | Laura Rossini | 7/5/2005 | Retail & Institutional | 1.60 |
| 02 Civ. 03804 | Lightwater | 5/17/2002 | Institutional | 7.00 |
| 05 Civ. 02275 | Lino Luis Arrigoni | 2/18/2005 | Retail | 2.95 |
| 05 Civ. 10201 | Los Angeles Capital | 12/5/2005 | Institutional | 6.45 |
| 07 Civ. 02349 | Los Angeles Capital | 3/21/2007 | Institutional | 7.73 |
| 05 Civ. 03095 | Luigi Daelli | 3/22/2005 | Retail | 1.00 (class action) |
| 02 Civ. 05932 | Macrotecnic | 7/26/2002 | Institutional | 0.45 |
| 07 Civ. 02607 | Marcella Dolcetti | 3/29/2007 | Retail | 2.08 |
| 06 Civ. 05157 | Marcello Barboni | 7/7/2006 | Retail | 0.03 (class action) |
| 04 Civ. 01077 | Marcelo Eduardo Prima | 2/5/2004 | Retail | 45.46 |
| 05 Civ. 03089 | Marcelo Ruben Rigueiro | 3/22/2005 | Retail | 7.87 |
| 07 Civ. 05807 | Marco Borgra | 6/19/2007 | Retail | 0.82 |
| 05 Civ. 01033 | Maria Consiglia Daho | 1/31/2005 | Retail | Class action |
| 04 Civ. 06594 | Maria Fausta Cilli | 8/13/2004 | Retail | 1.89 |
| 06 Civ. 13085 | Maria Lauretta Dussault | 11/9/2006 | Retail | 3.74 (class action) |
| 11 Civ. 02864 | Maria Lauretta Dussault | 4/28/2011 | Retail | 0.96 |
| 04 Civ. 00508 | Mario Alberto Cooke | 1/22/2004 | Retail | . |
| 05 Civ. 04299 | Massimo Bettoni | 5/2/2005 | Retail | . |
| 04 Civ. 03313 | Mazoral | 4/30/2004 | Institutional | 20.21 |
| 05 Civ. 05197 | Meridian Investments | 6/1/2005 | Institutional | 10.76 |
| 07 Civ. 10656 | Michael Heeb | 11/28/2007 | Retail & Institutional | 2.89 |

*continues on next page*

Table 4.3: List of cases filed in the SDNY (continued)

| Case number | Lead plaintiff | Date filed | Creditor type | Face value (Mn USD) |
|---|---|---|---|---|
| 09 Civ. 07059 | Michael Schmidt | 8/10/2009 | Retail & Institutional | 8.35 |
| 04 Civ. 02710 | Michelle Colella | 4/9/2004 | Retail | 4.55 |
| 04 Civ. 01048 | Million Air Corp | 2/9/2004 | Institutional | 0.32 |
| 06 Civ. 03276 | Mohammad Ladjevardian | 4/21/2006 | Retail & Institutional | 73.52 |
| 05 Civ. 04239 | Montreux Partners L.P. | 4/28/2005 | Institutional | 5.00 |
| 05 Civ. 00178 | Moreno Legnaro | 1/7/2005 | Retail | 0.85 |
| 03 Civ. 08845 | NML Capital | 11/7/2003 | Institutional | 172.15 |
| 05 Civ. 02434 | NML Capital | 2/28/2005 | Institutional | 32.00 |
| 06 Civ. 06466 | NML Capital | 8/25/2006 | Institutional | 54.85 |
| 07 Civ. 01910 | NML Capital | 3/5/2007 | Institutional | 71.60 |
| 07 Civ. 02690 | NML Capital | 4/2/2007 | Institutional | 15.30 |
| 07 Civ. 06563 | NML Capital | 7/20/2007 | Institutional | 0.30 |
| 08 Civ. 02541 | NML Capital | 3/13/2008 | Institutional | 16.72 |
| 08 Civ. 03302 | NML Capital | 4/2/2008 | Institutional | 29.85 |
| 08 Civ. 06978 | NML Capital | 8/5/2008 | Institutional | 81.08 (pari passu) |
| 09 Civ. 01708 | NML Capital | 2/24/2009 | Institutional | 140.89 (pari passu) |
| 09 Civ. 01707 | NML Capital | 2/24/2009 | Institutional | 0.03 (pari passu) |
| 10 Civ. 04656 | NW Global Strategy | 6/15/2010 | Institutional | 4.04 |
| 06 Civ. 15337 | Nakiga Holdings | 12/20/2006 | Institutional | 0.45 |
| 07 Civ. 01938 | Newbadem Investments S.A. | 3/6/2007 | Institutional | Class action |
| 02 Civ. 03808 | Old Castle | 5/17/2002 | Institutional | 0.70 |
| 10 Civ. 09587 | Olifant Fund | 12/23/2010 | Institutional | 5.00 |
| 07 Civ. 11591 | Oscar Luis Cavero | 12/27/2007 | Retail | Class action |
| 09 Civ. 08275 | Oscar Reinaldo Carabajal | 9/29/2009 | Retail & Institutional | 0.73 |
| 05 Civ. 03955 | Osvaldo Lorenzo Sauco | 4/19/2005 | Retail | 2.22 |
| 04 Civ. 05068 | Otavio Lavaggi | 6/4/2004 | Retail | Class action |
| 10 Civ. 05338 | Pablo Alberto Varela | 7/13/2010 | Retail | 0.28 |
| 04 Civ. 07504 | Paola Rosa | 9/22/2004 | Retail | 2.56 |
| 05 Civ. 06002 | Paolo Lisi | 6/28/2005 | Retail | 1.23 |
| 06 Civ. 15293 | Patricio Hansen | 12/19/2006 | Retail | 0.34 |
| 07 Civ. 00937 | Pier Luigi Catto | 2/8/2007 | Retail | 12.99 |
| 06 Civ. 03068 | Rafael Settin | 4/21/2006 | Retail | 2.14 |
| 07 Civ. 00689 | Renato Palladini | 1/29/2007 | Retail & Institutional | 5.73 |
| 06 Civ. 07151 | Renzo Beltramo | 9/18/2006 | Retail & Institutional | 21.64 |
| 13 Civ. 08887 | Ricardo Pons | 12/16/2013 | Retail & Institutional | 0.21 |
| 05 Civ. 04466 | Roberto Fedecostante | 5/6/2005 | Retail & Institutional | 2.24 |
| 07 Civ. 11331 | Romano Organizzazione | 12/17/2007 | Institutional | 12.44 |
| 04 Civ. 02118 | Ruben Chorny | 3/17/2004 | Retail | 2.88 (class action) |
| 07 Civ. 11495 | Rudolf Erb | 12/20/2007 | Retail | 1.38 |
| 05 Civ. 08195 | Sergio Lovati | 9/23/2005 | Retail | . |
| 04 Civ. 00400 | Silvia Seijas | 1/16/2004 | Retail | 14.01 |
| 04 Civ. 00401 | Silvia Seijas | 1/26/2004 | Retail | 12.80 |
| 05 Civ. 10636 | Socrate Pasquali | 12/19/2005 | Retail & Institutional | 3.12 |
| 03 Civ. 01680 | Susana Etevob | 3/11/2003 | Retail & Institutional | . |
| 07 Civ. 07351 | Sylvia Dina Fernandez | 8/17/2007 | Retail | 0.86 |
| 06 Civ. 06221 | Teachers Insurance and Annuity Association of America | 8/16/2006 | Institutional | 58.02 |
| 07 Civ. 02016 | Thomas Herb | 3/8/2007 | Retail | 0.09 |
| 07 Civ. 02015 | Thomas Herb | 3/8/2007 | Retail | 0.23 |
| 13 Civ. 08595 | Tortus Capital Master Fund | 12/3/2013 | Institutional | 0.67 |
| 14 Civ. 01109 | Tortus Capital Master Fund | 2/21/2014 | Institutional | 3.43 |
| 14 Civ. 03127 | Tortus Capital Master Fund | 5/2/2014 | Institutional | 1.03 |
| 07 Civ. 11497 | UVA Vaduz | 12/21/2007 | Institutional | 7.50 |
| 11 Civ. 08817 | VR Global Partners | 12/2/2011 | Institutional | 22.23 |
| 11 Civ. 09719 | VR Global Partners | 12/30/2011 | Institutional | 10.97 |
| 04 Civ. 03639 | Vanina Andrea Exposito | 5/12/2004 | Retail | 0.13 |
| 06 Civ. 13084 | Vegas Games | 11/9/2006 | Institutional | 2.30 |
| 07 Civ. 01797 | Wilton Capital | 3/1/2007 | Institutional | 4.10 |
| 09 Civ. 00401 | Wilton Capital | 1/14/2009 | Institutional | 3.05 |
| 06 Civ. 03196 | Wolfgang Bolland | 4/25/2006 | Retail & Institutional | 2.90 |
| 14 Civ. 05675 | Yellow Crane Holdings | 7/24/2014 | Institutional | 43.71 |
| 07 Civ. 11496 | Zylberberg Fein | 12/21/2007 | Institutional | 6.39 |

## Table 4.4: Argentine defaulted bonds

The table lists the bonds that were eligible to being tendered into the 2005 debt exchange. Name, ISIN, coupon, maturity and face value are extracted from the offer memorandum (Republic of Argentina, 2005). The data on holdouts are computed as the ratio of the eligible amount in the 2010 debt exchange over the eligible amount in the 2005 debt exchange. Data on litigated face value are extracted from the lawsuit complaints, and in this table represented as a share of the face value.

| Name | ISIN | Coupon (%) | Maturity | Face value (Mn USD) | Holdouts | Litigation |
|---|---|---|---|---|---|---|
| Ferrobonos | ARARGE030056 | | . | 5.5 | 3.8% | 0.0% |
| Bonex 92 | ARARGE030122 | 6m LIBOR | 9/15/2002 | 1,199.7 | 11.3% | 0.0% |
| Bontes | ARARGE031633 | 8.75 | 5/9/2002 | 1,513.4 | 10.2% | 0.0% |
| Debt Consolidation Bonds | ARARGE031773 | 1m LIBOR | 12/28/2010 | 364.4 | 12.9% | 0.0% |
| Debt Consolidation Bonds | ARARGE031781 | 1m CD | 12/28/2010 | 0.9 | 5.5% | 0.0% |
| Bontes | ARARGE032086 | ENCUESTA+ 3.2 | 7/21/2003 | 143.1 | 4.2% | 0.0% |
| Bontes | ARARGE032136 | 9.9375 | 9/19/2027 | 3.4 | 0.0% | 0.0% |
| Debt Consolidation Bonds | ARARGE032177 | 3m LIBOR | 4/15/2007 | 628.1 | 13.0% | 0.0% |
| Debt Consolidation Bonds | ARARGE032185 | 1m CD | 4/15/2007 | 114.9 | 4.8% | 0.0% |
| Bontes | ARARGE032409 | 11.25 | 5/24/2001 | 508.7 | 10.3% | 0.0% |
| Bontes | ARARGE032573 | 11.75 | 5/21/2003 | 732.9 | 10.7% | 0.0% |
| Bontes | ARARGE032581 | 12.125 | 5/21/2005 | 759.5 | 9.1% | 0.0% |
| Bono Pagare | ARARGE032714 | ENCUESTA + 4 | 4/24/2002 | 4.0 | 14.2% | 0.0% |
| Bono Pagare | ARARGE032862 | ENCUESTA + 3.3 | 8/22/2002 | 11.3 | 12.2% | 0.0% |
| Bono Pagare | ARARGE032953 | ENCUESTA + 5.8 | 10/30/2002 | 1.4 | 12.1% | 0.0% |
| Bontes | ARARGE033076 | 11.75 | 5/15/2006 | 225.2 | 8.3% | 0.0% |
| Bono Pagare | ARARGE033084 | ENCUESTA + 4.35 | 2/16/2004 | 20.7 | 0.8% | 0.0% |
| Letra del Tesoro | ARARGE033134 | 0 | 3/15/2002 | 448.5 | 5.9% | 0.0% |
| Debt Consolidation Bonds | ARARGE033183 | 1m LIBOR | 1/1/2010 | 66.3 | 3.5% | 0.0% |
| Debt Consolidation Bonds | ARARGE033191 | 1m LIBOR | 1/1/2016 | 13.3 | 8.3% | 0.0% |
| Debt Consolidation Bonds | ARARGE033217 | 3m LIBOR | 4/15/2007 | 51.5 | 11.6% | 0.0% |
| Debt Consolidation Bonds | ARARGE033225 | 1m CD | 4/15/2007 | 30.2 | 14.0% | 0.0% |
| Bono Gobierno Nacional | ARARGE033233 | 9 | 4/16/2002 | 561.8 | 1.1% | 0.0% |
| Pagares | ARARGE033266 | BADLAR + 4.05 | 4/24/2003 | 349.5 | 0.0% | 0.0% |
| Pagares | ARARGE033274 | BADLAR + 4.05 | 5/28/2003 | 351.7 | 0.0% | 0.0% |
| Pagares | ARARGE033340 | ENCUESTA + 5.8 | 6/19/2006 | 14.6 | 0.0% | 0.0% |
| Pagares | ARARGE033415 | BADLAR + 4.5 | 7/24/2006 | 361.9 | 0.0% | 0.0% |
| Pagares | ARARGE033431 | BADLAR + 4.5 | 8/8/2006 | 232.0 | 0.0% | 0.0% |
| Bono Pagare | ARARGE033449 | ENCUESTA + 5.8 | 8/7/2002 | 197.8 | 0.0% | 0.0% |
| Bono Pagare | ARARGE033456 | BADLAR + 3 | 8/7/2002 | 130.0 | 0.0% | 0.0% |
| Bono Pagare | ARARGE033464 | BADLAR + 0.75 | 8/7/2002 | 75.0 | 0.0% | 0.0% |
| Pagares | ARARGE033472 | BADLAR + 4.5 | 8/23/2007 | 186.0 | 0.0% | 0.0% |
| Pagares | ARARGE033480 | BADLAR + 4.5 | 9/4/2007 | 279.1 | 0.0% | 0.0% |
| Pagares | ARARGE033522 | BADLAR + 4 | 9/27/2005 | 464.1 | 0.0% | 0.0% |
| Letra del Tesoro | ARARGE033738 | 0 | 2/15/2002 | 119.7 | 10.7% | 0.0% |
| Letra del Tesoro | ARARGE033746 | 0 | 3/8/2002 | 116.8 | 10.9% | 0.0% |
| Letra del Tesoro | ARARGE033795 | 0 | 2/22/2002 | 25.0 | 15.7% | 0.0% |
| Letra del Tesoro | ARARGE033803 | 0 | 3/22/2002 | 30.8 | 13.0% | 0.0% |
| Debt Consolidation Bonds | ARARGE043836 | 0 | 4/15/2007 | 51.5 | 11.6% | 0.0% |
| Debt Consolidation Bonds | ARP04981BA66 | 1m LIBOR | 4/1/2007 | 496.5 | 11.1% | 0.0% |
| Debt Consolidation Bonds | ARP04981BV04 | 1m CD | 4/1/2007 | 55.9 | 18.7% | 0.0% |
| Debt Consolidation Bonds | ARP04981DG19 | 1m LIBOR | 9/1/2002 | 1,533.1 | 16.2% | 0.0% |
| Debt Consolidation Bonds | ARP04981DH91 | 1m CD | 9/1/2002 | 61.5 | 17.8% | 0.0% |
| ATS Letras Externas | AT0001912331 | 7 | 3/18/2004 | 94.8 | 15.3% | 0.4% |
| CHF Bonds | CH0005458101 | 7 | 12/4/2003 | 253.6 | 25.5% | 0.0% |
| DEM Bonds | DE0001300200 | 10.5 | 11/14/2002 | 667.2 | 27.6% | 0.0% |
| DEM Bonds | DE0001308609 | 10.25 | 2/6/2003 | 667.2 | 24.5% | 0.0% |
| DEM Bonds | DE0001319507 | 11.25 | 4/10/2006 | 667.2 | 36.1% | 0.0% |
| DEM Bonds | DE0001325017 | 11.75 | 5/20/2011 | 667.2 | 50.3% | 0.2% |
| DEM Bonds | DE0001340909 | 9 | 9/19/2003 | 250.2 | 23.3% | 0.6% |
| DEM Bonds | DE0001340917 | 12 | 9/19/2016 | 250.2 | 35.3% | 0.4% |
| DEM Bonds | DE0001348100 | 11.75 | 11/13/2026 | 333.6 | 37.1% | 0.2% |
| DEM Bonds | DE0001354751 | 8.5 | 2/23/2005 | 667.2 | 26.1% | 0.0% |
| DEM Bonds | DE0001767101 | 9 | 11/19/2008 | 333.6 | 29.8% | 0.9% |
| DEM Bonds | DE0001904308 | 7 | 3/18/2004 | 1,000.8 | 24.7% | 0.2% |
| DEM Bonds | DE0001954907 | 8 | 10/30/2009 | 667.2 | 31.5% | 0.2% |
| EUR Bonds | DE0001974608 | 8 | 2/26/2008 | 1,000.8 | 33.5% | 0.2% |

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Table 4.4: Argentine defaulted bonds (continued)

| Name | ISIN | Coupon (%) | Maturity | Face value (Mn USD) | Holdouts | Litigation |
|---|---|---|---|---|---|---|
| EUR Bonds | DE0002466208 | 9 | 6/20/2003 | 1,305.0 | 45.5% | 0.0% |
| EUR Bonds | DE0002483203 | 9 | 7/6/2010 | 667.2 | 33.9% | 0.2% |
| DEM Bonds | DE0002488509 | 7.875 | 7/29/2005 | 500.4 | 11.2% | 0.0% |
| EUR Bonds | DE0002923851 | 8 | 2/26/2008 | 456.7 | 37.0% | 0.2% |
| EUR Bonds | DE0002929452 | 9.5 | 3/4/2004 | 522.0 | 36.4% | 0.0% |
| EUR Bonds | DE0002966900 | 8 | 2/26/2008 | 326.2 | 37.8% | 0.0% |
| EUR Bonds | DE0002998952 | 9 | 4/26/2006 | 587.2 | 40.2% | 0.1% |
| EUR Bonds | DE0003045357 | 9 | 5/26/2009 | 848.2 | 42.1% | 0.2% |
| EUR Bonds | DE0003089850 | 8.5 | 7/1/2004 | 848.2 | 46.0% | 0.0% |
| EUR Bonds | DE0003527966 | 9.25 | 10/21/2002 | 652.5 | 52.3% | 0.1% |
| EUR Bonds | DE0003538914 | 9.75 | 11/26/2003 | 326.2 | 44.3% | 0.0% |
| Par Bonds | DE0004103007 | 5.87 | 3/31/2023 | 189.8 | 31.9% | 0.0% |
| Discount Bonds | DE0004103015 | LIBOR + 0.8125 | 3/31/2023 | 188.1 | 5.4% | 0.0% |
| EUR Bonds | DE0004500558 | 10 | 12/7/2004 | 522.0 | 43.1% | 0.0% |
| EUR Bonds | DE0004509005 | 10.25 | 1/26/2007 | 978.7 | 43.1% | 0.4% |
| EUR Bonds | DE0005450258 | 10 | 9/7/2007 | 652.5 | 31.9% | 0.1% |
| ESP Bonds | ES0273541013 | 7.5 | 5/23/2002 | 156.9 | 25.7% | 0.0% |
| Samurai Bonds | IT0006527292 | 8 | 2/25/2002 | 195.7 | 57.2% | 0.0% |
| EUR Bonds | IT0006529769 | EURIBOR + 4 | 7/22/2003 | 130.5 | 31.2% | 0.0% |
| Samurai Bonds | JP503200A061 | 5.125 | 6/14/2004 | 584.8 | 0.0% | 0.0% |
| Samurai Bonds | JP503200A095 | 4.85 | 9/26/2005 | 599.4 | 0.0% | 0.0% |
| Samurai Bonds | JP503200ASC0 | 5 | 12/20/2002 | 487.3 | 0.0% | 0.0% |
| Samurai Bonds | JP503200AWC2 | 5.4 | 12/17/2003 | 194.9 | 0.0% | 0.0% |
| Global Bonds | US040114AH34 | 8.375 | 12/20/2003 | 1,794.4 | 26.5% | 6.0% |
| Global Bonds | US040114AN02 | 11 | 10/9/2006 | 1,185.4 | 39.7% | 18.9% |
| Global Bonds | US040114AR16 | 11.375 | 1/30/2017 | 1,903.7 | 28.6% | 11.2% |
| Global Bonds | US040114AV28 | 9.75 | 9/19/2027 | 809.5 | 24.3% | 7.4% |
| Adjustable Margin Bonds | US040114AW01 | 14.25 | 11/30/2002 | 130.1 | 63.3% | 8.9% |
| FRAN Bonds | US040114AX83 | FRAN | 4/10/2005 | 383.5 | 78.4% | 78.4% |
| Global Bonds | US040114AZ32 | 11 | 12/4/2005 | 821.6 | 36.6% | 11.2% |
| Global Bonds | US040114BC38 | 12.125 | 2/25/2019 | 146.8 | 40.4% | 33.9% |
| Global Bonds | US040114BD11 | 8.875 | 3/1/2029 | 125.0 | 27.4% | 16.3% |
| Global Bonds | US040114BE93 | 11.75 | 4/7/2009 | 1,197.0 | 32.1% | 17.5% |
| Global Bonds | US040114BK53 | 0 | 10/15/2003 | 250.0 | 13.5% | 0.0% |
| Global Bonds | US040114BL37 | 0 | 10/15/2004 | 250.0 | 54.5% | 0.0% |
| Global Bonds | US040114FB19 | 12 | 2/1/2020 | 121.7 | 69.2% | 61.2% |
| Global Bonds | US040114FC91 | 11.375 | 3/15/2010 | 775.0 | 25.9% | 15.1% |
| Global Bonds | US040114GA27 | 11.75 | 6/15/2015 | 718.2 | 23.6% | 5.2% |
| Global Bonds | US040114GB00 | 10.25 | 7/21/2030 | 166.0 | 74.9% | 73.0% |
| Global Bonds | US040114GD65 | 12.375 | 2/21/2012 | 465.3 | 36.1% | 25.6% |
| Global Bonds | US040114GF14 | 15.5 | 12/19/2008 | 5,024.7 | 8.8% | 3.8% |
| Global Bonds | US040114GG96 | 12.25 | 6/19/2018 | 5,480.6 | 8.2% | 7.0% |
| Global Bonds | US040114GH79 | 12 | 6/19/2031 | 8,108.6 | 5.5% | 5.0% |
| Strip Coupon | US04011NAL29 | 0 | 5/28/2006 | 464.9 | 11.1% | 3.1% |
| Strip Coupon | US04011NAM02 | 0 | 5/28/2011 | 464.9 | 4.2% | 2.6% |
| Strip Coupon | US04011NAN84 | 0 | 5/28/2016 | 464.9 | 22.5% | 0.0% |
| Strip Coupon | US04011NAP33 | 0 | 5/28/2021 | 464.9 | 1.1% | 0.0% |
| Strip Coupon | US04011NAQ16 | 0 | 5/28/2026 | 464.9 | 3.5% | 0.0% |
| Letras Externas | US04011NAR98 | 0 | 5/28/2028 | 978.7 | 8.9% | 0.0% |
| Letras Externas | US04011NAS71 | 6.9 | 4/6/2004 | 225.9 | 34.7% | 0.0% |
| Letras Externas | USP0450KAB90 | 11.75 | 2/12/2007 | 5.8 | 3.7% | 0.0% |
| Letras Externas | USP8055KAP05 | 8.75 | 7/10/2002 | 20.2 | 18.3% | 0.0% |
| Letras Externas | USP8055KFQ33 | 9 | 5/24/2005 | 978.7 | 40.3% | 5.2% |
| Global Bonds | USP8055KGV19 | 12 | 1/31/2031 | 13.2 | 0.2% | 0.0% |
| Discount Bonds | XS0043118172 | LIBOR + 0.8125 | 3/31/2023 | 800.5 | 9.7% | 4.8% |
| Discount Bonds | XS0043118339 | LIBOR + 0.8125 | 3/31/2023 | 800.5 | 9.7% | 0.0% |
| Par Bonds | XS0043119147 | 6 | 3/31/2023 | 2,259.6 | 8.2% | 4.1% |
| Par Bonds | XS0043119576 | 6 | 3/31/2023 | 2,259.6 | 8.2% | 0.0% |
| USD Bonds | XS0043120236 | LIBOR + 0.8125 | 3/29/2005 | 2,923.5 | 6.6% | 0.3% |
| USD Bonds | XS0043120582 | LIBOR + 0.8125 | 3/29/2005 | 2,923.5 | 6.6% | 0.4% |
| USD Bonds | XS0043120822 | LIBOR + 0.8125 | 3/29/2005 | 2,923.5 | 6.6% | 0.0% |
| Letras Externas | XS0064910812 | 7.4 | 4/4/2006 | 68.2 | 3.3% | 0.0% |
| Letras Externas | XS0065490988 | 7.4 | 4/25/2006 | 78.0 | 12.5% | 0.0% |
| Letras Externas | XS0066125559 | 7.4 | 5/15/2006 | 78.0 | 1.3% | 0.0% |

*continues on next page*

Table 4.4: Argentine defaulted bonds (continued)

| Name | ISIN | Coupon (%) | Maturity | Face value (Mn USD) | Holdouts | Litigation |
|---|---|---|---|---|---|---|
| Letras Externas | XS0070531420 | 11 | 11/5/2003 | 337.0 | 46.6% | 0.2% |
| Letras Externas | XS0070808166 | 6 | 3/24/2005 | 487.3 | 1.9% | 0.0% |
| Letras Externas | XS0071898349 | 10 | 1/3/2007 | 404.4 | 43.4% | 2.2% |
| Letras Externas | XS0076249308 | 4.4 | 5/27/2004 | 487.3 | 3.9% | 0.0% |
| Letras Externas | XS0076397248 | LIBOR + 1.6 | 5/27/2004 | 337.0 | 38.1% | 4.8% |
| Letras Externas | XS0077243730 | 10 | 6/25/2007 | 376.2 | 16.4% | 0.0% |
| Letras Externas | XS0078502399 | 7.625 | 8/11/2007 | 505.5 | 45.6% | 0.3% |
| Letras Externas | XS0080809253 | 7 | 3/18/2004 | 505.5 | 44.2% | 4.7% |
| Letras Externas | XS0081057589 | 7 | 3/18/2004 | 252.7 | 45.4% | 2.3% |
| Letras Externas | XS0084071421 | 8.75 | 2/4/2003 | 783.0 | 38.8% | 2.1% |
| Letras Externas | XS0084832483 | 8 | 10/30/2009 | 505.5 | 43.0% | 0.3% |
| Global Bonds | XS0086333472 | 8.125 | 4/21/2008 | 978.7 | 41.7% | 3.5% |
| Letras Externas | XS0088590863 | LIBOR + 2.5 | 7/13/2005 | 674.0 | 40.5% | 4.8% |
| Letras Externas | XS0089277825 | 8.5 | 7/30/2010 | 652.5 | 39.1% | 0.3% |
| Letras Externas | XS0096960751 | 7 | 3/18/2004 | 521.5 | 43.2% | 4.4% |
| Letras Externas | XS0098314874 | 7.125 | 6/10/2002 | 261.0 | 38.6% | 0.0% |
| Letras Externas | XS0100354066 | 3.5 | 8/11/2009 | 175.4 | 14.1% | 0.0% |
| EUR Bonds | XS0103457585 | 8 | 2/26/2008 | 594.5 | 28.3% | 0.1% |
| Letras Externas | XS0105224470 | EURIBOR + 5.10 | 12/22/2004 | 261.0 | 30.2% | 6.1% |
| Letras Externas | XS0105694789 | 10 | 1/7/2005 | 848.1 | 44.5% | 6.2% |
| Letras Externas | XS0109203298 | 8.125 | 10/4/2004 | 652.5 | 46.4% | 0.0% |
| Letras Externas | XS0113833510 | 9.25 | 7/20/2004 | 1,305.0 | 41.2% | 0.0% |
| Letras Externas | XS0124528703 | 10 | 2/22/2007 | 652.5 | 35.9% | 3.7% |
| Global Bonds | XS0130278467 | 4 | 9/19/2008 | 247.7 | 82.1% | 82.1% |

Table 4.5: Summary statistics

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. | Source |
|---|---|---|---|---|---|---|
| Holdout rate | 145 | 22.50 | 18.82 | 0.00 | 82.09 | Republic of Argentina (2005, 2010) |
| Litigation rate | 145 | 3.85 | 12.80 | 0.00 | 82.09 | Court documents |
| Litigation rate (retail) | 145 | 0.19 | 0.68 | 0.00 | 5.12 | Court documents |
| Litigation rate (professional) | 145 | 3.62 | 12.64 | 0.00 | 82.09 | Court documents |
| Litigation rate (pre 2005) | 145 | 1.88 | 10.25 | 0.00 | 82.09 | Court documents |
| Litigation rate (pre pari passu) | 145 | 3.79 | 12.75 | 0.00 | 82.09 | Court documents |
| Litigation/Holdout rate | 129 | 11.50 | 24.65 | 0.00 | 100.00 | Court documents |
| Litigation/Holdout rate (retail) | 129 | 0.82 | 2.48 | 0.00 | 14.18 | Court documents |
| Litigation/Holdout rate (professional) | 129 | 10.499 | 23.443 | 0 | 100.00 | Court documents |
| Litigation/Holdout rate (pre 2005) | 129 | 3.37 | 14.30 | 0.00 | 100.00 | Court documents |
| Litigation/Holdout rate (pre pari passu) | 129 | 11.23 | 24.24 | 0.00 | 100.00 | Court documents |
| Retail bond (coupon) | 145 | 0.455 | 0.5 | 0 | 1 | Prospectus, Bloomberg |
| Retail bond (min. increment) | 145 | 0.51 | 0.502 | 0 | 1 | Prospectus, Bloomberg |
| Exchange listed | 145 | 0.848 | 0.36 | 0 | 1 | Bloomberg |
| Brady bond | 145 | 0.041 | 0.2 | 0 | 1 | Republic of Argentina (2005) |
| Coupon | 144 | 10.04 | 8.51 | 0.00 | 44.82 | Bloomberg, Sturzenegger and Zettelmeyer (2005) |
| Principal (USD mn) | 145 | 650.40 | 999.67 | 0.89 | 8108.63 | Republic of Argentina (2005) |
| Time to maturity (years) | 144 | 3.09 | 7.34 | -4.05 | 26.04 | Prospectus, Bloomberg |
| Gov. law NY | 145 | 0.32 | 0.47 | 0 | 1 | Prospectus, Bloomberg, Dealogic |
| Gov. law UK | 145 | 0.23 | 0.43 | 0 | 1 | Prospectus, Bloomberg, Dealogic |
| Gov. law other | 145 | 0.44 | 0.50 | 0 | 1 | Prospectus, Bloomberg, Dealogic |
| NPV haircut | 63 | 68.82 | 7.42 | 37.82 | 87.26 | Sturzenegger and Zettelmeyer (2005) |

## Table 4.6: Determinants of holdout rates

The table shows regressions in a cross-section of restructured Argentine bonds. The dependent variable in all specifications is the holdout rate, defined as the share of eligible principal not tendered into the 2005 debt exchange. Columns (1)-(6) are estimated using OLS. Column (7) is estimated in a fractional response GLM. Note that all standard errors are robust to heteroskedasticity.

| | (1) Retail bonds | (2) Listing | (3) Brady bonds | (4) Bond parameters | (5) Governing law | (6) Full model | (7) Fraction. response |
|---|---|---|---|---|---|---|---|
| Retail bond | 10.745*** | | | | | 19.393*** | 0.195*** |
| | (2.973) | | | | | (3.401) | (0.033) |
| Exchange listed | | 10.630*** | | | | 19.459*** | 0.200*** |
| | | (3.875) | | | | (4.961) | (0.054) |
| Brady bond | | | -10.750*** | | | -10.262* | -0.145** |
| | | | (4.015) | | | (6.044) | (0.058) |
| Coupon | | | | -0.190 | | -0.066 | -0.125 |
| | | | | (0.271) | | (0.246) | (0.295) |
| Principal (USD mn) | | | | -0.002 | | -0.003** | -0.000** |
| | | | | (0.001) | | (0.001) | (0.000) |
| Years to maturity | | | | -0.048 | | 0.168 | 0.002 |
| | | | | (0.266) | | (0.289) | (0.003) |
| Gov. law NY | | | | | 4.029 | 15.760*** | 0.170*** |
| | | | | | (3.907) | (4.421) | (0.043) |
| Gov. law UK | | | | | 4.731 | 3.957 | 0.047 |
| | | | | | (3.506) | (3.672) | (0.034) |
| Constant | 17.604*** | 13.478*** | 22.940*** | 25.677*** | 20.080*** | -6.296 | |
| | (2.183) | (3.483) | (1.617) | (3.033) | (2.163) | (6.195) | |
| Adj. R2 | 0.08 | 0.03 | 0.01 | -0.01 | -0.00 | 0.23 | |
| Obs | 145 | 145 | 145 | 144 | 145 | 144 | 144 |
| $p > \chi^2$ | 0.00 | 0.01 | 0.01 | 0.20 | 0.34 | 0.00 | 0.00 |

## Table 4.7: Determinants of litigation rates

The table shows regressions in a cross-section of restructured Argentine bonds. The dependent variable in all specifications is the litigation rate, defined as the share of eligible principal that was subject to litigation in the SDNY between 2002-14. Columns (1)-(6) are estimated using OLS. Column (7) is estimated in a fractional response GLM. Note that all standard errors are robust to heteroskedasticity.

| | (1) Retail bonds | (2) Listing | (3) Brady bonds | (4) Bond parameters | (5) Governing law | (6) Full model | (7) Fraction. response |
|---|---|---|---|---|---|---|---|
| Retail bond | -5.899*** | | | | | -0.067 | -0.013 |
| | (1.908) | | | | | (1.365) | (0.013) |
| Exchange listed | | 2.954** | | | | 3.573 | 0.048* |
| | | (1.455) | | | | (2.224) | (0.025) |
| Brady bond | | | -2.467* | | | -12.392** | -0.062*** |
| | | | (1.410) | | | (5.075) | (0.023) |
| Coupon | | | | 0.303 | | 0.240 | 0.178 |
| | | | | (0.246) | | (0.249) | (0.120) |
| Principal (USD mn) | | | | -0.001 | | -0.002** | -0.000** |
| | | | | (0.001) | | (0.001) | (0.000) |
| Years to maturity | | | | 0.502** | | 0.492* | 0.003*** |
| | | | | (0.237) | | (0.261) | (0.001) |
| Gov. law NY | | | | | 10.660*** | 11.157*** | 0.117*** |
| | | | | | (3.048) | (3.579) | (0.029) |
| Gov. law UK | | | | | 1.274*** | 2.678** | 0.085*** |
| | | | | | (0.358) | (1.301) | (0.024) |
| Constant | 6.538*** | 1.347* | 3.955*** | -0.140 | 0.099*** | -5.320 | |
| | (1.900) | (0.752) | (1.111) | (2.288) | (0.038) | (3.622) | |
| Adj. R2 | 0.05 | -0.00 | -0.01 | 0.08 | 0.13 | 0.21 | |
| Obs | 145 | 145 | 145 | 144 | 145 | 144 | 144 |
| $p > \chi^2$ | 0.00 | 0.04 | 0.08 | 0.09 | 0.00 | 0.00 | 0.00 |

## Table 4.8: Determinants of litigation rates (sub-samples)

The table shows results from exchanging the dependent variable but keeping the rest of the model based on column 6 in Table 4.7. Column (1) defines the litigation rate only taking into account claims filed by retail investors. Column 2 only considers claims brought by institutional investors. Columns (3) and (4) use time subsamples, considering only the claims filed prior to the 2005 debt restructuring, or the 2012 *pari passu* affirmation by the Second Circuit appeals court.

| | (1) Retail creditors | (2) Institutional creditors | (3) Pre 2005 | (4) Pre Pari Passu |
|---|---|---|---|---|
| Retail bond | -0.017 | -0.028 | -0.063 | -0.037 |
| | (0.044) | (1.358) | (0.874) | (1.364) |
| Exchange listed | 0.167** | 3.371 | 2.811 | 3.523 |
| | (0.072) | (2.200) | (1.876) | (2.219) |
| Brady bond | -0.484** | -11.928** | -8.562* | -12.348** |
| | (0.200) | (5.063) | (4.742) | (5.069) |
| Coupon | 0.000 | 0.241 | 0.092 | 0.241 |
| | (0.004) | (0.251) | (0.147) | (0.250) |
| Principal (USD mn) | 0.000 | -0.002** | -0.002** | -0.002** |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| Years to maturity | 0.005 | 0.491* | 0.345 | 0.494* |
| | (0.007) | (0.262) | (0.248) | (0.261) |
| Gov. law NY | 0.480*** | 10.523*** | 6.287** | 10.963*** |
| | (0.179) | (3.563) | (2.774) | (3.573) |
| Gov. law UK | 0.028 | 2.634** | 0.706 | 2.657** |
| | (0.037) | (1.296) | (0.746) | (1.302) |
| Constant | -0.133 | -5.177 | -3.034 | -5.292 |
| | (0.082) | (3.630) | (2.375) | (3.629) |
| Adj. R2 | 0.10 | 0.20 | 0.10 | 0.21 |
| Obs | 144 | 144 | 144 | 144 |
| $p > \chi^2$ | 0.18 | 0.00 | 0.45 | 0.00 |

## Table 4.9: Determinants of litigation ratios

The table shows regressions in a cross-section of restructured Argentine bonds. The dependent variable in all specifications is the litigation ratio, defined as the ratio of litigation to holdout rates. Note that since 16 bonds were completely tendered into the 2005 exchange, the number of observations is lower than in the previous tables. Columns (1)-(6) are estimated using OLS. Column (7) is estimated in a fractional response GLM. Note that all standard errors are robust to heteroskedasticity.

| | (1) Retail bonds | (2) Listing | (3) Brady bonds | (4) Bond parameters | (5) Governing law | (6) Full model | (7) Fraction. response |
|---|---|---|---|---|---|---|---|
| Retail bond | -16.485*** | | | | | -5.854*** | -0.046* |
| | (3.975) | | | | | (2.156) | (0.028) |
| Exchange listed | | 2.503 | | | | 6.558 | 0.055 |
| | | (5.226) | | | | (6.333) | (0.053) |
| Brady bond | | | 5.381 | | | -20.179* | -0.094* |
| | | | (9.930) | | | (11.023) | (0.056) |
| Coupon | | | | 1.159** | | 0.788 | 0.395 |
| | | | | (0.522) | | (0.558) | (0.272) |
| Principal (USD mn) | | | | 0.006*** | | 0.004** | 0.000* |
| | | | | (0.002) | | (0.002) | (0.000) |
| Years to maturity | | | | 1.271*** | | 1.343*** | 0.008*** |
| | | | | (0.378) | | (0.394) | (0.002) |
| Gov. law NY | | | | | 27.194*** | 16.232*** | 0.218*** |
| | | | | | (5.103) | (4.546) | (0.046) |
| Gov. law UK | | | | | 5.459** | 8.258*** | 0.184*** |
| | | | | | (2.088) | (2.628) | (0.039) |
| Constant | 19.425*** | 9.349** | 11.252*** | -6.730 | 0.367*** | -12.211* | |
| | (3.807) | (4.634) | (2.233) | (4.311) | (0.127) | (7.068) | |
| Adj. R2 | 0.11 | -0.01 | -0.01 | 0.31 | 0.23 | 0.41 | |
| Obs | 129 | 129 | 129 | 128 | 129 | 128 | 128 |
| $p > \chi^2$ | 0.00 | 0.63 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 |

## Table 4.10: Determinants of litigation ratios (sub-samples)

The table shows results from exchanging the dependent variable but keeping the rest of the model based on column (6) in Table 4.9. Column (1) defines the litigation rate only taking into account claims filed by retail investors. Column (2) only considers claims brought by institutional investors. Columns (3) and (4) use time subsamples, considering only the claims filed prior to the 2005 debt restructuring, or the 2012 *pari passu* affirmation by the Second Circuit appeals court.

| | (1) Retail creditors | (2) Institutional creditors | (3) Pre 2005 | (4) Pre Pari Passu |
|---|---|---|---|---|
| Retail bond | -0.259 | -5.536*** | -1.704 | -5.728*** |
| | (0.180) | (2.099) | (1.040) | (2.130) |
| Exchange listed | 0.632** | 5.669 | 5.976 | 6.216 |
| | (0.311) | (6.248) | (3.730) | (6.286) |
| Brady bond | -1.713** | -19.412* | -14.038** | -20.664* |
| | (0.769) | (10.716) | (6.854) | (10.697) |
| Coupon | 0.017 | 0.773 | 0.301 | 0.786 |
| | (0.030) | (0.570) | (0.353) | (0.561) |
| Principal (USD mn) | 0.001 | 0.003 | -0.002 | 0.003* |
| | (0.000) | (0.002) | (0.001) | (0.002) |
| Years to maturity | 0.017 | 1.336*** | 0.620* | 1.335*** |
| | (0.031) | (0.399) | (0.365) | (0.395) |
| Gov. law NY | 1.486*** | 14.319*** | 8.507** | 15.791*** |
| | (0.556) | (4.377) | (3.902) | (4.494) |
| Gov. law UK | 0.161 | 7.968*** | 1.953 | 8.105*** |
| | (0.155) | (2.573) | (1.186) | (2.609) |
| Constant | -0.762* | -11.213 | -6.912* | -11.750* |
| | (0.399) | (6.997) | (3.635) | (7.014) |
| Adj. R2 | 0.21 | 0.38 | 0.17 | 0.40 |
| Obs | 128 | 128 | 128 | 128 |
| $p > \chi^2$ | 0.04 | 0.00 | 0.00 | 0.00 |

## Table 4.11: Robustness: Alternative retail bond indicator

The table presents the main models from tables 4.6, 4.7, and 4.9 but exchanges the previously used retail bond indicator (based on coupon structure) by a retail indicator based on the minimum tradeable unit. A retail bond is defined as a bond with a minimum denomination unit of less than USD 10,000 which is denominated in a currency other than the USD.

| | (1) Holdouts | (2) Litigation share | (3) Litigation/ Holdouts |
|---|---|---|---|
| Retail | 20.770*** | 0.128 | -6.547** |
| | (3.499) | (1.889) | (3.059) |
| Coupon | 0.016 | 0.264 | 0.876 |
| | (0.245) | (0.254) | (0.540) |
| Principal (USD mn) | -0.002* | -0.002** | 0.004* |
| | (0.001) | (0.001) | (0.002) |
| Years to maturity | 0.002 | 0.364 | 1.147*** |
| | (0.261) | (0.223) | (0.336) |
| Gov. law NY | 17.599*** | 10.832*** | 14.292*** |
| | (4.716) | (3.674) | (4.630) |
| Gov. law UK | 3.361 | 3.239*** | 9.582*** |
| | (3.483) | (1.217) | (2.819) |
| Exchange listed | 16.530*** | 3.910* | 8.007 |
| | (4.212) | (2.356) | (6.692) |
| Constant | -7.137 | -6.150 | -13.437* |
| | (5.358) | (3.869) | (7.353) |
| Adj. R2 | 0.23 | 0.18 | 0.39 |
| Obs | 144 | 144 | 128 |
| $p > \chi^2$ | 0.00 | 0.00 | 0.00 |

Table 4.12: Robustness: Other determinants of litigation rates

This table presents robustness checks by adding more variables which might affect the litigation ratio. Column (1) uses as the dependent variable the litigation ratio without the cases filed by NML Capital, the largest individual plaintiff (see Table 4.2).

| | (1) NML lead | (2) Haircut |
|---|---|---|
| Litigated by NML | 21.791** | |
| | (8.455) | |
| NPV Haircut | | 1.259** |
| | | (0.555) |
| Exchange listed | -3.313** | |
| | (1.614) | |
| Retail | -1.196 | 55.965* |
| | (5.494) | (31.412) |
| Brady bond | -0.391 | |
| | (11.577) | |
| Coupon | 0.145 | 0.399 |
| | (0.269) | (0.554) |
| Principal (USD mn) | 0.006*** | 0.000 |
| | (0.002) | (0.002) |
| Years to maturity | 0.338 | 2.346*** |
| | (0.316) | (0.524) |
| Gov. law NY | 7.073 | 14.384** |
| | (4.556) | (6.189) |
| Gov. law UK | 5.513*** | 2.567 |
| | (1.944) | (3.294) |
| Constant | -0.802 | -141.200*** |
| | (5.706) | (49.418) |
| Adj. R2 | 0.38 | 0.56 |
| Obs | 128 | 53 |
| $p > \chi^2$ | 0.00 | 0.00 |

# Appendix

## Proof of lemma 4.1

*Proof.* All creditors compare the expected value of $V_i^H$ to $V_i^P$ in the first period to decide whether to hold out or to participate in the initial offer. They become holdout creditors only if:

$$E_1\left(V_i^H\right) > E_1\left(V_i^P\right) \tag{4.12}$$

Solving this expression for $c_i$ returns:

$$c_i < p + \frac{1}{2}h_2^S + \mu_i - 1 + \sqrt{(h_2^S + \mu_i)^2 + 2(h_2^S + \mu_i - 2h_1 + 2r - 2h_1 r) + 1} \tag{4.13}$$

Let $c_i^*$ be the marginal $c_i$ for which this inequality is equalized. This defines the share of creditors who hold out:

$$\int_0^{c_i^*} f(c_i)\ \ dc_i \equiv \Gamma(p, h_1, h_2^S, r, \mu_i) \tag{4.14}$$

$c_i^*$ is increasing in $p$ and $\mu$, and hence is $\Gamma$. □

Figure A1: Exemplary complaint

This is an excerpt from the complaint by two subordinates of the hedge fund Aurelius, filed in February 2010 in the SDNY. It exemplifies the legal basis of the lawsuits and the basis for the data coding. Paragraph §4 explains the the cause of the action. The following paragraphs list which bonds the plaintiffs owns. The case is *Aurelius Opportunities Fund II and Aurelius Capital Master v. The Republic of Argentina*, 10 Civ. 1602, SDNY.

**Nature of the Action**

1. This is an action for breach of contract.

2. Aurelius Opportunities Fund II, LLC is the beneficial owner of $3,557,000 in original principal amount of debt securities, as more particularly described below, issued by the Republic of Argentina pursuant to a Fiscal Agency Agreement

**[...]**

4. On December 24, 2001, the Republic of Argentina declared a moratorium on the payment of principal and interest with respect to all of its external debt, including the debt securities issued pursuant to the Fiscal Agency Agreement that

**[...]**

***The Debt Securities Owned by Plaintiff***

19. Aurelius Opportunities Fund II, LLC is the beneficial owner of $1,807,000 in original principal amount of the Global Bonds due June 19, 2018, bearing interest at 12.25%, ISIN No. US040114GG96. The Global Bonds were issued by the

**[...]**

# Chapter 5

# Sovereign Debt Crises and Bond Market Liquidity[1]

How liquid are sovereign bond markets during distress? And what impact does market liquidity have on sovereign spreads? Using a comprehensive dataset of emerging economies' actively traded sovereign bonds, this paper analyzes these questions for countries experiencing a sovereign debt crisis between 1998-2012. I find that bid-ask spreads rise significantly in the run-up to sovereign defaults and with increasing return volatility, but market conditions improve after debt exchanges take place. In a second step, I estimate how much of the sovereign spread can be attributed to liquidity risk. During calm times, liquidity risk is negligible, but during periods of distress, it contributes significantly to the spread over risk-free bonds relative to credit risk. These findings are consistent with predictions from inventory-based as well as more recent search-based theories.

*Keywords: Sovereign Bonds, Market Liquidity, Debt Crisis*

*JEL classification: G12, F34*

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## 5.1 Introduction

In spring 2010, concerns about the lack of market liquidity led the European Central Bank (ECB) to an unprecedented intervention in markets for sovereign bonds of peripheral European governments: in order to ensure "depth and liquidity" in these markets, the ECB bought sovereign debt worth more than EUR 200bn (Trebesch and Zettelmeyer, 2013). While the ECB's actions may have had various unofficial reasons, the publicly stated rationale for the implementation of the Securities Markets Programme was to ensure sufficiently liquid market conditions, so that the transmission of policy rates would not be hampered in the Eurozone's crisis countries.[2] However, illiquidity in government bond markets not only impairs monetary policy transmission. It also contributes to government borrowing rates and thereby skews the country risk perception of investors (Alquist, 2010; Lesmond, 2005; Acharya and Pedersen, 2005; Duffie et al., 2003). A number of recent theories predict negative feedback loops in which a lack of market liquidity can even trigger earlier endogenous defaults in the economy (He and Milbradt, 2014; Brunnermeier and Pedersen, 2009)

What is meant by market liquidity? The textbook understanding of trading on markets, financial and otherwise, is that supply and demand determine a unique equilibrium price which depends on the quantities offered and requested by market participants. At this unique price, markets clear – i.e., buyers purchase and sellers supply their desired quantity of the good or asset. In practice, however, sellers and buyers often do not meet directly, but rely on intermediaries for facilitating the actual trade instead. Car dealers, for instance, assume this role for used cars: they take up cars offered by sellers wishing to liquidate their vehicles, and keep it in their inventory until a buyer demands it. The car dealer receives compensation for this inventory role by paying less to sellers than charging to buyers. This is where market liquidity becomes important: the more liquid the market for used cars is, the smaller this price difference will be, and thus the more efficient the resource allocation. In the case of financial assets, the equivalent service is offered by investment banks and other so-called market makers. Their inventories, the trading books, provide market liquidity, i.e. they allow for swift and easy trading among market participants who do not meet directly. Market makers generate compensation for this service by paying a lower price to investors who want to sell *(bid price)* and demanding a higher price from investors who want to buy an asset (*ask* or *offer price)*. The spread between these bid and ask prices is a common measure for the liquidity of a market since it directly reflects the transaction costs between market participants (Amihud and Mendelson, 1986, 1991). Thus, *market* liquidity describes market conditions, not agent endowments; it is therefore a distinct concept from *funding* liquidity, which describes the capital endowment of an economic agent in the form of equity or debt

[2]See ECB (2010): "In view of the current exceptional circumstances prevailing in the market, the Governing Council decided (...) [t]o conduct interventions in the euro area public and private debt securities markets (Securities Markets Programme) to ensure depth and liquidity in those market segments which are dysfunctional." For an analysis of the effects of this programme see De Pooter et al. (2013).

(Brunnermeier and Pedersen, 2009).

Sufficient market liquidity in the form of narrow bid-ask spreads therefore lies at the core of smooth and efficient risk allocation on financial markets. When market liquidity dries up, investors are no longer able to quickly adjust their portfolios to newly arriving information, or to correctly price the assets they hold on their balance sheet. Furthermore, if bid-ask spreads increase, investors will demand a larger premium upfront in order to compensate for the higher transaction costs from paying larger fees to market makers. This becomes particularly problematic during financial crises, when reliable prices are most needed to judge the value of current positions, allocate risk efficiently, and when issuers need market access the most.

Despite a vast literature on the topic in corporate finance, there is little evidence on the dynamics of sovereign debt market liquidity, particularly in times of distress. How liquid are markets during debt crises? And what is the impact of market liquidity on sovereign spreads? This paper analyzes these questions for sovereign debt crises of emerging economies between 1998-2012 using a previously unexploited data set of daily bond-by-bond price quotes underlying JP Morgan's widely used Emerging Markets Bond Index (EMBI). More specifically, I estimate the impact of the probability of default and return volatility on bid-ask spreads as predicted by simple inventory-based models akin to Stoll (1978) or Ho and Stoll (1981). In the second part of the analysis, I estimate the impact of liquidity risk relative to credit risk on government borrowing costs, measured as the spread between the yield to maturity on risky government bonds and risk-free bonds.

My main finding is that markets become increasingly illiquid as a debt crisis worsens and uncertainty about the bonds' value increases. Following a stylized time line of typical crisis events, distressed sovereign bond markets remain significantly less liquid than non-distressed markets from the first negative return shocks until bonds are exchanged for new instruments. Estimates from event studies indicate that bid-ask spreads rise significantly by 2.7 percentage points in response to large and persistent negative return shocks. After payment defaults or the announcement of restructuring negotiations, bid-ask spreads widen by 2.9 percentage points. Liquidity only returns to the market once debt restructurings take place, with bid-ask spreads narrowing by 2.6 percentage points immediately after an exchange. The data also reveal dynamic effects surrounding these crisis events: while return shocks seem to come unexpected and impact market liquidity only in the aftermath of the event, defaults are anticipated and thus are correlated with widening bid-ask spreads up to two weeks before the actual event.

These indicative findings are confirmed using a broad panel encompassing the bonds of 79 emerging economies, including both defaulting and non-defaulting crisis countries. Computing market-implied default probabilities based on credit default swaps (CDS) premia and empirically observed recovery values from Cruces and Trebesch (2013), I find that a 10 percentage point increase in the risk of default is correlated with a bid-ask spread widening of 50 basis points (bps). Similarly, more volatile bonds are significantly

less liquid. These findings hold under control for a number of bond-specific variables as well as global risk developments.

These results are in line with predictions from inventory-based theories of market liquidity (Stoll, 1978; Ho and Stoll, 1981). If a bond is more volatile, the additional price risk which the market maker takes in his portfolio through his trading book will lead him to increase the spread. A simple extension of the original model makes similar predictions about the impact of rising default risk. More broadly, the results are also consistent with more recent search-based theories, which predict adverse feedback loops from default risk and market illiquidity (He and Milbradt, 2014).

In the second part of the empirical analysis, I estimate how much of the sovereign spread over risk-free assets can be attributed to liquidity concerns. Following the methodology of Beber et al. (2009), I find that during non-crisis times, the contribution of market liquidity risk relative to credit risk is negligible, accounting for less than five percent of the spread. However, this changes considerably depending on the risk environment. For low-risk states, with sovereign spreads below 5%, liquidity risk is essentially irrelevant. For crisis states, with spreads above 10% (Pescatori and Sy, 2007), the contribution of liquidty risk relative to credit risk almost doubles as compared to the full sample. The relation holds not only over time between high- and low-risk environments, but also across defaulting and non-defaulting countries. The results are furthermore consistent with previous studies on the role of market liquidity as a priced risk factor (Duffie et al., 2003; Acharya and Pedersen, 2005; Levy Yeyati et al., 2008; Beber et al., 2009; Favero et al., 2010; Ejsing et al., 2012; De Pooter et al., 2013; Schwarz, 2014).

**Related Literature** The findings in this paper contribute to the intersection of finance and international economics and therefore relate to at least two strands of the literature. First, there is a vast pricing literature on the role of market liquidity as a priced risk factor (for extensive reviews, see Amihud et al., 2005; Vayanos and Wang, 2013). Theoretically, less liquid markets imply higher transaction costs for investors, since they represent the present value of a stream of costs associated with trading over the lifetime of a bond. Thus, larger bid-ask spreads should be related to higher yields. Theoretical asset pricing models explicitly accounting for this factor are presented e.g. by Duffie et al. (2003) or Acharya and Pedersen (2005).[3] Empirically, Amihud and Mendelson (1991) were the first to establish the negative relation between liquidity and prices for government bonds. They compared the yields on US Treasury bills with the yield on otherwise equivalent notes with the same maturity date in the final six months before the principal was due; they found that treasury notes shortly before maturity are less liquid, and indeed trade at lower prices. A similar analysis with more recent data is done by Musto et al. (2014). They explicitly look at distress during the financial crisis and find that investors put a larger premium on liquidity during market turmoil. Longstaff (2004), Ejsing et al.

[3] At the margin, this could even give rise to adverse liquidity spirals, as suggested by Brunnermeier and Pedersen (2009).

(2012), and Schwarz (2014) identify liquidity premia by comparing US and European government bonds with bonds of identical credit risk issued by government-backed state agencies, with similar findings. Duffie et al. (2003), Hund and Lesmond (2008), Beber et al. (2009), Alquist (2010), Favero et al. (2010) and Longstaff et al. (2011), among others, find additional support for the significant impact of market liquidity on debt prices. The findings in the second part of this paper are in line with these studies, but reveal that liquidity risk can be a state-dependent risk factor, with a much stronger impact during crisis periods than during calm times.

With respect to sources of market illiquidity, Fleming and Remolona (1999) show that US Treasuries become less liquid in response to the release of public announcements on macroeconomic variables, possibly due to information-processing time. Chordia et al. (2005) find that return volatility shocks are good predictors of liquidity shocks, in line with the evidence found in this analysis. Levy Yeyati et al. (2008) show the impact of stock market and exchange rate crisis events on stock market liquidity in an emerging market sample. Similar to the results of this study, their main finding is a run-up effect in the sense of initially stable or even improved liquidity conditions immediately prior to a crisis event with a subsequent increase in bid-ask spreads.

Second, this paper relates to the international finance literature on capital flows. This literature has frequently ignored market microstructure, despite an increasing focus on this type of market frictions in macroeconomic modeling (see Shleifer and Vishny, 2011; Brunnermeier et al., 2012). Many studies on determinants of international capital flows thus abstract from the underlying transactions which constitute them (exceptions can be found in Jotikasthira et al., 2012, Fratzscher, 2011, or Forbes et al., 2012, among others). With respect to the results of this paper, this is particularly important since government debt often makes up the largest part of capital flows for a country (Henry, 2007; Tomz and Wright, 2013). Broner et al. (2013) find that gross capital flows increase during times of financial distress.

A number of theoretical contributions depend on the assumption of the existence (and persistence) of liquid secondary markets and unhindered capital flows to explain why governments may choose not to default on their debt (Kremer and Mehta, 2000; Guembel and Sussman, 2009; Broner et al., 2010). The underlying motivation of these papers is that governments will distinguish between domestic and foreign investors – and only default on foreign-held bonds. Hence, in the wake of rising sovereign risk, foreign investors should seek to sell their assets on secondary markets to domestic agents, which can in turn expect full repayment. Increasing illiquidity of sovereign bonds during periods of heightened distress serves as a substantial friction to this type of capital flows and thus hampers secondary markets' role as an enforcement device.

Finally, the results also stand in stark contrast with the simplifying assumption that government bond yields are an unbiased measure of country interest rates or default risk. Theoretical studies which use emerging markets' sovereign spreads such as EMBI country indices to calibrate their models (e.g. Arellano, 2008; Mendoza and Yue, 2012)

often ignore liquidity as an additional priced risk factor, which is particularly important during crises.

The remainder of this paper is structured as follows. Section 2 derives the hypotheses. Section 3 descibes the data. Section 4 reports the estimation approach and results. Section 5 concludes.

## 5.2 Hypotheses

The following section gives an intuitive theoretical motivation guiding the empirical analysis. Emerging economies' government bonds are traded in dealer markets, where market makers take up bonds in their inventory when investors want to reduce their exposure, and sell the asset to the market when there is demand for it. Market making implies the risk that the price changes while the bonds are kept in the trading book, which leaves room for dealer compensation in the form of bid-ask spreads. Accordingly, if the asset is volatile and price changes are frequent and large, the dealer will ask for a higher compensation. In the case of sovereign bonds, there is the additional risk that the borrower unilaterally defaults on her obligations and makes a take-it-or-leave-it offer. This typically happens in form of an exchange for a new bond with a lower present value than the "old" instrument. A debt crisis typically increases the volatility in sovereign bond markets, which in turn induces market makers to charge wider bid-ask spreads (see Figure 5.2). Hence, if the risk of default increases, or if there is additional uncertainty about the terms of the restructuring offer (the recovery value of the bond), this should decrease market liquidity.

These considerations can be easily formalized in an inventory model akin to the seminal contributions by Stoll (1978) and Ho and Stoll (1981). The following exposition of the model follows closely the representation in Foucault et al. (2013). The only addition I make here is to explicitly model a risk of sovereign default.[4]

Suppose a market maker maximizes tomorrow's wealth, $w_{t+1}$, in a two-period world. The dealer specializes in providing liquidity in one government bond market, by quoting bid and ask prices, $p_t^B$ and $p_t^A$. The debt can be of two types: it can either be a performing bond with underlying value $p \sim (\mu_p, \sigma_p)$, or a defaulting bond with recovery value $r \sim (\mu_r, \sigma_r)$. In period $t$, both types are indistinguishable for all agents in the economy; the type is only revealed in $t+1$. The government's decision about default is exogenous to the market maker's decision problem. Default occurs with probability $\delta$. I assume that $\sigma_r > \sigma_p$, meaning that there is less uncertainty about the underlying value of non-defaulting bonds than about the recovery value in case of a default.[5]

[4] Foucault et al. (2013) also present a multi-period extension of the model. For alternative overviews of this and other liquidity models see also O'Hara (1997); de Jong and Rindi (2009); and Vayanos and Wang (2013).

[5] This is also supported by the descriptive data, see Table 5.5. Another way of justifying this assumption is to think of the two bonds as being one-period zero coupon bonds with maturity in $t+1$. In that case, conditional on surviving to the next period without default, there is no uncertainty about a non-defaulting

Initially, the dealer has an inventory of the bond of size $q_t$, and holds the rest of his wealth in a liquid asset $c_t$, like cash or risk-free treasury bonds, which trades at par. The initial inventory $\{q_t, c_t\}$ before acting as a market maker is optimal given the dealer's individual portfolio optimization. Hence, his wealth today is reflected in his budget constraint $w_t = q_t p_t + c_t$.

Using the budget constraint, we can also describe his wealth tomorrow after any market making activities. Suppose a client wants to trade the bond in quantity $b_t$. The dealer has to fulfill all incoming orders at the prices he quotes. Dealing with clients thus means moving away from the optimal initial portfolio to the size of the client's desired trade size $b_t$. The dealer's next period inventory will consist of his initial position plus the order, $q_{t+1} = q_t + b_t$ (from the perspective of the market maker's inventory, $b_t < 0$ for a client buy order, reducing the dealer's own portfolio, and vice versa $b_t > 0$ for a sell order). Likewise, his cash position will be the sum of his initial cash and the amount spent or earned from trading with the client, executed at the specified bid or ask prices, $c_{t+1} = c_t - b_t p_t^{A,B}$. The dealer's terminal wealth tomorrow is thus given by the probability-weighted realized value of the bond in $t+1$ times the size of his position after fulfilling client orders, and the cash position after trading:

$$w_{t+1} = \left((1-\delta)p_{t+1} + \delta r_{t+1}\right)(q_t + b_t) + c_t - b_t p_t^{A,B} \tag{5.1}$$

where $p_t^{A,B} = p_t^A$ if $b_t < 0$ and $p_t^{A,B} = p_t^B$ if $b_t > 0$. Suppose that the dealer has exponential utility and his objective can hence be described with mean-variance preferences. Then his problem reduces to[6]

$$\begin{aligned} \max_{p_t^{A,B}} \quad & \left((1-\delta)E[p_{t+1}] + \delta E[r_{t+1}]\right)(q_t + b_t) \\ & + c_t - b_t p_t^{A,B} - \frac{1}{2}\left((1-\delta)\sigma_p + \delta\sigma_r\right)^2 \end{aligned} \tag{5.2}$$

The dealer maximizes this objective function by choosing the optimal price for an incoming marginal client order. Solving the first-order condition with respect to a marginal client order, $\frac{\partial U}{\partial b_t}$, for $p_t^{A,B}$ and collecting the terms independent of the order sign as the mid-quote $m_t$ yields the optimal bid and ask prices:

$$p_t^{A,B} = \begin{cases} p_t^A & = m_t + \left((1-\delta)\sigma_p + \delta\sigma_r\right)^2 \text{ if } b_t < 0 \\ p_t^B & = m_t - \left((1-\delta)\sigma_p + \delta\sigma_r\right)^2 \text{ if } b_t > 0 \end{cases} \tag{5.3}$$

where the sign in front of the second term depends on the sign of $b_t$, i.e. if the client submits a buy order ($b_t < 0$), the ask price becomes effective, and the bid price in case of a sell order ($b_t > 0$). The bid-ask spread is then given by the difference between these

bond any more: it will always repay the principal in full, and hence $\sigma_p = 0$. However, conditional on a default, the government has considerable discretion in deciding about how much to repay, implying $\sigma_r > 0$.

[6] Assume for notational simplicity that the coefficient of risk aversion is 1.

two prices,

$$p_t^A - p_t^B = 2\left((1-\delta)\sigma_p + \delta\sigma_r\right)^2 \tag{5.4}$$

Note that in this simple version of the model, the optimal bid-ask spread is independent of the portfolio and order size, and only depends on the volatility and default risk. These considerations lead to the first set of hypotheses on the expected determinants of market liquidity. They follow directly from the comparative statics on the expression for the optimal bid-ask spread: *liquidity is decreasing* in ($H1$) *the probability of default*, $\delta$, and ($H2$) *the bond's volatility*, $\sigma_{r,p}$. For higher default probabilities, the larger uncertainty about the recovery value of a defaulting bond looms larger, increasing the spread. But since market makers are averse to volatility anyway, an increase in both the uncertainty about the value of a performing as well as a defaulting bond will likewise imply less liquid market. The first part of the analysis thus estimates if bid-ask spreads are indeed correlated with default risk and volatility.

Market liquidity is also relevant for the pricing of sovereign bonds. The third hypothesis therefore considers the consequences of bid-ask spreads on the yields which investors demand, and follows directly from a simple asset pricing argument. Bid-ask spreads represent transaction costs from the investors' perspective, since they have to factor in the cost of entering and leaving the market. When pricing the value of a bond today, the present value of theses future costs has to be subtracted from the present value of the expected cash flow consisting of coupons and principal repayments (Amihud and Mendelson, 1991). Hence, financial assets that are less liquid should trade at a discount. In the present context, this implies that ($H3$) *governments with illiquid sovereign bond markets face higher borrowing costs* which not only depend on their creditworthiness, but also on the illiquidity premium that investors put on their bonds. If markets become indeed less liquid in distress, this could even give rise to adverse liquidity spirals, in which decreasing market liquidity decreases the borrower's solvency by increasing borrowing costs, further impairing liquidity conditions (an argument made by He and Milbradt, 2014; Brunnermeier and Pedersen, 2009). In the second part of the analysis, I will thus estimate the impact of bid-ask spreads on interest differentials to risk-free treasury bonds.

## 5.3 Data

Reliable and comprehensive pricing data on individual government bonds are hard to obtain since no centralized market places exist for sovereign debt, as is the case with exchanges for stocks and some derivatives.[7] This might be surprising at first, given the

[7]This has not always been the case. Foucault et al. (2013) explain that in fact, the original purpose of some exchanges was exclusively trading government bonds, e.g. the Vienne and Milan exchanges in the 18th and 19th century. Alquist (2010) points out that the London stock exchange concentrated large parts of sovereign debt trading in the late 19th and early 20th centrury. For some developed countries' markets, there are again more centralized markets today. European government bond trading, for instance, is increasingly

size of the market. However, after World War II, most developing countries re-financed by bilateral official loans; later on, for most of the 1980s and early 1990s, the market for sovereign borrowing was largely dominated by syndicated bank loans which changed hands infrequently (Rieffel, 2003; Cline, 1995). Data on market prices for that period are available only for a small sample of countries and instruments (see Edwards, 1984, 1986; Boehmer and Megginson, 1990; Sawada, 2001).

This changed with the Brady initiative of the early 1990s which aimed at ending the decade-long Latin American debt crisis. Without a liquid market for the large, syndicated loans, banks and other investors had been forced to keep their exposure to maturity, or accept significant illiquidity discounts when trying to sell them. The Brady policy forced banks to eventually realize losses on their sovereign loan portfolios which had previously been restructured without adjusting the book value to market prices. The Brady-type restructurings typically prescribed the loans to be exchanged for multiple bond series with different payment profiles, such as shorter-dated discount bonds with significant reductions in principal or par bonds with long maturity extensions (Rieffel, 2003; Sturzenegger and Zettelmeyer, 2006). This gave rise to a fundamental shift in emerging market funding away from bank loans to bonds placed directly on capital markets. However, despite the subsequent expansion in secondary market trading, even today sovereign debt is still typically traded over-the-counter, which complicates comprehensive data collection.

### 5.3.1 Market data

In this paper I therefore use a previously unexploited data set of bond-by-bond data on instruments for which reliable market quotes exist from a single market maker. More specifically, I use the constituent instruments of the Emerging Markets Bond Index (EMBI) by JP Morgan. The company has a long-standing reputation as being the largest market maker in emerging market debt for more than a century (Flandreau et al., 2009). While the widely used EMBI country indices are weighted averages of an issuer's outstanding tradable debt, I use daily data on the complete underlying bond population. This allows drawing a much more detailed picture of the market than using aggregate country-level indices.

For a debt instrument to be included in the sample, daily price information needs to be available. The data set encompasses bid and ask price quotes, yield spreads over comparable US treasuries, and daily total returns. Price quotes either reflect interdealer broker prices or quotes by JP Morgan traders, if the former are unavailable. Unlike many standard sources such as Bloomberg or Datastream, these quotes represent executable prices.[8] They are recorded daily at 3:00pm New York time. The price observations

concentrated on the MTS trading platform (Pelizzon et al., 2013). However, for the most part sovereign debt is still traded in a dealer market.

[8]Unfortunately, no information is available on the "depth" of these quotes, i.e. for how much volume the dealers stand ready to fulfill orders at the quoted prices.

range from 5 January 1994 to 31 December 2012.[9] I match the data set with bond characteristics on maturity, coupon, volume, currency, governing law, and exchange listings from Bloomberg.

The data set comprises 721 foreign bonds, issued by 79 governments under the jurisdiction of a G7 member state.[10] Table 5.1 reports the number of bonds and total volume issued by country. The median principal amount is USD 1.25bn, with a median time to maturity at issue of 10 years. 83% of the bonds are denominated in USD, and 15% in EUR. The United States is also the most important venue for issues, with 68% of the bonds governed by New York law, and 27% by English law. The remainder is governed by Japanese or German law. Circa 63% of the issued bonds were rated below investment grade (BB+ or lower) by the rating agency Standard & Poor's at the time of issue. More than 90% of the instruments are listed on an exchange. Table 5.2 reports more descriptive statistics on the characteristics of the included instruments, and Figure 5.1 plots the sample over time. It shows a steady increase in the number of outstanding issues since the mid 1990s, with a brief disruption of the trend during the financial crisis in 2007-09.

To approximate market liquidity, I rely on the percentage bid-ask spread[11] in the following form:

$$s_{it} = \frac{p_{it}^A - p_{it}^B}{\frac{1}{2}(p_{it}^A + p_{it}^B)} \tag{5.5}$$

where $s_{it}$ denotes the bid-ask spread of bond $i$ at time $t$, and superscripts $A$ and $B$ denote the ask and bid prices, respectively. $s_{it} \geq 0$ must hold since the market maker would lose money and be driven out of the market by offering $p_{it}^A < p_{it}^B$ .

Figure 5.2 provides a descriptive impression of market liquidity for emerging economies' sovereign debt through the sample period. The graph depicts the market wide volume-weighted average bid-ask spread, $s_t = \sum_i s_{it} \frac{vol_i}{\sum_i vol_i}$. In calm times, the average bid-ask spread is usually less than 1% of the mid-price. However, a few peaks stand out, whose dates are almost perfectly aligned with especially severe distress in financial markets. The first peak marks the days after Mexico devalued the Peso, on 20 December 1994, followed by the Russian default on 17 August 1998. $s_t$ almost passes the 5% mark in the aftermath of the Argentine default in late 2001. The market then remains relatively liquid until the bankruptcy filing of the US investment bank Lehman Brothers on 15 September 2008 heralded the most distressed phase of the financial crisis. However, after each of

[9]The only exception are quotes for Greek bonds, for which JP Morgan does not continuously provide separate bid and ask quotes since the country was not a member of the EMBI index during the mid-2000s. I therefore use data from Bloomberg for these bonds. However, I specify Bloomberg Trader as the data source in order to get executable quotes that are comparable to the JPM data.

[10]I exclude bonds issued by state-owned companies and special purpose vehicles and focus on instruments issued by the central government only.

[11]Roll (1984) argues that the percentage bid-ask spread is preferable to the absolute spread between bid and ask prices. However, the results are similar in every respect when I use the absolute bid-ask spread instead.

these events, $s_t$ falls back to pre-event levels within 12 months. That is not the case after the first Greek bailout package was announced on 2 May 2010; here it takes more than 2 years for the spread to fall below 3% again (coinciding with the Greek debt exchange in March 2012).

While the bid-ask spread can be seen critically as a measure of market liquidity, since it does not take trading volume and turnover into account, it has been widely shown to be closely correlated with alternative indicators, and is in some aspects the superior measure for bond markets (Lesmond, 2005; Chordia et al., 2001; Fleming, 2003). Most importantly, volume or turnover can be particularly misleading for government bonds if banks conduct multiple trades among their affiliates for purposes of adjusting their balance sheet to regulatory requirements (Barrios et al., 2009). Furthermore, given the opaque market for sovereign debt where no centralized information about alternative indicators is available, the bid-ask spread emerges as the indicator most reliably capturing overall market conditions. As an alternative in the robustness checks, and to mitigate concerns that changes in the denominator are driving the results, I also consider the absolute bid-ask spread, $p_{it}^A - p_{it}^B$.

Table 5.5 displays summary statistics for key variables both for the full sample, for countries undergoing a debt restructuring during the sample period, and for non-defaulting countries. The sample for restructuring countries has a considerably larger average bid-ask spread than the sample of non-defaulting countries. Likewise, the proability of default and return volatility are considerably higher, as are sovereign (stripped) spreads.[12]

### 5.3.2 Crisis events

The pricing data are complemented by newly coded data on crisis events in the major sovereign bond restructurings which fall into the sample period. Using this data, I can identify the developments in market liquidity around the major events of the debt crises in the sample. To identify the relevant bond exchanges, I rely on the lists of sovereign debt restructurings by Sturzenegger and Zettelmeyer (2006) and Cruces and Trebesch (2013). The definition of a restructuring follows the concept employed by Standard & Poor's: a distressed debt exchange is defined as an exchange of bonds in which, first, holders of the restructured debt receive new instruments which have a lower value than under the original terms and, second, the continuation of debt service under the original terms is in question if creditors do not participate in the exchange offer (Standard & Poor's, 2009). Regular debt management operations which are routinely conducted, especially for instruments with short maturities, are not considered as distressed unless there is serious doubt about the ability to pay of the debtor government. From this list, I focus on those 10 debt crises of nine emerging market economies for which a secondary

[12]For Brady bonds, stripped spreads are a more common measure of the risk spread over the assumed risk-free US Treasury zero-coupon bonds since they discount off the value of the collateral which was attached through the Brady initiative.

market with reliable pricing data existed since 1998. They include the defaults of Russia 1998, Ecuador 2000, Argentina 2001, Uruguay 2003, Grenada 2005, Dominican Republic 2005, Belize 2006, Ecuador 2008, Cote d'Ivoire 2010, and Greece 2012. Table 5.4 reports the bonds in my sample which were subject to a default and subsequent restructuring, and the instruments that resulted from the respective debt exchanges.

For each of the defaults, I code event dates for three key steps typically involved in a sovereign debt restructuring. The first event is a payment default or default announcement by a government official. This captures if an interest or principal payment on a bond was missed, or if a government official (such as the prime minister, finance minister or central bank president) announced that future payments would not be honored as originally scheduled. Following a default, creditors and debtor government usually enter a bargaining process in which they determine the terms of a restructuring of the defaulted debt. The announcement of the final restructuring offer with the exact payment terms of the resolution between creditors and government is the second event which I take into account. Finally, the actual debt exchange marks the third step. This is defined as the closing of the tendering period or the date when the exchange is officially conducted. Table 5.3 reports the event dates for each step, brief explanations of each event and sources for each of the debt crises. Wherever possible, I coded the data from the original debt exchange offers. I complemented the data with information that was extracted from the financial press and the academic literature.[13]

While these events exclusively apply to defaulting governments, I additionally consider broader "crisis" events based on significant negative returns, which can also occur in countries that do not end up in a default. For this market-based crisis measure, I identify dates on which the daily total return on a bond was -10% or less, and the cumulative return over the next three days was -15% or less:[14]

$$\mathbb{1}\left[(R_{it} < -0.1) \ \cup \ \sum_{n=1}^{3} R_{i,t+n} < -0.15\right] \tag{5.6}$$

where $R_{it}$ denotes the total return of bond $i$ on day $t$. This is similar to the idea used by Mauro et al. (2002), who identify breaks in the time series of sovereign bonds by structural changes in the spread without *a priori* knowledge about specific historical events. This measure thus accounts for the arrival of negative information about the creditworthiness of a government which was unexpected by the market, and thus resulted in a rapid adjustment of the bond valuation. To eliminate confounding the negative return dates with the other events, I do not take into account negative return events that took place in the same month as another event.

[13]The financial press was systematically searched through the database Factiva. Additional data were coded from the detailed crises summaries in Sturzenegger and Zettelmeyer (2006). Finally, I thank Christoph Trebesch for providing the detailed data from Trebesch (2010).

[14]For robustness, I also considered -5%, -15% and -20%, with similar results to those reported here.

## 5.4 Methods & results

### 5.4.1 Stylized facts

As a first take in describing the data, I exploit the high frequency of daily observations in the data set to conduct an event study of the correlation of the crisis events with secondary market liquidity. As Bessembinder et al. (2009) note, event studies for bond markets must take particular care of the fact that the same issuer has often multiple bonds on the market at the same time. The definition of a benchmark bond as representative for a country's debt market is necessarily ad hoc. Culminating multiple bonds into country portfolios loses all information about instrument-specific variables. The unit of analysis is therefore the individual bonds issued.

The event study follows the standard methodology suggested by Campbell et al. (1997). I compare the "abnormal" liquidity following an event with the "expected" liquidity derived from a preceding estimation period. Suppose $t$ describes the time index in trading days. Then $t_0$ marks the beginning of this estimation window, and $t_1$ marks the end of it. The event window starts at $t_2$ and ends at $t_3$. For the results presented here, I set $t_0 = -50, t_1 = -2, t_2 = -1$ and $t_3 = 0$ or $t_3 = 10$.[15] In other words, the estimation window comprises 50 days and the event window either one or eleven days, starting the day prior to and incorporating two weeks following the event. However, since I am testing multiple subsequently occurring events, I adjust $t_0$ in case a previous event falls into the estimation window in order to exclude the previous event from the estimation period.[16]

The abnormal illiquidity, $\widehat{As}_{it}$ for a bond is estimated as the difference between the observed liquidity, $s_{it}$, and the expected liquidity, $E(s_{it})$ derived from the estimation window: $\widehat{As}_{it} = s_{it} - E(s_{it})$. To approximate $E(s_{it})$, I assume constant mean liquidity, in which the mean bid-ask spread in the designated estimation window is used as the expected liquidity for the following event window, i.e. $E(s_{it}) = (t_1 - t_0)^{-1} \sum_{t_0}^{t_1} s_{it}$. After computing the abnormal liquidity during the event windows in response to the restructuring events, I test $H_0 : N^{-1}(t_2 - t_1)^{-1} \sum_N \sum_{t_2}^{t_3} \widehat{As}_{it} = 0$, where $N$ denotes the number of bonds affected by the respective event. To test this hypothesis, I report results from $t$-tests, which are appropriate for an estimation window of this size (Campbell et al., 1997), and from non-parametric sign tests which do not require assumptions about the distribution of the bid-ask spreads.

Table 5.7 gives the results. For unexpected negative return shocks, the unconditional

[15] The choice of the length of the event and estimation windows follows the literature. The results are not sensitive to choosing $t_3 = 3$ or $t_3 = 5$.

[16] For example, suppose a country defaults, but only 40 days after this default announces a restructuring offer to its creditors. In this case, I cannot extend the estimation window for the offer event to 50 days, since it would contain the default event. Instead, I would start the estimation window for the offer event 30 days prior to the offer and 10 days after the default, in order to exclude the default event window. Formally, for this specific example I would set $t_0^{default} = -50, t_1^{default} = -2, t_2^{default} = -1, t_3^{default} = 10$; $t_0^{offer} = 11, t_1^{offer} = 38, t_2^{offer} = 39, t_3^{offer} = 50$ with $t = 0$ indicating the default date.

difference between expected and observed bid-ask spreads amounts to 3.5 percentage points on the event day itself, and 2.7 percentage points when looking at the post-event window. The difference is significant in both cases, and not sensitive to using the $t$-statistic or a sign test. The results are similarly significant when looking at the impact of defaults, albeit the magnitude is longer lasting. On the day of a default, bid-ask spreads are more than 2.6 percentage points wider than during the pre-event estimation window; looking at the ten days following the event, the difference is almost 2.9 percentage points. Considering the mean bid-ask spread of 1.4%, with a standard deviation of 2.4%, these differences are also strong in terms of economic magnitude. This is in line with the theoretical prior that market liquidity will decrease if the default risk is increasing and the uncertainty about the recovery value becomes more prevalent.

The results for subsequent steps during a restructuring are also in line with expectations. Once information arrives in the market about the future payment profile of the securities, liquidity returns. The publication of exchange offers is associated with significantly narrower bid-ask spreads. The spread drops by 0.8 percentage points on the day of the agreement itself, although the difference is no longer significant when looking at the post-event window, indicating that the effect is short-lived. On the other hand, newly exchanged bonds immediately after the exchange display significantly lower bid-ask spreads than the old, pre-exchange instruments. The mean bid-ask spread on the day of the exchange is 2.8% lower than it was for the old bonds in the estimation window, and the effect lasts on a similar magnitude through the event window.

As an alternative way of looking at the dynamics around these events and in order to condition the effect on bond-specific features, I run the following regression:

$$s_{it} = \alpha + \boldsymbol{\delta}'\mathbf{X_{it}} + \boldsymbol{\varphi}'\mathbf{Z_{it}} + \eta_i + \theta_y + \lambda_c + \epsilon_{it} \tag{5.7}$$

$\boldsymbol{\delta}$ is a vector of coefficients capturing the impact of the same events as in the event studies before. $\mathbf{X_{it}}$ accordingly contains a set of weekly indicator variables marking the run up to each of these events, and the time after them.

$\mathbf{Z_{it}}$ is a set of bond-specific as well as global control variables, reflected in the coefficient vector $\varphi$. They include the remaining time to maturity, the amount issued, the coupon rate, and binary indicator variables for USD denomination, New York governing law as well as exchange listed bonds.

In order to control for broader market conditions, I also include the bid-ask spread of the benchmark EMBIG index, $s_{EMBIG,t}$. The EMBIG is a volume-weighted index of all outstanding bonds in the sample. This variable hence captures overall liquidity conditions in the market for emerging economies' government bonds. Everything else equal, I expect a positive relation with the individual bonds' bid-ask spreads.

There could be concerns that the global risk perception changes with events exogenous to the country-specifc risk of default. If this changes the investors' discount factor, they would revalue all assets, including the bonds in my sample. In order to correct for these

effects, I include the average borrowing rate for US non-investment grade rated corporate issuers, as measured by the Lehman/Barclay's Corporate High Yield index. This is an exogenous measure of the global interest rate for non-investment grade issuers (see e.g. Cruces and Trebesch, 2013). For robustness, I also used the TED spread and the VIX index as measures of global volatility instead of the Barclay's index, with virtually identical results (not reported).

Finally, $\eta_i$, $\theta_y$, and $\lambda_c$ are bond, year and country fixed effects, and $\epsilon_{it}$ captures the residual. All reported standard errors are corrected for autocorrelation and heteroskedasticity and clustered on the country level. While I include $\theta_y$ in all specifications, I alternate between using $\lambda_c$ and $\eta_i$. This allows estimating the correlations of the time-invariant bond-specific variables in those specifications with $\lambda_c$ and the assumption that all bond-specific effects are random. Any country-specific effects are absorbed by the bond-fixed effects in the regressions including $\eta_i$.

Table 5.8 reports the results from the regressions. Figure 5.4 displays the results graphically by plotting the coefficients of the weekly indicator variables in $\delta$ around the crisis events (based on the bond fixed effects regression columns). Turning to the effect of negative return shocks first, it shows that bonds have significantly lower bid-ask spreads in the weeks before the return shock occurs. From that week onwards, bid-ask spreads are more than 2 percentage points higher than before, increasing over time. The effects are not dependent on including bond fixed or random effects. Looking at payment defaults and restructuring announcements, the tendency is similar, although the level is more pronounced and the development appears more anticipated. Bid-ask spreads start to rise in the weeks before defaults occur, and are between 3-5 percentage points wider than for non-defaulting bonds from week 2 after the event. The effect is long-lasting and does not recede even when estimating longer lags (not reported).

As indicated in the event studies, the effect of the publication of restructuring offers is ambiguous and does not show any clear direction. Similarly, the actual debt exchanges do not exhibit a strong effect once estimated in a more controlled setting. If anything, trading new bonds immediately after an exchange takes place under somewhat less liquid conditions, but gradually returns to levels indistinguishable from non-restructured bonds.

The coefficients of the additional variables included are largely in line with expectations. Bonds with larger outstanding amounts and those listed on at least one exchange are significantly more liquid. If "global" liquidity conditions worsen as measured by the EMBIG, the bond-specific bid-ask spreads decrease at a similar rate.

These results give some indicative evidence on the role that distress and default play for market conditions, supporting hypothesis (*i*) and (*ii*). When returns are volatile and repayment comes increasingly in question, market liquidity deteriorates.

### 5.4.2 Determinants of market liquidity

The previous section provided results using discrete events typically observed in sovereign debt crises. However, the risk of default and price volatility are better described as continuous variables. Not all countries which experience a sovereign debt crisis end up defaulting and restructuring their outstanding bonds. Well-known examples of governments experiencing significant financial distress without defaulting are Brazil and Turkey in the early 2000s (Pescatori and Sy, 2007).

In the benchmark regressions for testing hypotheses (*i*) and (*ii*), I thus include measures of default risk and return volatility that are observable for all countries in the sample:

$$s_{it} = \alpha + \beta PD_{ct} + \gamma Vol_{it} + \boldsymbol{\varphi}' \mathbf{Z_{it}} + \eta_i + \theta_y + \lambda_c + \epsilon_{it} \tag{5.8}$$

In line with the hypotheses $H1$ and $H2$, the main parameters of interest are $\beta$ and $\gamma$. First, $\beta$ captures the marginal effect of a change in the probability of default $PD_{ct}$[17] on the bid-ask spread, $s_{it}$. Second, $\gamma$ is the coefficient on the return volatility of the bond. As before, $\boldsymbol{\varphi}$ contains the coefficients related to the control variables contained in $\mathbf{Z_{it}}$, and the remaining terms represent the various fixed effects and error terms.

In discussing the results, I will treat the version including bond-fixed effects as the benchmark specification. All estimates are obtained by OLS. As before, all errors are corrected for cross-sectional heteroskedasticity and autocorrelation.[18]

The expected probability of default is backed out from CDS premia with a 5 year tenor, the duration for which the largest number of reliable quotes exist (Figure 5.3 shows the aggregate time series in the sample). The probability of default is then computed as $PD = CDS/(1 - Recovery)$, where I use data from Cruces and Trebesch (2013) to approximate expected recovery rates (for details on how to evaluate default probabilities from sovereign CDS spreads see Sturzenegger and Zettelmeyer, 2006). For defaulting countries, I use the actual ex-post realized recovery rate ranging from 23.2% (Argentina 2005) to 91.2% (Uruguay 2003). For non-defaulting countries, I use the average recovery rate since 1980 of 62%. All results are robust to using the average recovery rate for all countries, or assuming flat 25% / 50% / 75% recovery rates for all countries, shifting the implied default probability only in levels but not in differences. To measure $Vol_{it}$, I compute the empirically observed standard deviation of total returns in a rolling window of the 30 prior trading days. This makes the regression essentially similar to an ARCH model in which every past observation has a unit weight (see Engle, 2001).

Table 5.9 reports the regression results. Turning to the impact of default risk first, the results confirm the prior of a positive correlation. For a 10 percentage points increase

[17] Note that the default probability is a country-level variable, as indicated by the subscript.

[18] I refrain from first-differencing the data or running GLS regressions in order to conserve the most relevant source of variation in the data, see Cochrane (2012). Besides, the main variables do not exhibit evidence of a unit root, see Table 5.6.

in the probability of default, roughly equal to one standard deviation, bid-ask spreads rise between 40-70 basis points, depending on the inclusion of other variables in the regression. This is an economically significant effect relative to the sample mean bid-ask spread of 1.36%.

Return volatility is also strongly positively correlated with illiquidity. A one-standard deviation increase in the volatility (0.93%) translates into a wider bid-ask spread of between 90-100 basis points. The results are stable irrespective of including bond or country fixed effects (column 6), or any of the control variables (columns 4-5). Most of the control variables do not display significant effects, with the exception of exchange-listed bonds which are found to be significantly more liquid. The coefficients on the global control variables are neither significant in the benchmark specification in column (6) nor in the random effects specifications.

For robustness, I expose the benchmark specification to a set of further checks. Table 5.10 gives the results. Column (1) excludes the defaulting countries and only looks at the non-restructuring sample. The results are similar to before, indicating that the relationship between market liquidity and default risk is also present in cases that do not end up in a default. I furthermore distinguish between high and low risk environments by dividing the sample into distressed periods with high sovereign spreads, and normal periods, according to the crisis definition of Pescatori and Sy (2007). The results hold both in crisis periods as well as "normal" times. Column (2) restricts the sample to non-crisis periods with sovereign spreads below 10%, and column (3) shows results from the sample with spreads above 10%. The coefficients on the risk of default and on return volatility decrease in the low-risk environment as compared to the full sample, but still remain significantly related to the bid-ask spread. In the high-risk state, on the other hand, the default risk coefficient is considerably higher than in the benchmark sample. Column (4) uses the absolute instead of relative bid-ask spread as the dependent variable. This alternative measure does not produce qualitatively different results from the benchmark specifications. A ten percentage point increase in default probability is associated with bid-ask spreads wider by about 10 cents. Again, this is significant compared to a median absolute bid-ask spread of 75 cents (mean of 103 cents). Finally, remaining concerns about misspecification of the error terms do not appear to be warranted. Column (5) shows Driscoll and Kraay (1998) standard errors which additionally correct for cross-sectional auto-correlation, and column (6) presents Newey and West (1987) standard errors. In both cases the test-statistics do not decrease noticeably. Explicitly modeling an AR(1) process in the error term, as done in column (7), slightly reduces the coefficient on return volatility but does not materially change the main results.

The results so far have established evidence in support of hypothesis (*i*) and (*ii*). Market liquidity is strongly correlated with financial distress. Both default risk and return volatility are positively correlated with wider bid-ask spreads, both for high and low risk environments.

### 5.4.3 Illiquidity premia in sovereign bond yields

The following section turns towards quantifying the importance of liquidity risk for borrowing costs. Under hypothesis $H3$, I expect market liquidity to be negatively correlated with government borrowing costs. As a first step, I estimate the following regression:

$$\text{Sovereign spread} \equiv y_{it} - y_{US,t} = \alpha + \underbrace{\beta_1(PD_{ct} - PD_{US,t})}_{\text{Credit Risk}} + \underbrace{\beta_2(s_{it} - s_{EMBIG,t})}_{\text{Liquidity Risk}} + \boldsymbol{\varphi}'\mathbf{Z_{it}} + \eta_i + \lambda_c + \theta_y + \epsilon_{it} \tag{5.9}$$

where the sovereign spread is given by the difference between $y_{it}$, the yield to maturity on the bond, and $y_{US,t}$, the yield to maturity on a US treasury bond of similar maturity. $PD_{US,t}$ and $s_{EMBIG,t}$ denote the implicit default probabilities from US CDS and the bid-ask spread of the EMBIG index. Differencing out these "global" conditions allows focusing on the country-specific element of borrowing rates, default probability, and illiquidity. As before, the remaining terms again represent control variables, fixed effects, and the error term.

Results are reported in Table 5.11. The first observation in columns (1) to (3) is that both measures of credit and liquidity risk positively contribute to government borrowing costs. For a 10 percentage points increase in the risk of default, sovereign spreads increase by more than 300bps. Liquidity risk is likewise an important factor in explaining sovereign spreads, though not as strong as credit risk. A one-standard deviation increase in the liquidity risk factor (1.2%) corresponds to a sovereign spread increase of about 50bps. Again, the results are not sensitive to including control variables or bond fixed effects, as shown in columns (2) to (3).

However, the results appear to be dependent on the state of the risk environment. Columns (4) to (7) show the results in different subsamples. If spreads are below 5%, representing a very calm period, both coefficients on default risk and on liquidity risk decrease considerably. While the probability of default continues to be significantly correlated with borrowing rates even in this low risk sample, at about half the magnitude as before, liquidity risk seems to be virtually irrelevant, with the coefficient both economically and statistically insignificant.

This impression changes remarkably when looking at higher risk subsamples. Successively considering periods with spreads above 5%, 7% and finally 10%, the coefficient on default risk remains constant (if anything, decreasing slightly). However, the importance of liquidity risk increases strongly when looking at the different risk states. In the highest risk scenario with spreads above 10%, a one-standard deviation increase in liquidity risk translates into a spread increase of 100bps. This implies that the borrowing cost premium related to the liquidity risk factor almost doubles in crisis periods as compared to the estimates obtained from the full sample.

An alternative way of looking at the interaction of distress and liquidity is to consider the interaction between the probability of default and the liquidity risk measure. Column (8) reports the result. Interpreting the coefficients is not straightforward since the conditional effects need to be accounted for. Figure 5.5 therefore plots the marginal effect of a change in the liquidity spread on the sovereign spread, conditional on the default risk. The result is in line with the previously obtained estimates: For low probabilities of default, the marginal effect is negligible and insignificant. However, even for seemingly modest default probabilities above 10% the effect becomes significant, and remains so for higher values of default risk. Importantly, this is not driven by the defaulting countries only. Estimating the regression in a sample without defaulting countries results in a similar effect, albeit at a somewhat lower level of statistical significance.

As an additional exercise in quantifying the *relative* importance of credit and liquidity risk, I rely on the approach suggested by Beber et al. (2009). They estimate effectively identical regressions as in equation (5.9), but on a sample of Eurozone government bond markets between 2003-04, an arguably relatively calm period in developed sovereign debt markets. In contrast to their time period, my sample exhibits considerably more variation in crisis intensity.

They suggest a methodology which allows comparing the relative weight given to the credit and liquidity risk factors based on the regression coefficients:

$$\text{Credit risk contribution}_i = \hat{\beta_1} \left[ \frac{1}{t_2 - t_1} \sum_{t_1}^{t_2} (PD_{ct} - PD_{US,t}) \right] \tag{5.10}$$

$$\text{Liquidity risk contribution}_i = \hat{\beta_2} \left[ \frac{1}{t_2 - t_1} \sum_{\tau=t_1}^{t_2} (s_{i,t} - s_{EMBIG,t}) \right] \tag{5.11}$$

where $\hat{\beta_1}$ and $\hat{\beta_2}$ are the estimated coefficients from equation (5.9). The average contribution values are given by their predicted part of the sovereign spread, based on the average observed values of the two risk factors in a given period between $t_1$ and $t_2$, in percentage points. Furthermore, this allows to consider the *relative* weight given to these two factors:

$$\text{Credit risk (share)}_i = \frac{|\text{Credit risk contrib}_i|}{|\text{Credit risk contrib}_i| + |\text{Liquidity risk contrib}_i|} \tag{5.12}$$

$$\text{Liquidity risk (share)}_i = \frac{|\text{Liquidity risk contrib}|}{|\text{Credit risk contrib}_i| + |\text{Liquidity risk contrib}_i|} \tag{5.13}$$

Table 5.12 report the results for this exercise. In the full sample, the average contribution for credit and liquidity risk is 96% and 4%, respectively. However, this changes depending on the risk environment. Excluding the periods when countries are in default reduces the relative impact of liquidity risk slightly (column 2), and estimating the contribution for non-defaulting countries only results in a negligible share of just above 1% (column 3).

The differential impact of liquidity risk is not only due to cross-sectional variation,

but can also be observed within countries over time. During calm times with spreads below 5%, liquidity risk is irrelevant, relative to credit risk. This holds for both the non-defaulting countries as well as when looking at all countries outside of default episodes. Looking at more risky environments though, spreads are increasingly explained with larger contributions of liquidity risk. In the samples with spreads above 5 and 10%, liquidity risk contributes about 7% of the interest rate difference to risk-free bonds, or between 100-150bps. Importantly, this is also true when excluding default periods and when looking at non-defaulting countries only, although at lower levels. But the general finding that investors tend to put higher premia on liquidity risk during distress periods can be confirmed.

These results are consistent with previous findings in the literature on the "flight to liquidity vs. flight to quality" debate, which has also shown that the liquidity premium on bond prices is conditional on the risk environment (e.g. Beber et al., 2009; Ejsing et al., 2012; Musto et al., 2014). When a bond becomes relatively more information-sensitive, as during a default episode or when sovereign spreads are large, liquidity is much more important compared to an information-insensitive asset whose value typically changes little with the arrival of new information.

## 5.5 Conclusion

Using a previously little used data source, this paper establishes two key findings related to secondary markets for sovereign debt. First, market liquidity dries up during crises. Increases in default probability and return volatility are significantly related to market illiquidity, suggesting that market makers are averse to holding risky bonds in their trading books. Second, liquidity risk contributes considerably to borrowing costs. Sovereign spreads not only depend on credit quality, but also include a significant liquidity risk factor. Furthermore, the relation is state-dependent. For low-risk environments, liquidity plays a negligible role. However, once government debt markets come into distress, the relative weight given to liquidity risk rises substantially. These findings are in line with theoretical predictions inventory-based market microstructure models, and also with asset pricing models explicitly accounting for liquidity risk.

These results have broader implications. Retaining a liquid secondary market for sovereign debt instruments is a desirable feature for governments in order to minimize borrowing costs. This is particularly important during distressed times, when endogenous liquidity spirals are looming. Moving sovereign bond trading to less opaque market places could thus possibly provide an improvement not only in transparency, but also in making risk allocation more efficient and improving market conditions during distress.

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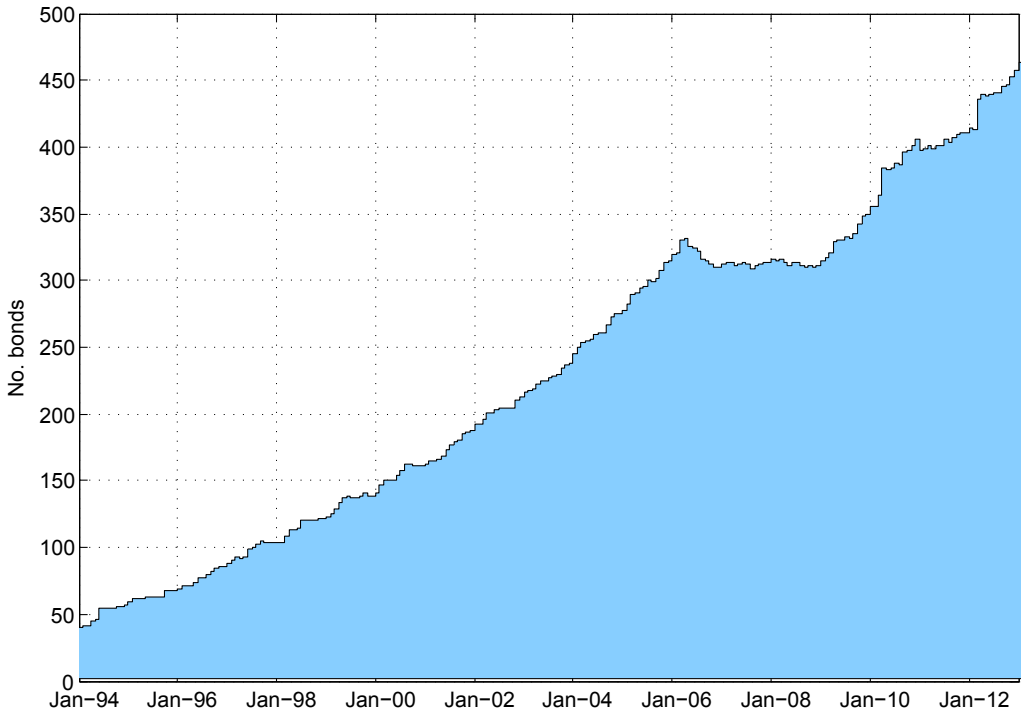
# Figures

Figure 5.1: The market for EME sovereign bonds

The figure plots the number of outstanding emerging market bonds included in the sample over time.




***Student Version of MATLAB***

Figure 5.2: Market liquidity for EME sovereign bonds

The figure plots the daily average bid-ask spreads over time. The data are weighted by the bonds' nominal face value amount outstanding. The blue lines indicate selected crisis events from between 1994 and 2012.

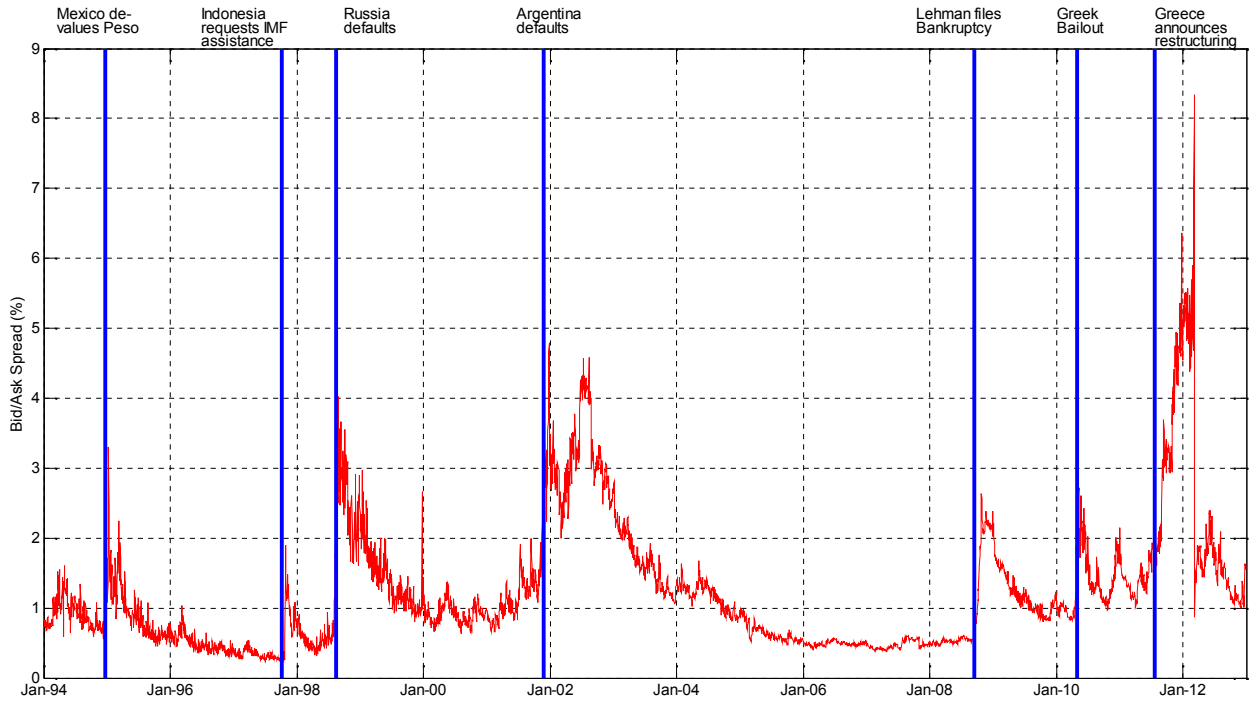


Figure 5.3: Probability of default

The figure plots the daily mean and median implied default probabilities in the sample. The variable is computed using CDS premia (5yr tenor). Conditional on the recovery rate $RR$, the market-implied probability of default can be backed out as $PD = CDS/(1 - RR)$. To approximate the expected recovery rate in case of default I use the creditor loss data (in present value terms) from Cruces and Trebesch (2013). For non-defaulting countries, I use the mean recovery rate of 62%. For defaulting countries, I use the ex-post realized recovery rates. Note that using the mean recovery rate for the entire sample, or using flat expected recovery rates of 25%/50%/75% does not noticably change the results, since it only affects the level of the default probability, but not the changes over time.

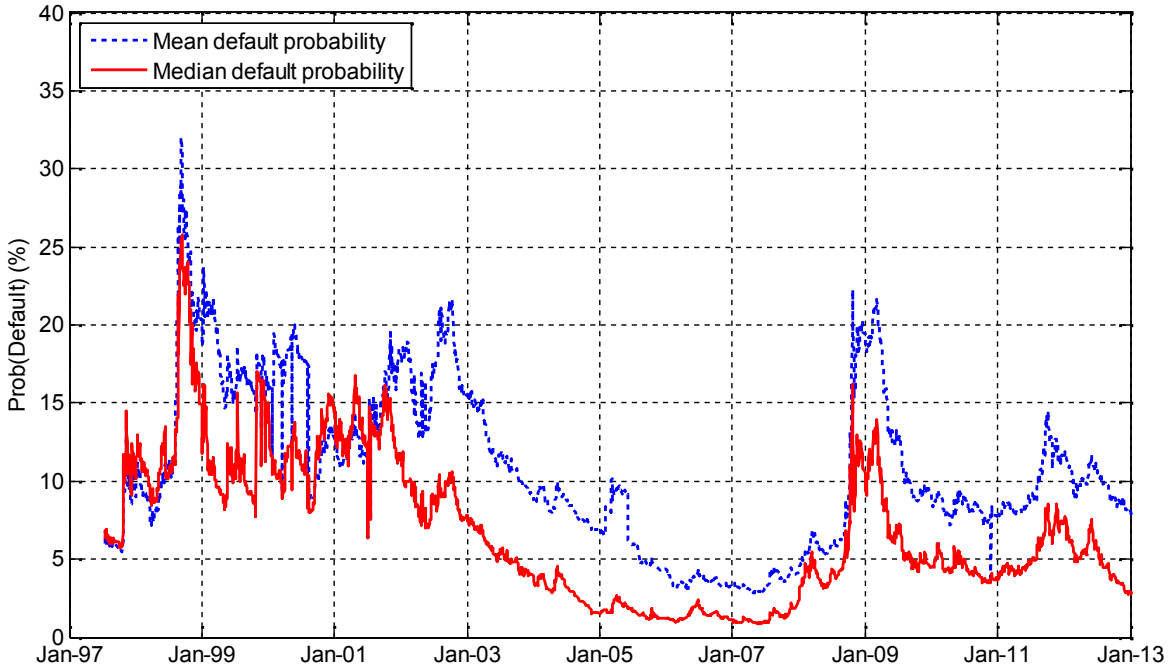


Figure 5.4: Run-up and off-effects around crisis events

The figure plots the coefficients on the weekly indicators around the four crisis events from the regressions based on equation 5.7 reported in Table 5.8. The red line connects the point estimates of the weekly indicators, and the blue line represents the 95% confidence interval around these point estimates.

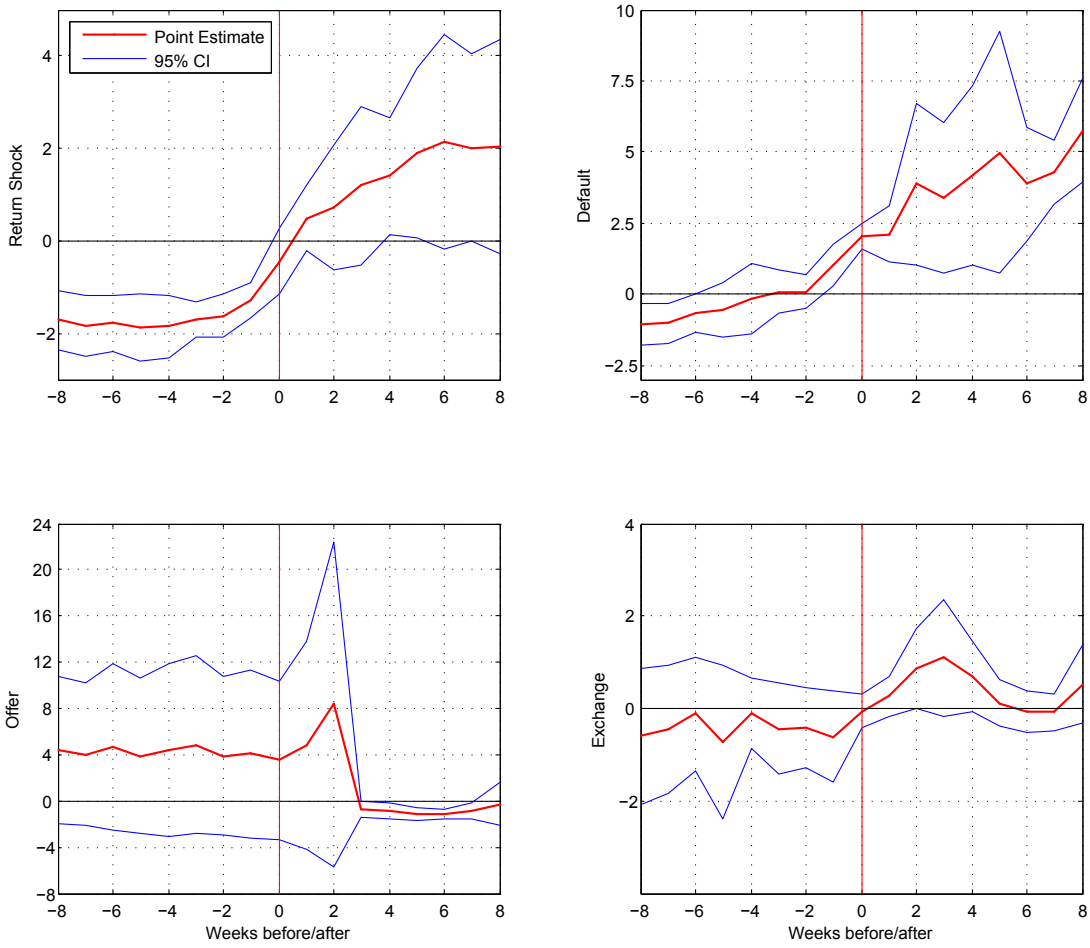
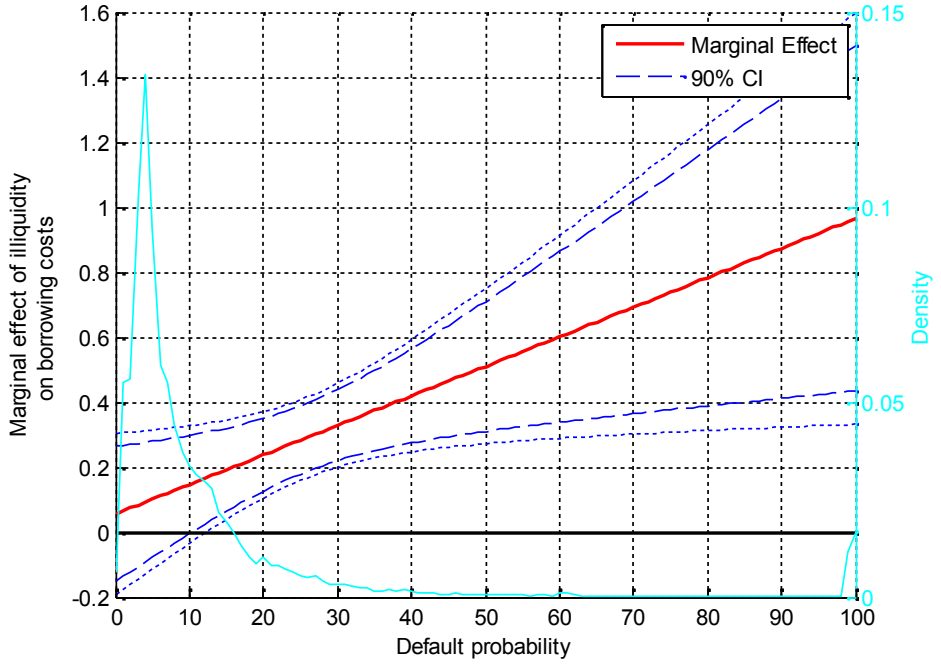
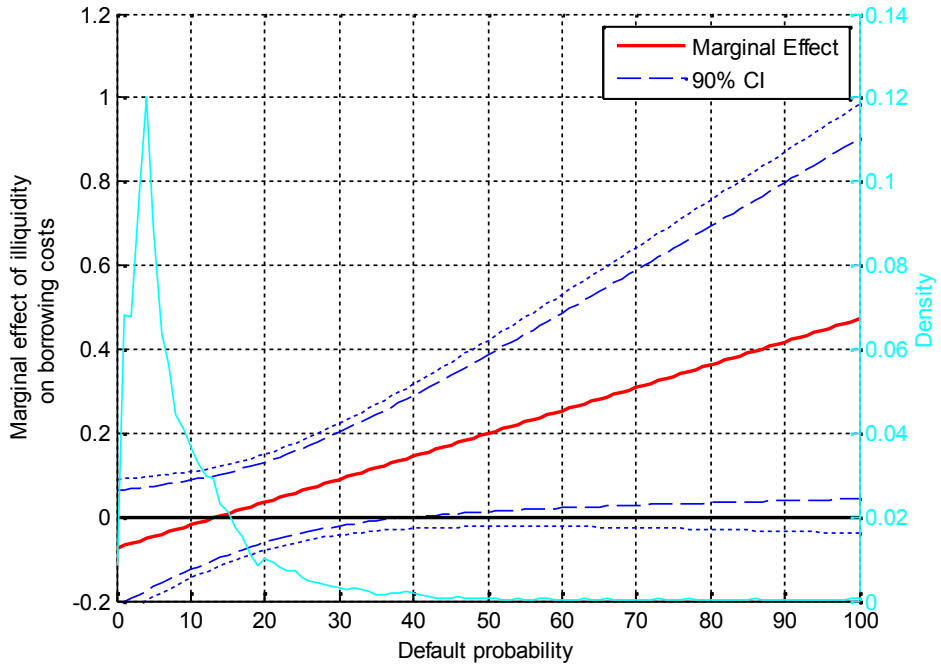


Figure 5.5: Impact of illiquidity on interest spreads

The figure plots the marginal effect of a change in the illiquidity spread (difference between the bond's bid-ask spread and the average bid-ask spread in the market) on the interest spread (spread between the yield to maturity on the bond and a US treasury bond of comparable maturity), conditional on the default probability of the country. The dashed blue lines indicate the 90% confidence interval (the dotted blue lines mark the 95% CI). The positive slope indicates that for higher default probabilities, the impact of illiquidity on spreads is increasing, while it is insignificant for very safe bonds. The cyan line shows the empirical density estimate of the default probability, indicating a bimodal distribution. For robustness, the lower panel thus excludes the defaulting countries. The interacting effect also holds when excluding defaulting countries, albeit at a lower level of significance.



# Tables

Table 5.1: Bonds by country

The table reports the distribution of bonds in the sample by country. All bonds were issued by the central government, and governed under the laws of a G7 member state. The total volume reported is the sum of all bonds in the sample by country, in nominal USD at the time of issue.

| Country | No. bonds | Total (Bn USD) | Country | No. bonds | Total (Bn USD) |
|---|---|---|---|---|---|
| Albania | 1 | 0.43 | Latvia | 4 | 3.23 |
| Algeria | 2 | 1.27 | Lebanon | 35 | 32.04 |
| Angola | 1 | 1 | Lithuania | 8 | 11.25 |
| Argentina | 46 | 144.95 | Macedonia | 1 | 0.23 |
| Armenia | 1 | 0.7 | Malaysia | 2 | 3.25 |
| Aruba | 5 | 0.51 | Mexico | 43 | 110.75 |
| Bahamas | 3 | 0.6 | Mongolia | 2 | 1.5 |
| Barbados | 3 | 0.6 | Montenegro | 1 | 0.26 |
| Belarus | 2 | 1.8 | Morocco | 5 | 6.71 |
| Belize | 3 | 1.2 | Namibia | 1 | 0.5 |
| Bermuda | 3 | 1.73 | Nicaragua | 1 | 0.19 |
| Bolivia | 2 | 1 | Nigeria | 5 | 8.35 |
| Brazil | 49 | 136.55 | Pakistan | 5 | 2.64 |
| Bulgaria | 7 | 7.56 | Panama | 18 | 15.4 |
| Chile | 9 | 6.95 | Paraguay | 1 | 0.5 |
| China | 9 | 19.59 | Peru | 14 | 16.74 |
| Colombia | 23 | 22.6 | Philippines | 30 | 38.56 |
| Congo, Republic Of | 1 | 0.48 | Poland | 25 | 55.37 |
| Costa Rica | 9 | 3.46 | Qatar | 9 | 16.4 |
| Cote D'Ivoire | 3 | 3.77 | Romania | 7 | 14.17 |
| Croatia | 10 | 11.43 | Russian Federation | 20 | 66.13 |
| Czech Republic | 6 | 14.57 | Rwanda | 1 | 0.4 |
| Dominican Republic | 9 | 5.8 | Senegal | 1 | 0.5 |
| Ecuador | 6 | 10.35 | Serbia | 4 | 5.33 |
| Egypt | 4 | 3 | Slovakia | 5 | 8.03 |
| El Salvador | 8 | 5.49 | Slovenia | 2 | 4.75 |
| Gabon | 1 | 1 | South Africa | 12 | 14.92 |
| Georgia | 2 | 1 | South Korea | 10 | 11.5 |
| Ghana | 2 | 1.75 | Sri Lanka | 5 | 4 |
| Greece | 39 | 241.89 | Tanzania | 1 | 0.6 |
| Grenada | 2 | 0.29 | Thailand | 1 | 0.04 |
| Guatemala | 5 | 2.36 | Trinidad And Tobago | 2 | 0.4 |
| Honduras | 1 | 0.5 | Turkey | 38 | 61.12 |
| Hong Kong | 1 | 1.25 | Ukraine | 15 | 17.4 |
| Hungary | 14 | 21.99 | United Arab Emirates | 8 | 7.52 |
| Indonesia | 18 | 27.95 | Uruguay | 14 | 11.45 |
| Iraq | 1 | 2.7 | Venezuela | 27 | 53.76 |
| Israel | 9 | 10.2 | Viet Nam | 4 | 2.27 |
| Jamaica | 9 | 3.32 | Zambia | 1 | 0.75 |
| Jordan | 3 | 1.36 | | | |

Table 5.2: Bond characteristics

The table reports characteristics of the bonds contained in the sample, as reported by Bloomberg.

| | Value | No. Bonds | Share |
|---|---|---|---|
| Currency | EUR | 107 | 14.9% |
| | USD | 605 | 84.1% |
| | Other | 7 | 1.0% |
| Governing law | New York | 400 | 67.8% |
| | England | 161 | 27.3% |
| | Other | 29 | 4.9% |
| Rating at issue | BB+ and below | 419 | 63.0% |
| | BBB- and above | 246 | 37.0% |
| Exchange listed | Not listed | 64 | 9.0% |
| | Listed | 646 | 91.0% |

| | No. Observations | Mean | SD |
|---|---|---|---|
| Time to maturity (years) | 713 | 14.6 | 9.6 |
| Coupon | 686 | 6.8 | 2.7 |
| Principal (Bn USD) | 718 | 1.9 | 2.1 |

Table 5.3: List of debt crisis events

| Country | Date | Event | Details | Source |
|---|---|---|---|---|
| Argentina | 11/23/2001 | Default | Domestic debt exchange implies technical default as defined by Standard and Poors | Sturzenegger and Zettelmeyer (2006) |
| | 11/01/2004 | Restructuring Offer | Final debt exchange offer announced. | Sturzenegger and Zettelmeyer (2006) |
| | 06/10/2005 | Debt Exchange | Exchange completed, after the implementation had been be delayed by holdout creditors. | IMF (2005) |
| Belize | 08/04/2006 | Default | Government announces it is going to seek a debt restructuring. | Wall Street Journal, 10 August 2006, "Belize to Redo External Debt" |
| | 12/18/2006 | Restructuring Offer | Revised agreement with creditors published. | Reuters, 19 December 2006, "Belize launches final debt exchange offer" |
| | 02/20/2007 | Debt Exchange | After multiple extensions, debt exchange closes. | Reuters, 20 February 2007, "Belize restructures debt, most creditors on board" |
| Cote d'Ivoire | 05/01/2000 | Default | Ivory Coast makes only partial payment on its outstanding Brady bonds. | Reuters, 28 April 2000, "Ivory Coast near Brady default as payments stalled"; Reuters, 04 May 2000, "BNP confirms partial Ivory Coast Brady payment" |
| | 09/28/2009 | Restructuring Offer | Almost ten years after the default and after a previous Paris Club deal, Cote d'Ivoire announces an agreement with its private creditors. | Reuters, 28 September 2009, "Ivory Coast reaches deal on debt restructure offer" |
| | 04/08/2010 | Debt Exchange | Debt exchange period closes after initial period was extended by one week. | Reuters, 07 April 2010, "Ivory Coast extends deadline on debt exchange" |
| Domincan Republic | 01/23/2004 | Default | First payment default on bond. Although partially cured within the grace period, the government made a number of late payments again within weeks, and finally announced a restructuring. | Dow Jones Emerging Markets Report, 29 January 2004, "Dominican Republic Missed $27M Payment On '13 Bond" |
| | 04/20/2005 | Restructuring Offer | Government announces restructuring offer. | Dow Jones Newswires, 20 April 2005, "Dominican Republic Launches Debt Exchange Offer" |
| | 05/05/2005 | Debt Exchange | Exchange offer closes. | Euroweek, 06 May 2005, "Dominican Rep escapes default with popular exchange" |
| Ecuador | 08/25/1999 | Default | After weeks of rumours, Ecuador announces a bond restructuring and payment halt. | AP, 25 August 1999, "Ecuador's president defers $96 million Brady interest payment for 30 days" |
| | 07/27/2000 | Restructuring Offer | After a year of negotiations, the offer is announced. | AP, 27 July 2000, "Ecuador offers foreign creditors ambitious bond swap" |
| | 08/23/2000 | Debt Exchange | Exchange is conducted. | Reuters, 23 August 2000, "Ecuador swaps 97 pct of Brady, Euro debt" |

*continues on next page*

Table 5.3: List of debt crisis events (continued)

| Country | Date | Event | Details | Source |
|---|---|---|---|---|
| Ecuador | 12/12/2008 | Default | Outstanding foreign debt is declared 'illegal' and coupon payment missed. | Reuters, 12 December 2008, "Ecuador defaults, says to fight 'monster' creditors" |
| | 04/20/2009 | Restructuring Offer | Ecuador offers to buy back the outstanding bonds at a steep discount of 35 cents on the dollar. | Reuters, 20 April 2009, "Ecuador offers defaulted debt buyback, big discount" |
| | 06/03/2009 | Debt Exchange | Buyback deadline closes after extension. | Reuters, 11 June 2009, "Ecuador buys back most debt, rekindles threats" |
| Greece | 07/21/2011 | Default | After months of rumors since late 2010, the EU summit finally announces that a "private sector involvement" will be negotiated. | Zettelmeyer et al. (2013) |
| | 02/21/2012 | Restructuring Offer | The creditor committee and Greek government announce the terms of the debt restructuring. | Zettelmeyer et al. (2013) |
| | 03/12/2012 | Debt Exchange | The largest sovereign debt exchange in history takes place. | Zettelmeyer et al. (2013) |
| Grenada | 12/29/2004 | Default | Government misses coupon payment and announces it seeks a debt restructuring following the severe recession due to hurricane "Ivan". | BBC, 30 December 2004, "Grenada moves to restructure external debt"; Standard and Poor's, 30 December 2004, Rating Update |
| | 09/09/2005 | Restructuring Offer | Grenada publishes the restructuring offer, delayed by almost three months due to the hurricane "Emily" | Grenada Offering Memorandum, 09 September 2004 |
| | 11/15/2005 | Debt Exchange | Grenada exchanges its USD and ECD denominated bonds for new instruments with a 20 year extended maturity. | Dow Jones Newswires, 17 November 2005, "Grenada successfully restructures overseas, local debt" |
| Russia | 08/17/1998 | Default | Default on primarily foreign held local-law GKO instruments. Defaults on additional instruments, including Soviet-era debt and Eurobonds, followed in the coming months. | Sturzenegger and Zettelmeyer (2006) |
| | 02/01/2000 | Restructuring Offer | After months of negotiations, details of the restructuring of outstanding eurobonds are revealed. | Reuters, 01 February 2000, "Russia to announce MinFin 3 bonds swap details Tuesday" |
| | 11/30/2000 | Debt Exchange | Last exchange of foreign debt closes. | Standard and Poor's, 8 December 2000, Rating Update |
| Uruguay | 03/11/2003 | Default | After a few weeks of discussions, the government announces it will make a voluntary debt restructuring offer. | Reuters, 11 March 2003, "Uruguay proposes voluntary debt restructuring" |
| | 04/10/2003 | Restructuring Offer | Details of the restructuring offer announced. | Reuters, 10 April 2003, "Uruguay gives creditors two options in debt swap" |
| | 05/29/2003 | Debt Exchange | Completion of the debt exchange. | Standard and Poor's, 02 June 2003, Rating Update |

Table 5.4: Pre- and post-restructuring bonds by country

The table lists the bonds in the sample that were exchanged in the course of a debt restructuring, and the resulting "new" bonds. The data were collected from the original debt restructuring agreements wherever possible, and complemented by information from various IMF country reports and data in Sturzenegger and Zettelmeyer (2006). Note that I include only those bonds in the sample for which reliable and continuous price quotes are available. In the cases of Argentina and Greece, this excludes a range of bonds that were placed in private markets or too small to be traded regularly.

| Country | Pre-restructuring bonds | | Post-restructuring bonds | |
|---|---|---|---|---|
| | Instrument | ISIN | Instrument | ISIN |
| Argentina | Bontes due 2002 | ARARGE031633 | Discount 8.28% due 2033 | US040114GL81 |
| | Bontes due 2003 | ARARGE032573 | Par Step up due 2038 | US040114GK09 |
| | Bontes due 2004 | ARARGE032409 | | |
| | Bontes due 2005 | ARARGE032581 | | |
| | Bontes due 2006 | ARARGE033076 | | |
| | Bontes FRN due 2003 | ARARGE032086 | | |
| | Discount Bonds | XS0043118172 | | |
| | FRBs | XS0043120236 | | |
| | Par Bonds | XS0043119147 | | |
| | 10.25% due 2030 | US040114GB00 | | |
| | 11.75% due 2009 | US040114BE93 | | |
| | 11.75% due 2015 | US040114GA27 | | |
| | 11.375% due 2010 | US040114FC91 | | |
| | 11.375% due 2017 | US040114AR16 | | |
| | 11% due 2005 | US040114AZ32 | | |
| | 11% due 2006 | US040114AN02 | | |
| | 12.25% due 2018 | US040114GG96 | | |
| | 12.125% due 2019 | US040114BC38 | | |
| | 12.375% due 2012 | US040114GD65 | | |
| | 12% due 2031 | US040114GH79 | | |
| | 12% due 2020 | US040114FB19 | | |
| | 12% due 2031 | USP8055KGV19 | | |
| | 8.375% due 2003 | US040114AH34 | | |
| | 9.75% due 2027 | US040114AV28 | | |
| | Step up due 2008 | US040114GF14 | | |
| | Pro 2 (Series 1) | ARP04981BA66 | | |
| | Pre 4 (Series 2) | ARP04981DG19 | | |
| Belize | 9.5% due 2012 | USP16394AC58 | 4.25% due 2029 | USP16394AF89 |
| Cote d'Ivoire | FLIRbs FRN due 2018 | XS0075820133 | Step up due 2032 | XS0496488395 |
| | PDI FRN due 2018 | XS0075803477 | | |
| Dominican Republic | 9.5% due 2006 | USP3579EAA57 | 9.5% due 2006 | USP3579EAC14 |
| | 9.04% due 2013 | USP3579EAB31 | 9.04% due 2018 | USP3579EAD96 |
| Ecuador I | Discount Bonds | XS0055571789 | 12% due 2012 | XS0115748401 |
| | Par Bonds | XS0055572084 | Step up due 2030 | XS0115743519 |
| | PDI Bonds | XS0055571433 | | |
| Ecuador II | 12% due 2012 | XS0115748401 | None (Buyback) | |
| | Step up due 2030 | XS0115743519 | None (Buyback) | |
| Grenada | 9.375% due 2012 | USP48863AA55 | Step up due 2025 | USP48863AC12 |
| Greece | 2.3% due 2030 | GR0338002547 | Step up due 2023 | GR0128010676 |
| | 3.6% due 2016 | GR0124028623 | Step up due 2024 | GR0128011682 |
| | 3.7% due 2015 | GR0124026601 | Step up due 2025 | GR0128012698 |
| | 4.5% due 2014 | GR0124024580 | Step up due 2026 | GR0128013704 |
| | 4.5% due 2037 | GR0138001673 | Step up due 2027 | GR0128014710 |
| | 4.3% due 2017 | GR0124029639 | Step up due 2028 | GR0133006198 |
| | 4.6% due 2018 | GR0124030645 | Step up due 2029 | GR0133007204 |
| | 4.6% due 2040 | GR0138002689 | Step up due 2030 | GR0133008210 |
| | 4.7% due 2024 | GR0133003161 | Step up due 2031 | GR0133009226 |
| | 5.5% due 2014 | GR0114022479 | Step up due 2032 | GR0133010232 |
| | 5.3% due 2026 | GR0133004177 | Step up due 2033 | GR0138005716 |
| | 5.9% due 2017 | GR0118012609 | Step up due 2034 | GR0138006722 |
| | 5.9% due 2022 | GR0133002155 | Step up due 2035 | GR0138007738 |
| | 6.5% due 2019 | GR0133001140 | Step up due 2036 | GR0138008744 |
| | 6.25% due 2020 | GR0124032666 | Step up due 2037 | GR0138009759 |
| | 6.1% due 2015 | GR0114023485 | Step up due 2038 | GR0138010765 |
| | 6.95% due 2008 | US423324AC66 | Step up due 2039 | GR0138011771 |
| | 6% due 2019 | GR0124031650 | Step up due 2040 | GR0138012787 |
| | | | Step up due 2041 | GR0138013793 |
| | | | Step up due 2042 | GR0138014809 |
| Russia | Interest Accrual Note (IAN) | XS0082144923 | 8.25% due 2010 | XS0114295560 |
| | Principal Note (PRIN) | TT3294119 | Step up due 2030 | XS0114288789 |
| Uruguay | Par Bonds | XS0030490782 | 7.875% due 2033 | US917288BA96 |
| | 7.625% due 2012 | US917288AJ15 | 7.5% due 2015 | US917288AZ56 |
| | 7.875% due 2027 | US760942AE20 | 7.25% due 2011 | US917288AY81 |
| | | | 7% due 2019 | XS0167137834 |
| | | | 7% due 2019 | XS0167137834 |

Table 5.5: Descriptives statistics of main variables

Full sample

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Bid-ask spread (%) | 1.36 | 2.44 | 0 | 100 | 1045443 |
| Stripped Spread (%) | 5.32 | 8.05 | -3 | 99.99 | 1030395 |
| Default Probability (%) | 12.78 | 20.06 | 0 | 100 | 809340 |
| Volatility (Rolling, %) | 0.68 | 0.93 | 0 | 27.84 | 1006184 |
| Liquidity Spread (%) | 0.47 | 1.36 | -1.22 | 10.19 | 1005097 |
| Time to maturity (Days) | 4405.31 | 3557.2 | 0 | 36530 | 1044157 |
| Principal (Bn USD) | 1.88 | 2.2 | 0.02 | 20.17 | 1042883 |
| Coupon (%) | 7.46 | 2.67 | 0 | 18.92 | 963355 |
| NY law | 0.77 | 0.42 | 0 | 1 | 794968 |
| Exchange-listed | 0.84 | 0.36 | 0 | 1 | 1027351 |
| Bid-ask EMBIG (%) | 0.75 | 0.37 | 0.22 | 3.54 | 1025609 |
| US HY Rate (%) | 9.64 | 2.8 | 6.06 | 22.97 | 1045443 |

Non-defaulting countries sample

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Bid-ask spread (%) | 1.09 | 1.27 | 0 | 50.79 | 869728 |
| Stripped Spread (%) | 3.91 | 3.8 | -3 | 95.07 | 866317 |
| Default Probability (%) | 8.71 | 10.12 | 0 | 100 | 679813 |
| Volatility (Rolling, %) | 0.56 | 0.64 | 0 | 17.01 | 850311 |
| Liquidity Spread (%) | 0.34 | 1.07 | -1.22 | 10.19 | 844423 |
| Time to maturity (Days) | 4364.01 | 3604.39 | 0 | 36530 | 869728 |
| Principal (Bn USD) | 1.57 | 1.61 | 0.02 | 11.66 | 869728 |
| Coupon (%) | 7.53 | 2.39 | 0 | 14.5 | 795653 |
| NY law | 0.81 | 0.39 | 0 | 1 | 663977 |
| Exchange-listed | 0.83 | 0.38 | 0 | 1 | 859447 |
| Bid-ask EMBIG (%) | 0.75 | 0.37 | 0.22 | 3.54 | 853538 |
| US HY Rate (%) | 9.59 | 2.83 | 6.06 | 22.97 | 869728 |

Defaulting countries sample)

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Bid-ask spread (%) | 2.68 | 5.02 | 0 | 100 | 175715 |
| Stripped Spread (%) | 12.76 | 16.29 | -3 | 99.99 | 164078 |
| Default Probability (%) | 34.13 | 37.89 | 0 | 100 | 129527 |
| Volatility (Rolling, %) | 1.31 | 1.68 | 0 | 27.84 | 155873 |
| Liquidity Spread (%) | 1.12 | 2.23 | -1.22 | 10.19 | 160674 |
| Time to maturity (Days) | 4611.23 | 3304.21 | 0 | 12274 | 174429 |
| Principal (Bn USD) | 3.43 | 3.63 | 0.1 | 20.17 | 173155 |
| Coupon (%) | 7.14 | 3.69 | 0 | 18.92 | 167702 |
| NY law | 0.58 | 0.49 | 0 | 1 | 130991 |
| Exchange-listed | 0.91 | 0.28 | 0 | 1 | 167904 |
| Bid-ask EMBIG (%) | 0.76 | 0.37 | 0.22 | 3.54 | 172071 |
| US HY Rate (%) | 9.9 | 2.66 | 6.06 | 22.97 | 175715 |

Table 5.6: Stationarity tests of main variables

| Variable | Fisher-type Meta test of I(1) |
|---|---|
| Bid/Ask spread | -131.302*** |
| Default probability | -6.884*** |
| Return volatility | -36.1503*** |
| Sovereign spread | -14.1661*** |
| Liquidity spread | -142.3638*** |

| Variable | DF-GLS |
|---|---|
| Bid/Ask spread EMBIG | -4.171*** |
| US HY rate (Barclays/Lehman) | -2.848** |

$^{***}p < 0.01$,$^{**}p < 0.05$.

Table 5.7: Event study results

The table reports results from event studies around the events indicated in the column headers. The "excess bid-ask spread" denotes the difference between the observed bid-ask spread during the post-event time (on the event day itself in the "Day" column, and the trading 10 days following the event in the "Window" column), and the mean bid-ask spread in the pre-event window (50 trading days prior to the event). The third row reports the probability of observing the difference under the null that the median excess bid-ask spread is zero based on a binomial distribution (sign test), while the fourth row reports the results from a $t$-test with the null that the mean excess bid-ask spread is zero. The results indicate significantly larger bid-ask spreads on and after negative return shocks as well as payment defaults than during the pre-event windows, and significantly lower bid-ask spreads on and after the publication of restructuring offers as well as debt exchanges than during the pre-event windows.

| | Return shock | | Default | | Offer | | Exchange | |
|---|---|---|---|---|---|---|---|---|
| | Day | Window | Day | Window | Day | Window | Day | Window |
| Excess bid-ask spread (mean) | 3.451 | 2.662 | 2.669 | 2.889 | -0.790 | 0.181 | -2.836 | -2.636 |
| Standard deviation | 4.716 | 4.836 | 3.506 | 4.423 | 1.804 | 3.404 | 4.656 | 4.723 |
| p under $H_0$ (Sign test) | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.161 | 0.011 | 0.000 |
| p under $H_0$ ($t$-test) | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.001 | 0.000 |
| Observations | 44 | 427 | 68 | 514 | 64 | 533 | 21 | 166 |

Table 5.8: Market liquidity during distress (I)

The table reports results from regressions based on equation (5.7). The dependent variable in all specifications is the percentage bid-ask spread as defined in 5.5. The coefficients $t-8 \dots t+8$ are related to binary indicators marking the weeks before and after the respective event noted in the column header. The time-invariant bond characteristics are absorbed by the bond fixed effects in the respective specifications, as are the country fixed effects. All specifications include year indicators to capture possible time trends. All standard errors corrected for heteroskedasticity and autocorrelation of the error terms. The results are in line with the findings from the event studies. For negative return shocks (columns 1-2), bid-ask spreads are significantly lower in the weeks before the events. For payment defaults and restructuring announcements (columns 3-4), markets turn increasingly illiquid even in the weeks before the actual default indicating an anticipation effect that starts about 5 weeks prior to the event. The results for the publication of exchange offers (columns 5-6) and the actual debt exchanges (columns 7-8) are somewhat inconclusive, but indicate that the events do not have considerable influence on market conditions.

| | Return shock | | Default | | Offer | | Exchange | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Random Effects | Fixed Effects | Random Effects | Fixed Effects | Random Effects | Fixed Effects | Random Effects | Fixed Effects |
| t-8 | -1.62*** | -1.71*** | -1.01*** | -1.07*** | 5.34 | 4.38 | -0.84 | -0.60 |
| | (0.17) | (0.32) | (0.31) | (0.37) | (4.10) | (3.19) | (0.75) | (0.74) |
| t-7 | -1.76*** | -1.83*** | -1.03*** | -1.03*** | 4.81 | 4.01 | -0.70 | -0.46 |
| | (0.23) | (0.33) | (0.31) | (0.35) | (4.16) | (3.10) | (0.72) | (0.70) |
| t-6 | -1.88*** | -1.79*** | -0.71** | -0.66* | 5.85 | 4.69 | -0.22 | -0.12 |
| | (0.20) | (0.31) | (0.33) | (0.35) | (4.62) | (3.63) | (0.71) | (0.62) |
| t-5 | -1.86*** | -1.88*** | -0.51 | -0.57 | 5.14 | 3.86 | -0.97 | -0.73 |
| | (0.20) | (0.36) | (0.50) | (0.48) | (4.32) | (3.37) | (0.89) | (0.83) |
| t-4 | -1.77*** | -1.85*** | -0.02 | -0.15 | 5.72 | 4.38 | -0.16 | -0.12 |
| | (0.18) | (0.34) | (0.63) | (0.63) | (4.65) | (3.74) | (0.42) | (0.38) |
| t-3 | -1.68*** | -1.71*** | 0.24 | 0.07 | 6.42 | 4.84 | -0.49 | -0.44 |
| | (0.19) | (0.19) | (0.36) | (0.38) | (4.62) | (3.86) | (0.59) | (0.50) |
| t-2 | -1.52*** | -1.62*** | 0.05 | 0.09 | 5.21 | 3.91 | -0.44 | -0.42 |
| | (0.27) | (0.23) | (0.34) | (0.30) | (4.20) | (3.42) | (0.53) | (0.44) |
| t-1 | -1.36*** | -1.28*** | 1.13** | 1.03*** | 5.47 | 4.10 | -0.67 | -0.61 |
| | (0.22) | (0.19) | (0.46) | (0.36) | (4.51) | (3.65) | (0.57) | (0.50) |
| t | -0.82 | -0.45 | 2.08*** | 2.03*** | 4.79 | 3.53 | 0.10 | -0.05 |
| | (0.60) | (0.36) | (0.28) | (0.23) | (4.43) | (3.43) | (0.31) | (0.19) |
| t+1 | 0.06 | 0.48 | 2.01*** | 2.11*** | 6.56 | 4.85 | 0.45** | 0.27 |
| | (0.61) | (0.36) | (0.54) | (0.50) | (5.57) | (4.52) | (0.21) | (0.21) |
| t+2 | -0.15 | 0.72 | 3.60** | 3.88*** | 11.49 | 8.40 | 1.10*** | 0.87** |
| | (0.91) | (0.68) | (1.61) | (1.43) | (8.49) | (7.05) | (0.36) | (0.44) |
| t+3 | 0.17 | 1.19 | 3.11** | 3.39** | -0.95*** | -0.68* | 1.41** | 1.10* |
| | (0.93) | (0.85) | (1.45) | (1.33) | (0.32) | (0.35) | (0.55) | (0.64) |
| t+4 | 0.43 | 1.40** | 4.25** | 4.17** | -1.03** | -0.88** | 0.89*** | 0.68* |
| | (0.74) | (0.63) | (1.94) | (1.59) | (0.41) | (0.35) | (0.32) | (0.39) |
| t+5 | 1.56 | 1.90** | 5.13** | 4.99** | -1.24*** | -1.14*** | 0.23 | 0.11 |
| | (1.11) | (0.92) | (2.41) | (2.14) | (0.34) | (0.26) | (0.23) | (0.25) |
| t+6 | 1.76 | 2.14* | 3.36*** | 3.87*** | -1.20*** | -1.09*** | 0.05 | -0.06 |
| | (1.47) | (1.17) | (0.67) | (1.01) | (0.29) | (0.21) | (0.21) | (0.22) |
| t+7 | 1.51 | 2.02* | 4.39*** | 4.30*** | -0.89* | -0.89** | 0.01 | -0.09 |
| | (1.15) | (1.02) | (0.64) | (0.57) | (0.46) | (0.36) | (0.20) | (0.20) |
| t+8 | 1.81 | 2.05* | 6.20*** | 5.77*** | -0.11 | -0.28 | 0.67* | 0.54 |
| | (1.35) | (1.16) | (0.62) | (0.92) | (1.21) | (0.95) | (0.40) | (0.42) |
| Time to maturity | 0.00** | 0.00 | 0.00** | 0.00* | 0.00** | 0.00 | 0.00** | 0.00* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Principal (Bn USD) | -0.23*** | | -0.24*** | | -0.25*** | | -0.23*** | |
| | (0.02) | | (0.01) | | (0.01) | | (0.02) | |
| Coupon | 0.01 | | 0.01 | | -0.00 | | 0.01 | |
| | (0.02) | | (0.02) | | (0.02) | | (0.02) | |
| NY law | -0.12 | | -0.13 | | -0.14 | | -0.12 | |
| | (0.26) | | (0.26) | | (0.25) | | (0.26) | |
| Exchange-listed | -0.66** | | -0.66** | | -0.68** | | -0.66** | |
| | (0.31) | | (0.31) | | (0.30) | | (0.31) | |
| Bid-ask EMBIG | 1.25*** | 1.30*** | 1.22*** | 1.30*** | 1.30*** | 1.36*** | 1.27*** | 1.34*** |
| | (0.14) | (0.14) | (0.13) | (0.13) | (0.13) | (0.15) | (0.14) | (0.15) |
| US HY Rate | -0.01 | 0.01 | -0.01 | 0.01 | -0.02 | -0.00 | -0.02 | 0.00 |
| | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) |
| Constant | 1.37*** | 0.44 | 1.41*** | 0.40 | 1.49*** | 0.43 | 1.38*** | 0.44 |
| | (0.35) | (0.38) | (0.36) | (0.38) | (0.45) | (0.45) | (0.37) | (0.39) |
| Bond fixed effects | No | Yes | No | Yes | No | Yes | No | Yes |
| Country fixed effects | Yes | n/a | Yes | n/a | Yes | n/a | Ye | n/a |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R2 B | 0.77 | 0.04 | 0.78 | 0.06 | 0.78 | 0.08 | 0.77 | 0.04 |
| R2 W | 0.08 | 0.08 | 0.09 | 0.08 | 0.11 | 0.09 | 0.08 | 0.07 |
| R2 O | 0.19 | 0.06 | 0.19 | 0.07 | 0.21 | 0.08 | 0.18 | 0.06 |
| Obs | 788,805 | 1,024,625 | 788,805 | 1,024,625 | 788,805 | 1,024,625 | 788,805 | 1,024,625 |
| No. Bonds | 541 | 666 | 541 | 666 | 541 | 666 | 541 | 666 |

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

## Table 5.9: Market liquidity during distress (II)

The table reports results based on equation (5.8). The dependent variable in all specifications is the percentage bid-ask spread as defined in 5.5. The specifications with respect to fixed effects and disturbances are as before (see Table 5.8). Columns 1 and 2 introduce the main variables of interest. They indicate that default risk and volatility are indeed positively correlated with bid-ask spreads, as predicted by the theoretical considerations. The effect also holds up concurrently (column 3), although at a somewhat weaker level due to the collinearity between the two variables. Including controls for bond characteristics and global risk developments (columns 4 and 5) does not change the results. Finally, the benchmark specification in column 6 including bond fixed effects reports a large and significant correlation with market illiquidity.

| | (1) $PD$ | (2) $Vol_{it}$ | (3) Main variables | (4) Bond features | (5) Global vars. | (6) Benchmark |
|---|---|---|---|---|---|---|
| | Random Effects | Random Effects | Random Effects | Random Effects | Random Effects | Fixed Effects |
| Default Probability (%) | 0.07*** | | 0.05*** | 0.04*** | 0.04*** | 0.05*** |
| | (0.01) | | (0.00) | (0.01) | (0.01) | (0.00) |
| Volatility (%) | | 1.05*** | 0.78*** | 0.91*** | 0.92*** | 0.77*** |
| | | (0.16) | (0.21) | (0.25) | (0.29) | (0.24) |
| Time to maturity (days) | | | | -0.00* | -0.00 | -0.00 |
| | | | | (0.00) | (0.00) | (0.00) |
| Principal (Bn USD) | | | | 0.16** | 0.17** | |
| | | | | (0.07) | (0.07) | |
| Coupon (%) | | | | 0.03 | 0.03 | |
| | | | | (0.03) | (0.03) | |
| NY law | | | | 0.21 | 0.21 | |
| | | | | (0.16) | (0.16) | |
| Exchange-listed | | | | -1.20*** | -1.22*** | |
| | | | | (0.44) | (0.45) | |
| Bid-ask EMBIG (%) | | | | | -0.09 | 0.04 |
| | | | | | (0.28) | (0.25) |
| US HY Rate (%) | | | | | 0.01 | -0.00 |
| | | | | | (0.02) | (0.02) |
| Constant | 0.70*** | 1.68*** | 0.67*** | 1.27** | 1.31** | 0.62** |
| | (0.15) | (0.21) | (0.17) | (0.54) | (0.61) | (0.24) |
| Bond fixed effects | No | No | No | No | No | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | n/a |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R2 | 0.29 | 0.32 | 0.35 | 0.40 | 0.40 | 0.32 |
| Obs | 809340 | 1006184 | 781411 | 640540 | 640540 | 781031 |
| No. Bonds | 586 | 652 | 574 | 470 | 470 | 573 |

$^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$

Table 5.10: Market liquidity during distress (robustness)

The table exposes the benchmark specification in column 6 of Table 5.9 to a number of alternative specifications. Column 1 restricts the sample to non-defaulting countries only. Compared to the full sample, the coefficients are considerably smaller, but still on a level both economically and statistically significant. The finding is similar when excluding high-distress periods with sovereign spreads above 10%, or when looking at crisis periods only (columns 2-3). Column 4 uses the absolute bid-ask spread as the dependent variable instead of the percentage version used as the benchmark definition. Columns 5 and 6 report results when assuming cross-sectional autocorrelation (Driscoll and Kraay, 1998) or computing the Newey and West (1987) covariance matrix. Note that this only affects the standard errors, not the coefficient estimates as compared to the benchmark specification. Column 7 explicitly models the disturbances as an AR(1) process, which also impacts the point estimates of the coefficients. However, the results remain robust to this alternative specification.

| | (1) Exclude defaulters | (2) Spread < 10% | (3) Spread > 10% | (4) Absolute bid-ask spreads | (5) Driscoll-Kraay SE | (6) Newey-West SE | (7) AR(1) disturbances |
|---|---|---|---|---|---|---|---|
| Default Probability (%) | 0.02*** | 0.02*** | 0.06*** | 0.01*** | 0.05*** | 0.05*** | 0.03*** |
| | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Volatility (%) | 0.30*** | 0.32*** | 0.38*** | 0.12*** | 0.77*** | 0.77*** | 0.53*** |
| | (0.06) | (0.05) | (0.10) | (0.02) | (0.09) | (0.05) | (0.01) |
| Time to maturity (days) | 0.00* | 0.00 | 0.00** | -0.00** | -0.00 | -0.00 | 0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Bid-ask EMBIG | 0.80*** | 0.76*** | -0.12 | 0.60*** | 0.04 | 0.04 | 0.77*** |
| | (0.07) | (0.07) | (0.23) | (0.04) | (0.09) | (0.05) | (0.01) |
| US HY Rate | -0.02** | -0.03*** | -0.09 | -0.01 | -0.00 | -0.00 | -0.03*** |
| | (0.01) | (0.01) | (0.06) | (0.01) | (0.01) | (0.00) | (0.00) |
| Constant | 0.07 | 0.15 | -0.04 | 0.66*** | 0.62*** | | 0.18*** |
| | (0.11) | (0.11) | (2.49) | (0.09) | (0.13) | | (0.00) |
| R2 | 0.22 | 0.20 | 0.12 | 0.04 | 0.27 | 0.27 | 0.31 |
| Obs | 666302 | 696850 | 75159 | 780943 | 781031 | 781030 | 780458 |
| No. Bonds | 456 | 566 | 233 | 573 | 573 | 572 | 572 |

$^{***}p < 0.01$,$^{**}$ $p < 0.05$,$^{*}$ $p < 0.1$

## Table 5.11: Credit and liquidity risk in sovereign spreads

The table reports results based on equation (5.9). Standard errors are corrected for autocorrelation and heteroskedasticity. The dependent variable in all specifications is the sovereign spread, defined as the difference between the bonds' yields to maturity and US treasuries with corresponding maturities. Default probability here measures the difference between the implied country default risk and the implied US default risk (which is close to zero throughout the sample). The liquidity spread is defined as the difference between the bid-ask spread on the bond and the bid-ask spread on the EMBIG index. Columns 1-2 specify random effects, and the model in column 3 is the benchmark specification including bond fixed effects. All main specifications indicate a significant positive correlation of the two risk factors with the spread. Looking at exceptionally calm periods, with spreads below 5% (column 4), the liquidity risk factor appears almost irrelevant both in terms of size and statistical significance. This changes when restricting the sample to higher risk environments, as in columns 5-7. While the default risk factor is similar to the estimate obtained from the full sample, liquidity risk becomes more dominant, with the coefficient almost doubling in size relative to the benchmark specification. This is further strengthened in the interaction specification in column 8, the results of which are plotted in figure 5.5.

| | (1) Full sample | (2) Full sample + controls | (3) Full sample | (4) Spread < 5% | (5) Spread > 5% | (6) Spread > 7% | (7) Spread > 10% | (8) Interaction |
|---|---|---|---|---|---|---|---|---|
| Default Probability | 0.36*** | 0.39*** | 0.37*** | 0.20*** | 0.37*** | 0.36*** | 0.33*** | 0.35*** |
| | (0.05) | (0.05) | (0.05) | (0.03) | (0.04) | (0.04) | (0.04) | (0.05) |
| Liquidity Spread | 0.42*** | 0.47*** | 0.43*** | 0.03 | 0.62*** | 0.71*** | 0.79*** | 0.06 |
| | (0.13) | (0.14) | (0.14) | (0.05) | (0.19) | (0.19) | (0.12) | (0.13) |
| Time to maturity | | -0.00 | -0.00 | 0.00*** | -0.00 | -0.00 | -0.00 | -0.00 |
| | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Principal (Bn USD) | | 1.02 | | | | | | |
| | | (0.72) | | | | | | |
| Coupon | | 0.34 | | | | | | |
| | | (0.29) | | | | | | |
| NY law | | 0.33 | | | | | | |
| | | (0.34) | | | | | | |
| Exchange-listed | | -1.47 | | | | | | |
| | | (1.43) | | | | | | |
| Bid-ask EMBIG | | -0.50 | -0.55 | -0.02 | -1.03 | -1.02 | -1.10 | -0.44 |
| | | (0.35) | (0.41) | (0.10) | (0.66) | (0.91) | (0.80) | (0.39) |
| US HY Rate | | -0.02 | 0.03 | 0.07*** | -0.02 | 0.05 | 0.34 | 0.03 |
| | | (0.03) | (0.04) | (0.02) | (0.16) | (0.26) | (0.41) | (0.04) |
| PD x Liquidity | | | | | | | | 0.01** |
| | | | | | | | | (0.00) |
| Constant | -0.24 | -0.75 | 1.63 | -0.48* | 9.07*** | 10.58*** | 15.05*** | 1.69 |
| | (0.71) | (3.97) | (1.28) | (0.25) | (2.71) | (3.81) | (4.84) | (1.29) |
| Bond fixed effects | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | n/a | n/a | n/a | n/a | n/a | n/a |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R2 | 0.71 | 0.74 | 0.68 | 0.42 | 0.57 | 0.55 | 0.45 | 0.68 |
| Obs | 782621 | 644948 | 782269 | 582695 | 199573 | 129489 | 70912 | 782269 |
| No. Bonds | 585 | 479 | 584 | 539 | 418 | 335 | 234 | 584 |

$^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$

## Table 5.12: Contribution

The table reports the average and relative contributions of liquidity and credit risk to the sovereign spread based on equation 5.11 and 5.13. All computations are based on the specification in column 3 of Table 5.11 in different subsamples indicated in the rows and columns. The full sample/full sample results indicate that the average overall contribution of the liquidity risk factor to sovereign borrowing rates is about 4%. However, the number is lower for non-defaulting countries and when spreads are low. But it almost doubles in distressed periods, both for defaulting and non-defaulting countries.

| | | Full sample (1) | (2) | Not in default (3) | (4) | No defaulters (5) | (6) |
|---|---|---|---|---|---|---|---|
| | | Contr. | Share | Contr. | Share | Contr. | Share |
| Full sample | Credit Risk | 4.73 | 96% | 2.65 | 97% | 2.29 | 99% |
| | Liquidity risk | 0.20 | 4% | 0.07 | 3% | 0.02 | 1% |
| Spread $< 5\%$ | Credit Risk | 1.13 | 100% | 1.13 | 100% | 1.32 | 100% |
| | Liquidity risk | 0.01 | 0% | 0.01 | 0% | 0.00 | 0% |
| Spread $> 5\%$ | Credit Risk | 11.81 | 94% | 5.58 | 97% | 4.92 | 99% |
| | Liquidity risk | 0.73 | 6% | 0.17 | 3% | 0.06 | 1% |
| Spread $> 7\%$ | Credit Risk | 14.69 | 94% | 6.52 | 96% | 5.80 | 99% |
| | Liquidity risk | 1.02 | 6% | 0.29 | 4% | 0.07 | 1% |
| Spread $> 10\%$ | Credit Risk | 18.09 | 93% | 8.39 | 94% | 7.02 | |
| | Liquidity risk | 1.43 | 7% | 0.57 | 6% | 0.22 | 3% |

# Chapter 6

# Foreign Law Bonds: Can They Reduce Sovereign Borrowing Costs?[1]

Joint work with
Marcos Chamon[2]
Christoph Trebesch[3]

The Greek debt restructuring of 2012 has shown that the legal terms of sovereign bonds can protect creditors against losses, in particular the type of governing law. This paper studies whether sovereign bonds that are issued in foreign jurisdictions trade at a premium vis-á-vis domestic law bonds. We use the Eurozone between 2006 and 2014 as a unique testing ground to assess this "legal safety premium" and collect secondary market bond yield data for the near-universe of Eurozone government bonds issued in foreign jurisdictions. Controlling for currency risk, liquidity risk, and term structure, we find that foreign law bonds indeed carry lower yields on average. But a sizable premium only emerges for large values of credit risk (CDS spreads beyond 500bps). At those levels, a 100bp increase in CDS spreads is associated with a 30-80bp larger yield premium on foreign law bonds. In contrast, we do not find a premium for countries with low credit risk. These results indicate that sovereigns in distress can, at the margin, borrow at lower rates under foreign law, but that the ex ante benefits in normal times are likely limited.

*Keywords: Sovereign debt; Creditor rights; Seniority; Law and finance*

*JEL classification: F34, G12, K22*

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## 6.1 Introduction

This paper studies the role of law in sovereign debt markets, in particular the price impact of different governing laws under which sovereign bonds can be issued. We test whether sovereign bonds that submit the issuer to foreign jurisdictions, e.g. under English law or New York law, trade at a premium compared to domestic law bonds. The intuition behind this test is simple. The terms of domestic law bonds can be easier amended ex post by domestic legislation, and there have been cases where their terms were altered retroactively by the debtor country by an act of parliament.[4] For instance, amendments could take the form of inserting additional covenants which make the implementation of a restructuring easier, changing the currency denomination, or even altering the payment terms. Thus, at least in principle, sovereigns are in a stronger bargaining position vis-á-vis the holders of their domestic bonds relative to bonds issued under a foreign jurisdiction. Foreign law bonds are also increasingly prone to litigation and attachment orders in foreign courts, possibly making them better shielded against default and unilateral default (see IMF, 2013; Schumacher et al., 2014; Frankel, 2014). This paper explores the price impact of this "legal safety premium". How do markets value bonds that are protected by the rule of law abroad?

Our study is motivated by recent events, in particular the Greek restructuring of 2012, which showed that governing law can play a crucial role in sovereign debt markets. On 23 February 2012, the Greek parliament passed the "Greek Bondholder Act", which retroactively introduced collective action clauses (CACs) with aggregation features into its outstanding *domestic law* sovereign bonds.[5] After the offer was launched, more than 66% of domestic law bonds were tendered into the exchange. This forced minority holders to also restructure and accept the associated haircut, even if they voted against. In contrast, Greece did not have the possibility to change the terms of its *foreign law* bonds by domestic legislation. The aggregation CACs were consequently not inserted, which allowed investors in those bonds to reject the exchange offer more easily and hold out instead. The result was that more than 50% of Greek bonds under English, Swiss and Japanese law were not restructured and have since been serviced in full and on time.[6] The foreign law clause thus protected these investors from deep losses, i.e. the 65% haircut suffered by all domestic law bond investors (for a detailed assessment of the case see Choi et al., 2011; Gulati and Zettelmeyer, 2012; IMF, 2013; Zettelmeyer et al., 2013).

After the Greek experience of 2012, many observers suggested that bonds with foreign

[4]Constitutions often prevent laws from retroactively impairing contract rights (in the US by Article I, section 10, clause I). Nevertheless, in a crisis or war situation, even constitutions can be altered.

[5]Greek law no. 4050/2012 "Rules of amendment of titles issued or guaranteed by the Hellenic Republic with the Bondholder's agreement", see Hellenic Republic Ministry of Finance Press Release (9 March 2012), online available at http://www.minfin.gr/portal/en/resource/contentObject/id/baba4f3e-da88-491c-9c61-ce1fd030edf6.

[6]Holdouts made up a total of EUR 6.4bn in face value or 3.1% of total debt exchanged (Zettelmeyer et al., 2013).

governing laws are preferable from a creditor perspective. For example, the New York Times speculated that "investors might think twice before investing in those local-law bonds, no matter how high the yield" (Thomas, 2012). Similarly, the Wall Street Journal reported analyst recommendations to sell domestic law Portuguese government bonds and buy foreign law securities instead (Stevis, 2012). Gulati and Zettelmeyer (2012) even suggest to use differences in governing law as a policy tool to address the debt overhang problem in crisis countries. Specifically, they propose voluntary debt restructurings in which holders of local-law bonds swap these against foreign law bonds with longer maturities, i.e. with a present value haircut. Such voluntary swaps could be mutually beneficial since investors receive a safer asset while countries receive debt relief. A first application of this idea was the Greek debt exchange proposal itself, since all Greek-law bonds were exchanged into new English-law bonds – a carrot to induce investors' participation in the exchange.

The potential advantages of foreign law bonds have also come to the attention of debt managers. Cyprus, Greece and Portugal all returned to the international bond market by issuing English-law instruments in 2014, and other small crisis countries, such as Latvia or Slovenia, also shifted their sovereign bond issuance patterns from domestic to foreign law according to data by Dealogic. We generally find foreign law bonds to account for a substantial share of public sector borrowing in the last decade, both in Europe and in Emerging Markets (see Figures 6.1 and 6.2).

Despite the widespread use of foreign law bonds, there is still limited evidence on the price impact of legal clauses and governing law in sovereign debt markets. Few rigorous empirical studies exist and theory is ambiguous whether and how sovereign bond contract design matters. On the one hand, Roubini (2000) and Weinschelbaum and Wynne (2005) argue that contractual bond clauses such as CACs or governing law are likely to be irrelevant, both ex-ante and once the country enters financial distress.[7] On the other hand, the work by Bolton and Jeanne (2007, 2009) suggests that debt which is harder to restructure, in legal terms, will effectively be senior and therefore have lower yields ex-ante (a similar argument is made by Pitchford and Wright, 2007).[8] Our aim is to exploit a large sample of bonds and the unique Eurozone setting with multiple sovereign issuers in the same currency to understand whether foreign law debt is indeed priced at a premium, and how large this premium is across countries and time.[9]

[7]Roubini (2000) argues that initial contractual terms are likely to be irrelevant since creditors and sovereigns can find ways to work around them ex-post, as shown by a number of actual cases. Weinschelbaum and Wynne (2005) emphasize that governments have a variety of different debt contracts outstanding and that the relevance of contract design in individual portions of the debt will decrease the more diversified the debt stock is. Moreover, they argue that the implicit guarantee of official sector bailouts in case of distress makes investors ignore contractual clauses.

[8]There is a large related body of theory work studying the ex-ante and ex-post effects of easy versus hard to restructure debt and the economic consequences of sovereign bond contracts and creditor behavior during debt crises, see Miller and Zhang (2000), Ghosal and Miller (2003), Gai et al. (2004), Haldane et al. (2005), Engelen and Lambsdorff (2009), Bi et al. (2011), Lanau (2011), Pitchford and Wright (2012) and Ghosal and Thampanishvong (2013).

[9]Note that the focus is on debt issued under foreign law, and not necessarily external debt issued to

We use the Eurozone crisis as a laboratory since it provides the cleanest setting with which to study a premium on hard to restructure debt. In emerging markets, it is very difficult to find local- and foreign law bonds denominated in the same currency. Disentangling the currency risk premium from a jurisdiction premium is further complicated because there is no domestic currency risk-free yield curve. This is not a problem in the case of the Euro area because the credit risk-free yield curve of Germany can be used to separate currency from credit risk. Identification in our paper thus comes from comparing bonds from the same sovereign issued under different jurisdiction, e.g. an Italian local-law bond and one under New York law, and using local and foreign currency credit risk-free benchmark yield curves to correct for currency risk. More generally, our approach accounts for term structure effects, bond liquidity, currency risk, and country-level default risk. Our time window is 2006-2014 and we cover the near-universe of foreign law bonds in the Eurozone.

As an add-on to our main analysis, we also show two simpler case studies from emerging market countries, namely Argentina and Russia. These sovereigns are the only ones for which we could identify sovereign "twin bonds" (domestic law and foreign law bonds by the same government issued in USD) to proxy the jurisdiction premium, although in a more simplistic way than for the Eurozone.

Our main result is that a foreign law premium exists, but it only becomes significant and sizable in periods of severe debt distress, with a likely debt restructuring on the horizon. For the Eurozone we define "severe distress" as CDS spreads rising over 500bps. Under these circumstances, an increase in the CDS spread of 1 percentage point is related to an increase in the foreign law premium of 0.27%; this effect rises to 0.74% at CDS spreads of 1,000bps, and even more than 1% for very high risk levels with CDS spreads of about 1,500bps, before flattening out beyond this level. In contrast, during times of low CDS premia (below 5%), foreign law bonds do not trade at a premium, ceteris paribus. We conclude that the legal features of sovereign bonds are not a dominant driver of bond prices and debt servicing costs in normal times, but they seem to matter in periods of distress and for countries with a high risk of default. Thus, we find that the ex-ante pricing effects of easy versus hard to restructure debt are limited, and only become relevant during crises. These results can be relevant for debt managers looking at diversifying their investor base, as well as investors holding distressed government bonds.

One interpretation of our findings is a "flight to safety" effect in the run up to a default and/or debt restructuring (see e.g. Beber et al., 2009). In a high-risk environment, investors start valuing contractual terms, in particular the choice of jurisdiction. With

foreigners. The resulting premium is likely to be the result of differences in a restructuring technology associated with foreign law, but may also be affected by differences in the willingness to impose different losses on creditors situated in different jurisdictions. There have been cases in which governments discriminated against foreign investors in favor of domestic creditors. But this is not a general pattern, and there have been numerous cases in which the opposite was true (Erce, 2012). The Eurozone restructurings in Cyprus and Greece both discriminated against domestic law bonds. Finally, secondary markets can blur the relation between jurisdiction and residency, as argued in Broner et al. (2010).

increasing default risk, more and more investors exit local-law bonds: bonds issued in a foreign country may be less likely to be restructured, or subject to other value-depreciating action, such as currency redenomination (see Krishnamurthy et al., 2014). Currency redenomination was seen as a possible risk factor in the event of a country leaving the Eurozone. For domestic law bonds, exiting countries could have achieved this through legislation; but for foreign law bonds, a debt exchange into securities denominated in the new currency would have been required. In our setting, we therefore cannot distinguish between the price impact of discrimination in terms of a restructuring, redenomination, retroactive insertion of contract terms, etc. Our premium should be broadly interpreted as a premium on the legal protection against all possible ex post contract amendments. The result is a widening foreign law premium as default approaches. Another, closely related interpretation of our findings is a change in the investor base. As yields continue to rise, buy-and-hold investors exit the market and professional distressed debt funds enter. These specialized investors may be more prone to value investor-friendly contract language such as foreign governing law, also because they may keep these bonds until the restructuring occurs and potentially hold out. Finally, there may be a dilution effect at play, to the extent that foreign law bonds are harder to restructure than their domestic law counterparts (Bolton and Jeanne, 2007, 2009).

The paper contributes to research in law and finance, in particular to the literature studying how legal conditions affect bond prices and lending.[10] In this body of work, there are only few studies on sovereign debt markets and almost all of them focus on one specific contractual dimension: CACs.[11] Early studies on the price impact of CACs exploit the cross-sectional variation in emerging market bonds, by comparing primary or secondary market yield spreads of English law bonds, which typically contain CACs, to those of New York law bonds, which usually did not contain CACs prior to 2003. Using this strategy and different data sources and samples, Tsatsaronis (1999), Becker et al. (2003), and Richards and Gugiatti (2003) do not find a significant pricing impact of bonds that include CACs. In contrast, Eichengreen and Mody (2000, 2004), and the more recent bond-by-bond analyses by Bradley and Gulati (2013) and Bardozzetti and Dottori (2014) find that CACs significantly reduce bond yields, but that this result depends on the creditworthiness of countries.

To our knowledge, only two previous studies analyze the price impact of governing law choice in sovereign bonds. Choi et al. (2011) compare yields of a single pair of Greek bonds: one bond issued under English law (maturing in April 2016 with a floating coupon rate of 6m EURIBOR + 0.075%) and one issued under Greek law (maturing in July 2016 with a coupon of 3.6%). They find that the English law bond trades about 200

[10] A large literature in finance studies how debt contract design, bond covenants and creditor rights influence borrowing and bond yields of firms. Two recent examples include Haselmann et al. (2010) and Miller and Reisel (2012) (see also references cited therein).

[11] Bradley et al. (2010) show evidence that bonds containing a *pari passu* provision increased in price following the Elliott vs. Peru court ruling that implied a novel, creditor-friendly interpretation of the *pari passu* clause.

basis points (bps) lower than its English law twin in mid-2009 and up to 400bps lower in mid-2010, and interpret this as evidence that markets price in a smaller likelihood of default for English-law governed bonds. The paper by Clare and Schmidlin (2014), written in parallel to our paper, uses a large sample of 400 European bonds, including from non-Eurozone countries such as the Czech Republic, Sweden or Turkey, of which 64 bonds are governed by foreign law. They then run cross-sectional regressions of bond yields on a set of explanatory variables, including bond maturity and a dummy for foreign law bonds, for each quarter between Q3 2008 and Q4 2012. Identification in the paper largely comes from cross-country variation, since 7 out of the 14 countries feature only foreign law bonds in the sample used.

We add to this literature by being the first to apply methods from the finance literature to cleanly identify yield premia associated with contractual bond features in sovereign debt markets. This allows us to take into account the contribution of currency risk and maturity (given the country's yield curve) to the price of each foreign bond at every point time when constructing the jurisdiction premium. We use a large, representative sample of Eurozone sovereign bonds and identify effects from the within-country variation in sovereign bond issues. This reduces potential selection and endogeneity effects, such as the choice of governing law.

## 6.2 Theoretical prior

This section gives a formal representation of our hypothesis by comparing the risk-neutral prices for a bond placed under domestic law with an otherwise equivalent bond governed by a foreign jurisdiction. We use prices instead of yields for simplicity. Consider first a domestic bond $D$ with $K$ annual coupon payments $c$ at dates: $\tau_k, k = 1, 2, ...K$. Given a discount function $d(m)$ for each date $m$, we assume the price of that bond is given by the net present value of its payment stream consisting of $K$ coupons and the principal:

$$P_D = \sum_{k=1}^{K} cd(\tau_k) + 100d(\tau_K) \tag{6.1}$$

Now compare this to a foreign law bond $F$ with the same coupon, principal, and maturity. Suppose that with probability $\pi$ the country will stick to the original terms of its foreign law bonds, even as it reduces the value of the domestic law obligations, and with probability $1 - \pi$ those bonds will receive the same treatment as the domestic bonds. Moreover, for simplicity, suppose that this uncertainty over their treatment is resolved before the next coupon payment. That is, while the uncertainty over whether the country will change the domestic law bond is not resolved before $\tau_1$, the uncertainty related to a differentiated treatment of foreign bonds is. The price of the foreign bond will then be given by a weighted average of the two possible payment streams. With probability $\pi$ its future cashflows can be discounted by the risk-free discount function $d^{rf}(\cdot)$ since there is

no risk within this stream, and with probability $1-\pi$ the cashflows are discounted by the same discount function $d(\cdot)$ used for the domestic bonds:

$$P_F = \pi \left( \sum_{k=1}^{K} c d^{rf}(\tau_k) + 100 d^{rf}(\tau_K) \right) + (1-\pi) \left( \sum_{k=1}^{K} c d(\tau_k) + 100 d(\tau_K) \right) \tag{6.2}$$

We assume that the risk-free discount rate is smaller for at least some dates during the lifetime of the bonds, i.e. $d(\tau) \leq d^{rf}(\tau)$ for all $\tau$, with strict inequality for some $\tau_k$. This means that the domestic law bond will always have a lower present value than the foreign law bond. Intuitively, one can think of $d^{rf}(\tau) - d(\tau)$ as a function of the sovereign spread over a risk-free benchmark, where the difference increases with a country's government credit risk. Under these assumptions we can show:

**Lemma 6.1.** *The premium $P_F - P_D$ increases with credit risk $d^{rf}(\tau_k) - d(\tau_k)$ if $\pi > 0$.*

*Proof.* Let $P_F^A$ and $P_D^A$ denote the initial prices under the discount function $d^A(\cdot)$. Consider a discount function $d^B(\cdot)$ where $d^B(\tau) \leq d^A(\tau)$ for all $\tau$ with strict inequality for some $\tau_k$, hence $P_D^A > P_D^B$. Equations (6.1) and (6.2) imply:

$$P_F^A - P_F^B = (1-\pi)(P_D^A - P_D^B) \tag{6.3}$$

so:

$$P_F^B - P_D^B = P_F^A - P_D^A + \pi(P_D^A - P_D^B) \tag{6.4}$$

and since $P_D^A > P_D^B$, equation (6.4) implies:

$$P_F^B - P_D^B > P_F^A - P_D^A \tag{6.5}$$

which means that the premium is larger under discount function $d^B(\cdot)$ than under $d^A(\cdot)$, with a larger spread $d^A(\tau) - d^B(\tau)$ for at least some $\tau$. □

**Lemma 6.2.** *B) The premium $P_F - P_D$ increases with the probability $\pi$.*

*Proof.* Since $d(\tau) \leq d^{rf}(\tau)$ for all $\tau$, with strict inequality for some $\tau_k$, (6.2) implies $\partial P_F / \partial \pi > 0$. □

## 6.3 Data and methods

### 6.3.1 Data

We start by compiling a list of foreign law bonds and consider all Eurozone countries. Our selection criteria are simple. First, we consider all bonds maturing after January 2006 and listed on Bloomberg. Second, we include bonds for which sufficient price information is available on Bloomberg. Third, we drop floating rate bonds. Table 6.11

shows the resulting sample of 100 fixed-rate foreign law bonds outstanding by Eurozone countries between 2006 and 2014. Most of the bonds in our analysis are from Southern European crisis countries: Greece, Italy, Portugal, and Spain. But the sample also includes foreign law bonds issued by Austria, Belgium, Finland, and Slovakia for which there was reasonable coverage in Bloomberg. For all other Eurozone countries, e.g. Germany, France or Ireland, we could not find foreign law bonds to be included in the analysis.[12]

The price data are recorded with daily frequency. The price observations are based on mid prices (average of bid and ask) at market closing time. Wherever possible, we rely on transaction-based price data from the Bloomberg trading platform (CBBT). If these are not available, we use composite Bloomberg pricing data, i.e. the standard Bloomberg data that most researchers use. These are computed as an average of price quotes across dealers reporting to Bloomberg, but the quotes were not necessarily executed and are therefore not always based on actual transactions.

We also collect data on domestic benchmark yield curves. We rely on the benchmark zero curves constructed by Bloomberg which are based on the most liquid bonds (all domestic law bonds). For each country in our sample, the benchmark curve is available at 3, 6, and 12 month maturities, and 2, 3, 4, 5, 10, 15, 20, and 30 year maturities. We use these benchmark curves when deriving the theoretical price of the bonds in the countries which we analyze. We also use the US, UK, Germany, Switzerland and Japan benchmark curves when pricing bonds issued in a foreign currency, as described in the next subsection.

### 6.3.2 Extracting foreign law premia

For each of the bonds, we estimate the foreign law premium by comparing the observed yield to maturity to a theoretically expected yield, by pricing a theoretical bond with the same characteristics as the foreign law bond using the domestic law benchmark yield curve. We discount the stream of payments given the foreign law bond's maturity and coupon structure using the domestic benchmark yield curve, thus reflecting the country-specific credit risk.[13]

Since the benchmark curve is only available at given maturities we linearly interpolate it when pricing the coupon and bond repayments. For example, if a bond has a coupon payment 8 months from the current date, the value of that payment is discounted using an interpolation of the 6 and 9 month benchmark yield. Similarly, if that bond matures in 7 years, that payment is discounted using an interpolation of the 5 and 10 year benchmark

[12]The only foreign law bond issued by Ireland for which pricing data is available matures in early 2010, dropping Ireland from most of our sample period.

[13]One alternative to using the domestic benchmark curve is to directly estimate a foreign law yield curve from the available bond price data. We tried estimating yield curves using the approaches described in Nelson and Siegel (1987) and Svensson (1994) but found the results to be excessively noisy during times of distress. This is in line with Härdle and Majer (2014) who show that standard yield curve models perform badly in the recent Eurozone crisis. Given our focus on distress episodes we prefer using Bloomberg's benchmark curves as a simpler and more transparent way to price the bonds.

yield. Hence, the discounting yield is derived as:

$$Y_{i,j,t,m} = \frac{m - \underline{m}}{\overline{m} - \underline{m}} Y_{i,j,t,\underline{m}} + \left(1 - \frac{m - \underline{m}}{\overline{m} - \underline{m}}\right) Y_{i,j,t,\overline{m}} \tag{6.6}$$

$Y_{i,j,t,m}$ denotes the interpolated domestic yield for bond $i$, issued by country $j$, at date $t$, maturing on $m$, and $Y_{i,j,t,\underline{m}}$ and $Y_{i,j,t,\overline{m}}$ represent the corresponding yields on the benchmark curve with the closest available maturities before and after $m$.

Foreign law bonds are often priced in a foreign currency. Of the 100 foreign law bonds, only 18% are issued in EUR. The most common currency is the USD, which accounts for 49% of bonds issued, while the JPY, CHF and GBP account for 18, 11 and 4%, respectively. For these bonds, we construct a foreign currency benchmark yield for the country using the benchmark yields for countries whose bonds are considered risk-free in the respective currencies. Specifically, we rely on Germany as the risk-free EUR issuer; the US as the risk-free USD issuer; Japan as the risk-free JPY issuer; Switzerland as the risk-free CHF issuer; and the UK as the risk-free GBP issuer. None of these countries has defaulted on their debt in the post-WW II era, and all are rated AA or above by the major rating agencies. For example, we construct the benchmark dollar yield for Spain by multiplying its benchmark EUR yield by the US benchmark yield (risk-free yield in USD) and dividing by the German benchmark yield (risk-free yield in EUR). Generally,

$$Y_{i^*,j,t,m} = (1 + Y_{i,j,t,m}) \times \frac{1 + Y_{i,FC,t,m}}{1 + Y_{i,GER,t,m}} \tag{6.7}$$

Where $Y_{i,FC,t,m}$ denotes the yield to maturity date $m$ for Germany, US, UK, Japan, or Switzerland in their respective currencies, and $Y_{i,GER,t,m}$ represents the German yield to maturity in EUR.[14] Note that for EUR denominated bonds, the second term reduces to 1 (i.e. no currency adjustment is necessary, and $Y_{i^*,j,t,m} = Y_{i,j,t,m}$).

We then use the maturity- and currency-adjusted theoretical yield of a domestic law bond to discount all promised cash flows on the foreign law bond. This net present value corresponds to the theoretical price of the foreign law bond if it had been issued under domestic law:

$$P_{i,j,t}^{\text{theoretical}} = \text{Present Value}_{i,j,t} = \sum_{k=t}^{m} \frac{\text{Cash Flow}_k}{(1 + Y_{i^*,j,t,m})^k} \tag{6.8}$$

This implied net present value corresponds to the theoretical price in the domestic market of a bond with the same characteristics as the foreign law bond.[15] By comparing that theoretical price with the actual bond price we can obtain a measure of the premium (or

[14] Using currency swaps would in principle provide a better measure of the market's price for converting a stream of payments across different currencies. But the liquidity of these swaps varies with the horizon. Using the benchmark curves for the US and Germany provides an excellent approximation, and are likely a less noisy measure than swaps at longer horizons.

[15] Note that even when we use benchmark curves of third countries, these are only used to adjust the risk-free yields for the currency risk between the euro and a foreign currency. Credit risk is entirely determined by the domestic benchmark yield curve.

discount) associated with a foreign jurisdiction. Similarly, we can compute the yield to maturity based on that theoretical price and compare it to the yield to maturity based on the observed price. This difference in yield to maturity represents the annual premium placed on the different jurisdiction:

$$\text{Premium}_{i,j,t} = Y^{\text{theoretical}}_{i,j,t,m} - Y^{\text{observed}}_{i,j,t,m} \tag{6.9}$$

This premium is our variable of interest. It represents the yield differential that countries "save" on their foreign law bonds, vis-á-vis a hypothetical identical bond placed under domestic jurisdiction. On average, this premium amounts to 0.24 percentage points; however, there are considerable differences between countries. For Austria, Belgium, Finland, Italy, and Spain, the mean premium is negative, ranging between -0.72 (Belgium) and -0.24 (Italy); only for Greece, Portugal, and Slovakia we observe a positive average premium of between 0.14 (Slovakia) and 2.56 (Greece) percentage points.

Besides this cross-sectional variation, the foreign law premium also changes considerably over time. Figure 6.3 plots the average premium by country (weighted by the bonds' principal) throughout the sample period. For the early period of the crisis in 2010, the premium is close to zero for all countries and does not change much. However, the premium increases in line with the rising distress in the coming months, evidenced by rising CDS spreads particularly during 2011-12. The co-movement is particularly pronounced for Greece, Italy, Portugal, Slovakia, and Spain; the premium changes much less for Austria, Belgium, and Finland.

This considerable variance, both within as well as between countries, suggests that not only credit risk is driving the existence of the premium. Non-EUR denominated foreign law bonds make up only a small segment of most Eurozone government borrowing (see Figure 6.1). This suggests that they are less actively traded than their domestic law benchmark counterparts and subject to a liquidity premium, reducing the observed credit risk discount. Indeed, for foreign law bonds, we find an average bid-ask spread of around 50bps relative to the mid-quote. In addition, foreign currency bonds were not eligible for use as collateral with the ECB during a large part of our sample period (see Corradin and Rodriguez-Moreno, 2014). This further reduces the value of foreign law bonds for market participants. Both market liquidity risk and the lack of ECB eligibility should lead us to underestimate the jurisdiction premium we find.

We do not have a theoretical prior for the shape of the relationship between credit risk and the legal premium. We therefore employ a two-step approach: we first start with a visual exploration of the data by plotting non-parametrically and semi-parametrically estimated relationships, and then continue with a more systematic econometric analysis.

### 6.3.3 Data exploration

In order to get a visual representation of the relationship, we first estimate the relationship between the foreign law premium and CDS spreads non-parametrically. Suppose that

relationship is given by a function $f(\cdot)$ :

$$\text{Premium}_{i,j,t} = f(CDS_{j,t}) + \varepsilon_{i,j,t} \tag{6.10}$$

where $\text{Premium}_{i,j,t}$ is the foreign law premium at which bond $i$ issued by country $j$ trades at date $t$, and $\text{CDS}_{j,t}$ is the 5-year CDS spread for country $j$ at $t$. We estimate $f(\cdot)$ using Fan's (1992) locally weighted regression, with quartic kernel weights. Our estimates at a point with CDS spread $CDS_1$ are based on a linear regression that weights an observation with spread $CDS_2$ by:

$$w_{\text{CDS}_1}(\text{CDS}_2) = \begin{cases} \frac{15}{16}\left(1 - \left(\frac{\text{CDS}_1 - \text{CDS}_2}{\lambda}\right)^2\right)^2 & \text{if } |\text{CDS}_1 - \text{CDS}_2| < \lambda \\ 0 & \text{otherwise} \end{cases} \tag{6.11}$$

We estimate this non-linear regression for each country, pooling observations from all of their bonds.[16] We also estimate this relationship in a semi-parametric specification, controlling for differences in time to maturity (in years) and the percentage bid-ask spreads:

$$\text{Premium}_{i,j,t} = f(\text{CDS}_{j,t}) + \beta_{BA}\text{Bid-Ask}_{i,j,t} + \beta_{TM}\text{Time to Maturity}_{i,j,t} + \epsilon_{i,j,t} \tag{6.12}$$

We estimate the parametric terms $\beta_{BA}$ and $\beta_{TM}$ using the differencing method described in Yatchew (1998). We initially order the observations in increasing CDS spreads. Let $k$ denote that ordering. Under the assumption that $f(\text{CDS}_k) - f(\text{CDS}_{k-1}) \approx 0$, we can difference (6.12) in order to eliminate the non-parametric term and estimate:

$$\begin{aligned} &\text{Premium}_k - \text{Premium}_{k-1} = \\ &\beta_{BA}(\text{Bid-Ask}_k - \text{Bid-Ask}_{k-1}) + \beta_{TM}(\text{Time to Maturity}_k - \text{Time to Maturity}_{k-1}) + v_k \end{aligned} \tag{6.13}$$

Once $\widehat{\beta}_{BA}$ and $\widehat{\beta}_{TM}$ have been estimated, we can estimate the non-parametric term:

$$f(\text{CDS}_{j,t}) = \text{Premium}_{i,j,t} - \widehat{\beta}_{BA}\text{Bid-Ask}_{i,j,t} - \widehat{\beta}_{TM}\text{Time to Maturity}_{i,j,t} \tag{6.14}$$

Figure 6.4 reports the results for Greece, Portugal, Spain and Italy. Each panel presents a scatter plot of the foreign law premium against the CDS spreads, the estimated non-parametric relationship (solid black line), and the semi-parametric relationship that controls for differences in the bid-ask spread and time to maturity across bonds (solid red line). The dashed lines correspond to the bootstrapped 95% confidence interval.

The plot for Greece (Panel A) indicates a relatively flat relationship for low levels of the CDS spread. But the premium starts rising once the CDS spread grows beyond around 7.5%. That relationship seems fairly linear until the CDS spread approaches 12.5%. Past that threshold, the plots continue to point to a linear relationship, but at a

[16] We set the bandwidth parameter $\delta = 300, 250,$ and 100 for Greece, Portugal, Spain and Italy, respectively.

more moderate slope. The error bands are fairly tight around the point estimates except for large values of the CDS spread (where we have relatively few observations). The two estimated specifications move roughly in paralell to each other, with most of the difference between the two being a level effect.

The plot for Portugal (Panel B) also indicates no relationship between the foreign law premium and CDS spreads for low levels of the latter, but a positive relationship once the CDS spread reaches around 4% for the non-parametric curve, and around 10% for the semi-parametric curve. Our sample includes only two foreign law bonds for Portugal, one of which had a substantially larger premium than the other (as illustrated by the two separate clusters of points in the scatter plots for large values of the CDS premium). The non-parametric results yield a curve that is averaging these two clusters. The semi-parametric results (red line) follow the lower cluster of points more closely, as part of the higher premium for one of the bonds is attributed differences in its bid-ask spread and time to maturity relative to the other bond. The latter specification also points to a flatter relationship. Whereas moving the CDS spread from 5 to 10% would raise the premium by 3.7% along the black curve, it would only raise it by 0.4% along the red line. But eventually both specifications point to a steeper relationship. For example, moving the CDS spread from 10 to 15% would raise the premia by 8.2 and 7.0%, along those two respective curves.

Panels D and C show the results for Spain and Italy. The results point to an essentially flat relationship (note the difference in the scale of the premium relative to the previous figures). The CDS spread for Spain never reached 6.5%, and the one for Italy never reached 6% in our sample. Thus, the lack of a relationship between the foreign law premium and the spreads for these countries is consistent with our previous results for Greece and Portugal, where a clear relationship did not emerge until spreads reached higher levels.

### 6.3.4 Empirical strategy

We next use a more systematic econometric approach to the data and account for potentially non-linear relationships. As a first step, we estimate the following linear regression for a panel of bonds:

$$\begin{aligned}\text{Premium}_{i,j,t} = \beta_1 \text{CDS}_{j,t} + \sum_j \beta_{2,j} D_j \text{CDS}_{j,t} + \beta_3 \text{Bid-Ask}_{i,j,t} \\ + \beta_4 \text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.15}$$

$D_j$ is a dummy for country $j$, which we interact with the CDS spread, and $\theta_{i,j}$ is a bond-level fixed effect. Our priors are that the foreign law premium is positively correlated with the CDS spreads, since protection through governing law should become more important as credit risk rises; and a negative relationship with the bid-ask spread, since all else equal, a less liquid bond is less attractive. In the case of a compounding default

probability, a longer time to maturity foreign law bond should have a larger premium. As a default becomes eminent, the premium should be larger for shorter-term bonds.[17]

The results from the non-parametric and semi-parametric visual exploration of the data hint at a non-linear relationship between the premium and credit risk. We therefore also estimate a cubic model to accomodate such a functional form:

$$\begin{aligned}\text{Premium}_{i,j,t} &= \beta_1 \text{CDS}_{j,t} + \beta_2 \text{CDS}_{j,t}^2 + \beta_3 \text{CDS}_{j,t}^3 + \sum_j \beta_{2,j} D_j \text{CDS}_{j,t} + \beta_3 \text{Bid-Ask}_{i,j,t} \\ &+ \beta_4 \text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.16}$$

There are potential concerns that the correlations between CDS spreads and the legal premium could be spurious if both series are generated by a non-stationary process. Even though Fisher-type panel unit root tests lead us to reject the hypothesis that the series in all panels possess a unit root (see Table A1 in the appendix), this may be an overly permissive null (Ng, 2008). Since the foreign law premium is fairly persistent, and we cannot reject that it is integrated of order one I(1), we also estimate equations (6.15) and (6.16) in first differences:

$$\begin{aligned}\Delta\text{Premium}_{i,j,t} &= \beta_1 \Delta\text{CDS}_{j,t} + \sum_j \beta_{2,j} D_j \Delta\text{CDS}_{j,t} + \beta_3 \Delta\text{Bid-Ask}_{i,j,t} \\ &+ \beta_4 \text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.17}$$

$$\begin{aligned}\Delta\text{Premium}_{i,j,t} &= \beta_1 \Delta\text{CDS}_{j,t} + \beta_2 (\Delta\text{CDS}_{j,t} \times \text{CDS}) + \beta_3 (\Delta\text{CDS}_{j,t} \times \text{CDS}_{j,t}^2) \\ &+ \sum_j \beta_{2,j} D_j \Delta\text{CDS}_{j,t} + \beta_3 \Delta\text{Bid-Ask}_{i,j,t} + \beta_4 \text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.18}$$

A large increase in the premium, in the absence of a proportional adjustment in the CDS spreads, is likely to be reversed over time. In order to allow the model to capture a richer dynamic relationship between these two variables, we include the lagged levels of the premium and CDS spread in the regression in differences:[18]

$$\begin{aligned}\Delta\text{Premium}_{i,j,t} &= \beta_1 \text{Premium}_{i,j,t-1} + \beta_2 \Delta\text{CDS}_{j,t} + \beta_3 \text{CDS}_{j,t-1} \\ &+ \beta_4 \text{Bid-Ask}_{i,j,t} + \beta_5 \text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.19}$$

This model yields the same point estimates as if we estimated the regression in first differences but included a lagged error correction term (from the residuals of the regression

[17] For example, consider a case where creditors expect a 50% haircut on domestic bonds, but no restructuring of foreign bonds. If a default is eminent, domestic bond prices will converge to 50 cents on the dollar, and a 1- or a 10-year domestic bond will have similar prices if investors expect both to be accelerated and receive the same haircut. But the premium on short-term foreign bonds will be much larger than on long-term bonds. For example, a 1-year bond that is expected to be excluded from the restructuring could trade at a premium close to 100%, whereas a 10-year zero-coupon bond could at most trade at a premium of 7.2% (since that premium is compounded over a longer maturity).

[18] Note that the time dimension in our setting is very large relative to the cross-sectional dimension, mitigating concerns about a bias from including the lagged dependent variable.

of the level of the premium on the level of the CDS), but it can perform the estimation in a single regression. Again, we also estimate the model in cubic form:

$$\begin{aligned}\Delta\text{Premium}_{i,j,t} = {} & \beta_1\text{Premium}_{i,j,t-1} + \beta_{2,j}\Delta\text{CDS}_{j,t} + \beta_3(\Delta\text{CDS}_{j,t} \times \text{CDS}) \\ & + \beta_4(\Delta\text{CDS}_{j,t} \times \text{CDS}_{j,t}^2) + \beta_5\text{CDS}_{j,t-1} + \beta_6\text{CDS}_{j,t-1}^2 + +\beta_7\text{CDS}_{j,t-1}^3 \\ & + \beta_8\text{Bid-Ask}_{i,j,t} + \beta_9\text{Time to Maturity}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}\end{aligned} \tag{6.20}$$

## 6.4 Results: Eurozone 2006-2014

Table 6.2 reports the first results. Columns (1)-(3) shows the estimates for equations (6.15) and (6.16) in levels, whereas columns (4)-(6) show the results for equations (6.17) and (6.18) in first differences. In column (1), the model is estimated in a pooled sample of all countries, i.e. without the interaction of a country dummy with the CDS spreads. We find a positive, large and significant correlation between CDS spreads and the level of the premium of almost one – meaning that a one standard deviation increase in the CDS premium (5.3 percentage points) is associated with a 5.2 percentage point change in the difference in yields between foreign and domestic law bonds.

We are concerned that foreign law bonds might be less liquid than their domestic benchmark counterparts, and therefore carry a liquidity premium. If that were the case, we would in fact underestimate the premium placed on jurisdiction, since the difference between the two types of bonds in terms of restructuring risk would be mitigated by the liquidity risk compensation. Since we include bond fixed effects in all regressions, any bond-specific average risk premia should already be accounted for; however, liquidity risk may well be time-varying. However, the coefficient on the bid-ask spread of foreign bonds turns out small and insignificant, reducing concerns about liquidity.

Column (2) shows a model including country-specific slopes, using Austria as the benchmark country. The results indicate that the relationship in column (1) is largely driven by Greece; but the joint effect of an increase in CDS spreads on the premium is still positive for most countries. The model also has a considerably better fit of the variance in the premium data.

The cubic model in column (3) performs even better, vindicating the visual impression from Figure 6.4. The coefficients indicate a decreasing yet insignificant effect in the first power regressor, a significant increase in the second power, and a small significant decrease in the third power. This confirms the visual impression that the effect of an increase in the default probability on the foreign law premium becomes only relevant for higher levels of credit risk. Indeed, the marginal effect of a change in the CDS spread is insignifiant for low risk levels (CDS spread = 1%), about 0.27 for heightened risk (CDS spread = 5%), and 1.07 for very high credit risk (CDS spread = 15%). In this pooled sample, the marginal effect peaks with 1.28 at a CSS spread of ca. 25% before declining again.

Columns (4)-(6) show the results based on the difference equations (6.17) and (6.18). In line with the results in levels, an increase in default risk in form of a change in the CDS premium is correlated with a positive change in the premium. The magnitude of the coefficient with the differenced model is of course smaller than in columns (1) and (2), but the effect is more robust. The coefficient remains significant when we include country interaction terms for the change in CDS (column 5). The only country for which that interaction has a negative and significant effect is Slovakia, although the point estimate is small, and the joint effect taking into account any change in the CDS premium is insignificant. It is noteworthy that the point estimate for the interaction for Greece is relatively small, e.g. smaller than the one for Finland. But one must bear in mind that the magnitude of the change in spreads was much larger for Greece than for any other country. A relatively small coefficient can therefore lead to the large observed increase in foreign law premium for Greece.[19] The interaction terms point to a stronger effect of spreads on the premium for Italy, Portugal and Spain, which are the other periphery countries that experienced heightened levels of distress. For robustness, we also estimate a specification in which we use the difference from $t-5$ business days to $t$. The results are similar to the ones in first differences (not reported). The cubic model in column (6) indicates that a change in the CDS premium has a fairly constant correlation with changes in the premium for all risk levels and does not change as the level of the spread increases.

The pooled results with interaction effects have displayed considerable country variation. As a next step, we therefore provide a series of estimations in a country-by-country setting. While Belgium, Finland and Portugal have only 3-5 foreign bonds outstanding, the other countries have up to 21 (Italy). Besides the time-series variation, this allows exploiting cross-sectional variation even within the country regressions.

Table 6.3 reports country-by-country results for Greece, Portugal, Italy and Spain (GIPS). We find the strongest effects on the linear model for Greece, but Portugal and Spain also have a positive and statistically significant effect. The non-linear specifications point to a stronger relationship for Greece and Portugal. For ease of illustration, Figure 6.5 plots the combined effect of the terms on the CDS, $CDS^2$ and $CDS^3$ terms for different values of the CDS spread (along with error bands for the 95% confidence interval). In the case of Greece, the combined effect only becomes statistically significant when the CDS spread goes beyond 10%. But the foreign law premium eventually reaches a level close to 10%. For Portugal, the premium initially rises with the CDS spread, and is about 2% for most of the range of CDS spreads, until the CDS spread grows past 10% and the premium rapidly shoots-up. In the case of Italy, the foreign law premium is typically small and negative, whereas for Spain the relationship is broadly flat with wide error bands. The results are very similar if we drop outlier observations (above/below the 99th

[19]The relationship between CDS spreads and the premium may weaken for very large values of the former. For example, as the risk of default becomes imminent, bonds are priced based on their expected recovery values which can have very different implications for the yields on short- vs long-term bonds.

and 1st percentile of the premium, reported in Table A3).

For the sake of comparison, Table 6.4 reports similar results for Austria, Belgium, Finnland and Slovakia (ABFS). There are only two instances of a positive and significant coefficient (quadratic term for Belgium, and linear specification for Slovakia), none of which would amount to a non-negligible premium given the spreads faced by those countries. This evidence further supports the finding that markets only worry about the jurisdiction of issuance when credit risk becomes a concern.

Table 6.5 reports country-by-country results for the regression in first differences for the GIPS countries. We consider specifications where a change in the CDS spread affects the change in the premium (equation 6.17), as well as specifications where the change in the CDS spread is interacted with the level and the squared level of the CDS (equation 6.18). All of the regressions without this interaction point to a positive and statistically significant effect, with point estimates of 0.20, 0.49, 0.70 and 0.55 for Greece, Italy, Portual, and Spain, respectively. The regressions where the change in the CDS is interacted with its level point to a stronger relationship in changes for Greece and Portugal, which then declines as the CDS spread rises. These specifications point to weaker or non-existent effects for Italy and Spain, possibly because there is not much non-linearity in the relationship at the levels of spreads experienced by those countries. For ease of illustration, Figure 6.6 plots the estimated relationship in changes for different levels of the CDS spread. The results are similar (and quantitatively stronger) if we use a 5-day difference (not reported). The results are also robust to dropping outlier observations (Table A4).

Table 6.6 is analogous to Table 6.5 but presents the results for the ABFS countries. As expected, the estimated relationship tends to be much weaker, and never amounts to a substantial foreign law premium given the much lower CDS spreads for these countries.

The different strands of evidence point to the result that the foreign law premium is mainly relevant for countries experiencing significant financial distress; in "normal" times, and for perceived safe issuers, the correlation between default risk and jurisdiction premium is small. The sharper results from the regression in differences are consistent with the descriptive evidence from the summary plots. Those plots showed a strong tendency for co-movement between the premium and CDS spreads, particularly for high-risk countries, which is consistent with the results in the differences regressions. However, those plots also point to periods where the premium was high (or low) regardless of the evolution of the CDS spreads, e.g. when the two lines (in different scales) would cross. This is consistent with the weaker results for the level regressions.

Table 6.7 presents the results from first difference regressions where we control for dynamic features of the series by including a lagged term for both the dependent variable as well as the CDS spreads. This is essentially equivalent to an error correction model in which the short-run and equilibrium relationship can be inferred from the first-differenced and level coefficients. Notably, the results with respect to the correlation between changes in the CDS spread and changes in the foreign law premium remain almost identical to

those obtained from equation (6), both in the pooled sample as well as in the country-by-country regressions. The presence of an equilibrium relationship between credit risk and the foreign law premium is further backed by a set of panel co-integration results, all of which clearly reject the null hypothesis of no co-integration between the two variables (see Table A2). We follow the test-procedure suggested by (Westerlund, 2007). Intuitively, we test the hypothesis that there is no error correction in model (6.19), and hence no long-term relationship exists.[20] We find that in all specifications (with and without trend and drift) the tests reject the null of no error correction, which is evidence for a structural long-term equilibrium relationship.

Further evidence of a cointegrating relationship is given in Figure 6.7, which plots the results of a regression of the foreign law premium on the CDS spreads using only observations from the current quarter, for every quarter in 2006Q1-2014Q1. The figure plots the coefficients for each bond in our sample for Greece, Italy, Spain and Portugal. The specification is analogous to the one in Table 6.3. Only coefficients that are significant at the 5% level are plotted. Prior to 2009, the coefficients are widely dispersed, and do not suggest any consistent pattern. These results seem strongly driven by noise.[21] However, from 2009 onwards, the coefficients on the bonds move tightly closer. The median coefficient from 2009Q1 onwards is 0.57 (0.53 if we exclude Greece). This suggests that once credit risk became non-negligible, a stable relationship emerged between credit risk and the foreign law premium.

We should bear in mind that there are additional contractual differences between foreign and domestic law bonds beside whose courts have jurisdiction over legal proceedings. While we have focused our discussion of the legal premium on the potential benefits from protection against ex-post contract amendments, foreign law bonds tend to be less liquid. This is partly captured in our regressions by the bid-ask spreads. But one dimension of liquidity that is not captured by that measure is the ease with which the bonds can be used as collateral, in particular for repo-operations with the ECB. While bonds denominated in USD, GBP, and JPY issued and held in the euro area could benefit from the "Long Term Refinancing Operations" (LTRO), many of the foreign law bonds considered fell outside the scope of those programs according to the ECB's eligibility criteria. These considerations can have a substantial effect on the demand for, and hence the premium of, foreign law bonds. Indeed, Corradin and Rodriguez-Moreno (2014) show that a large spread emerged between EUR and USD denominated bonds issued by the same euro area country. They attribute that spread to ECB liquidity facilities and non-standard monetary policy measures that impacted euro and foreign currency

[20] Formally, note that we can write equation 6.19 as

$$\Delta\text{Premium}_{i,j,t} = \beta_1(\text{Premium}_{i,j,t-1} - \beta_3^*\text{CDS}_{j,t-1}) + \beta_{2,j}\Delta\text{CDS}_{j,t} + \beta_4\text{B-A}_{i,j,t} + \beta_5\text{Time Mat.}_{i,j,t} + \theta_{i,j} + \epsilon_{i,j,t}$$

for $\beta_3 = -\beta_1\beta_3^*$. Then $\beta_1$ corresponds to the error correction rate with which the model converges to the equilibrium relationship after a shock of $(\text{Premium}_{i,j,t-1} - \beta_3^*\text{CDS}_{j,t-1})$ (Westerlund, 2007, p. 712). The tests reported in Table A2 test if the error correction rate $\beta_1$ is different from zero.

[21] There was very limited variation in credit risk prior to the crisis, so a large coefficient could result from a small uptick in credit risk that coincides with an increase in the foreign law premium.

denominated bonds differently.

We therefore estimate the empirical models controlling for the bonds' collateral eligibility with the ECB. Specifically, we use a monthly binary indicator if a bond was eligible to be used as collateral in credit operations with the ECB between April 2010 and September 2013.[22] In this period, Italian foreign law bonds were never eligible central banking collateral, which is why we cannot estimate the adjusted model for Italy. Table 6.8 shows the results in levels. The results for Greece and Portugal remain similar to before, but the results for Spain using the cubic specification become much more similar to the results obtained for Portugal. This is in line with our argument above that an omission of a liquidity variable should bias the results against finding a significant correlation between credit risk and the foreign law premium.

Generally, these considerations would have a much more muted effect on the regression in changes. For example, large one-off shifts to the foreign law premium for reasons other than credit risk (e.g. liquidity and ease of discounting) will weaken the estimated relationship to the CDS spreads. But the same one-off shifts will be confined to relatively few observations when the regression is estimated in differences, and as a result have a more modest impact on the estimated relationship with the change in the CDS spreads. Indeed, the results in Table 6.9 obtained from the corresponding specification support this reasoning and show less of a difference to the results in Table 6.5 (without eligibility control variable).

Finally, Table 6.10 shows that our findings remain robust when credit ratings are used as a measure of credit risk instead of CDS spreads. A regression of the foreign law premium on ratings indicates that lower ratings are associated with an increase in the premium. The results are statistically significant both for the regression in levels and in differences.

## 6.5 Emerging markets: the case of Argentina and Russia

We do not attempt to estimate foreign law premia in emerging market (EME) bonds in the same rigorous way as above. This is because it is challenging, if not impossible, to disentangle currency risk from legal risk in these countries. Moreover, most emerging markets lack a domestic benchmark yield curve, especially in the 1990s and early 2000s, when most EME crises occurred.[23]

Despite this, we conducted an extensive search for "twin bonds", i.e. bonds issued in the same currency and with a similar maturity, but with different governing laws. To do so, we gathered a dataset of all EME sovereign bonds issued since the early 1990s from the comprehensive Dealogic database and used Bloomberg to search for yield

[22] Data are from the ECB's website. Longer back dating information is unfortunately not publicly available.

[23] A recent paper by Du and Schreger (2013) estimates local currency risk-free curves for emerging markets beginning in 2005. In theory, their analysis could be extended to the late 1990s/early 2000s. But the noise involved is likely larger than the jurisdiction premium we are trying to recover, particularly since debt crises tend to coincide with currency crises (Kaminsky and Reinhart, 1999).

data of promising bond pairs. Ultimately, we only found "twin bonds" with reasonable pricing data in two countries: Argentina and Russia. Both countries floated domestic law bonds in USD in the wake of sovereign debt restructuring agreements and this allows us to extract approximate foreign law premia. Specifically, for Russia, we focus on an English-law, USD-denominated Eurobond issued in 1997 and maturing in 2007 (ISIN: US78307AAB98) and compare its yield to the average yield of two Russian-law, USD denominated instruments due in 2006 and 2008: the "MinFin5" and "MinFin6" bonds with ISIN of RU0001337966 and RU0004146083, respectively. For Argentina, we use an even cleaner bond pair, since the country issued exactly the same instruments in both domestic and foreign law in its 2005 bond restructuring. Specifically, we compare the yields of the so called "Discount Bonds" under New York law with the yield of the same series under Argentine law (both due 2033 and with ISIN US040114GL81 and ARARGE03E097, respectively). Another perfect pair are the USD "Par Bonds" due 2033, which were also issued under New York law as well as under Argentine law.

The resulting yield differences between local-law and foreign law USD bonds are plotted in Figure 6.8. The upper panel shows the premium of the Russian foreign law Eurobond vis-á-vis their respective domestic law instruments. The approximate foreign law premium is largest in 2000-2003, a period with high yields in which Russia was still recovering from its own 1998-1999 default. The premium then decreases from more than 400bp to close to zero in the boom years of 2004-2006. For Argentina, the lower two panels show the evolution of the foreign law premium by comparing the yields of New York law bonds with those of their domestic law twin. The premium is highest after the outbreak of the 2008 financial crisis, reaching up to 600bp. It then decreases strongly and even turns negative after 26 October 2012, when the New York Second Circuit Court of Appeals announced a surprise ruling in favor of the hedge fund NML Capital which prohibited US intermediaries from forwarding payments on the New York law bonds.[24]

Taken together, these two case studies confirm our findings for the Eurozone: the foreign law premium is typically small, but it can become quite sizable during periods of financial distress.

## 6.6 Conclusion

This paper has estimated the jurisdiction premium associated with foreign law debt. Our estimates indicate that the premium is small when credit risk is limited, but it can become significantly larger in crisis times. In calm times, when risk is low, an increase in credit risk does not go along with a significant increase in the foreign law premium. However, during crisis times, when CDS premia rise beyond 10%, a change in the CDS spread of 100bps is associated with an increase in the foreign law premium of 74bps. This finding is robust to a vast number of variations in the econometric specification, and can

[24] *NML Capital v. Republic of Argentina*, Federal District Court for the Southern District of New York, docket no. 08 Civ. 6978, 09 Civ. 1707, 09 Civ. 1708.

be identified both in the cross-sectional as well as in the time dimension. We also find a notable foreign law premium following the sovereign debt restructurings of Russia 2000 and of Argentina 2005. Our results thus indicate that distressed countries can borrow, at the margin, at more favorable terms by issuing bonds in a foreign jurisdiction during distress. The results may be due to a flight-to-safety into harder to restructure debt when differential treatment becomes likely. Moreover, distressed debt investors may enter the market and push up the price for foreign law bonds which are more suitable for holdout strategies.

In crisis times, the findings are thus consistent with the view that issuing foreign law bonds represents a commitment device: by submitting to foreign jurisdictions and thereby making the debt harder to restructure, sovereigns send a signal that they are unlikely to default on these bonds. Dilution considerations can also contribute to a lower yield of foreign law bonds. As shown by Bolton and Jeanne (2009), the larger the stock of harder to restructure debt (such as foreign law bonds), the higher the expected haircut on the easier to restructure debt (such as domestic law bonds). However, there are limits to a dilution strategy, since the higher the share of foreign law debt, the lower the likelihood that it will be spared in the event of a default. In that regard, the estimated premium for peripheral Europe, where the bulk of the debt was issued domestically, may be larger than what we would observe for an emerging market where the share of foreign currency debt is higher to begin with and discrimination thus less likely.

In normal times, however, countries do not seem to pay more when issuing debt with easier to restructure debt. The small foreign law premium that we observe for low to moderate levels of credit risk suggests that the ex-ante benefits of issuing hard to restructure debt are small. These results speak to the literature on sovereign default and debt restructuring procedures, in which ex-ante vs. ex-post considerations play a central role (see e.g. Dooley, 2000; Pitchford and Wright, 2007; Bolton and Jeanne, 2007, 2009).

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# Figures

Figure 6.1: Foreign law bonds in European countries

This figure shows the share of foreign law bonds in total public sector bond issuance between January 2003 and July 2014 for EU countries based on Dealogic data. The shares are calculated using issuance amounts of sovereign and quasi-sovereign debt in USD, i.e. bonds placed by the central government or by government owned companies. Only instruments with maturity above 1 year are included.

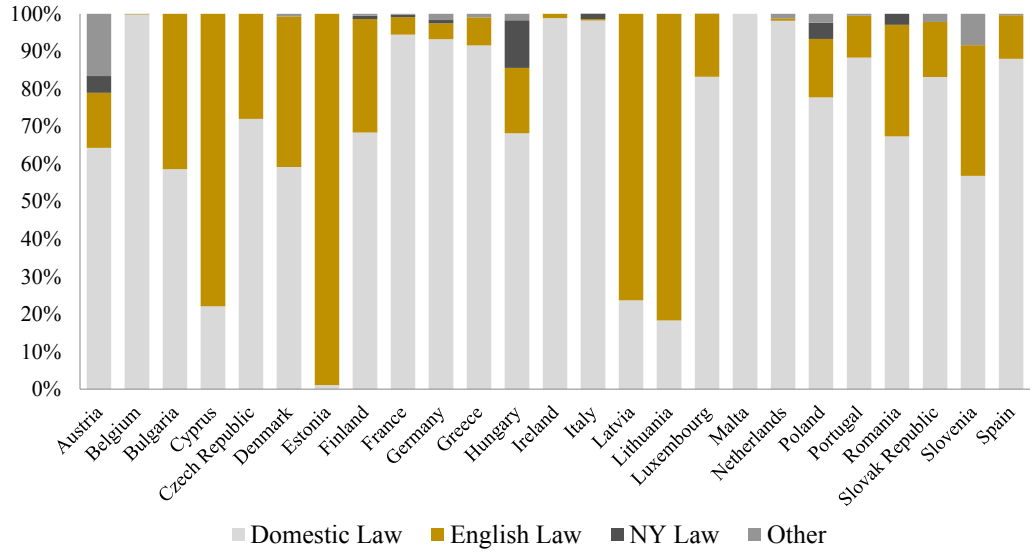



Figure 6.2: Foreign law bonds in EMEs

This figure shows the share of foreign law bonds in total public sector bond issuance between January 2003 and July 2014 for selected emerging markets, based on data from Dealogic. The shares are calculated using issuance amounts of sovereign and quasi-sovereign debt in USD, i.e. bonds placed by the central government or by government owned companies. Only instruments with maturity above 1 year are included. The Argentina numbers include the 2005 restructured bonds.

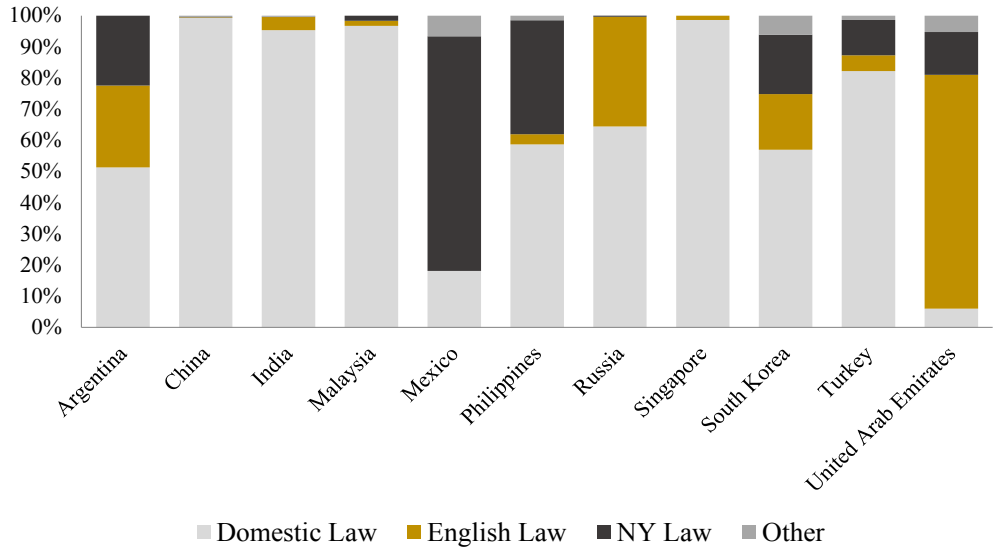


Figure 6.3: Foreign law premia and CDS spreads

This figure shows the estimated legal premium on foreign law bonds in percent (left axis, country averages weighted by principal) and the country-level CDS spread in percent (right axis).

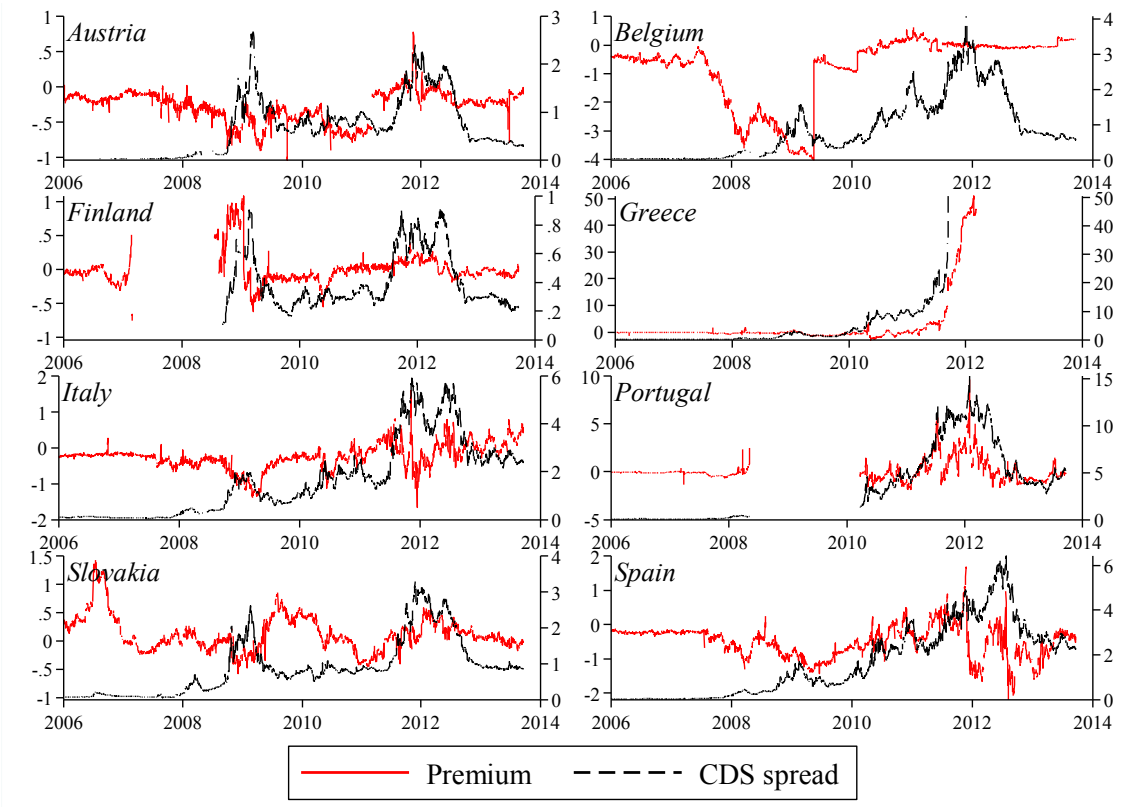


Figure 6.4: Non-parametric relationship between foreign law premium and CDS spread

This figure shows non-parametric estimates of the relationship between the foreign law premium and the CDS spreads using a locally-weighted linear regression with quartic kernel weights for Greece, Italy, Portugal and Spain, respectively (black line). The red line corresponds to a semi-parametric estimation that controls for differences in the bid-ask spread and time to maturity. Estimates for Greece, Portugal, Spain and Italy based on a bandwidth of 300, 250, 100, and 100bps, respectively. The dashed line corresponds to the bootstrapped 95 percent confidence interval. The scatter plot excludes some outlier observations.

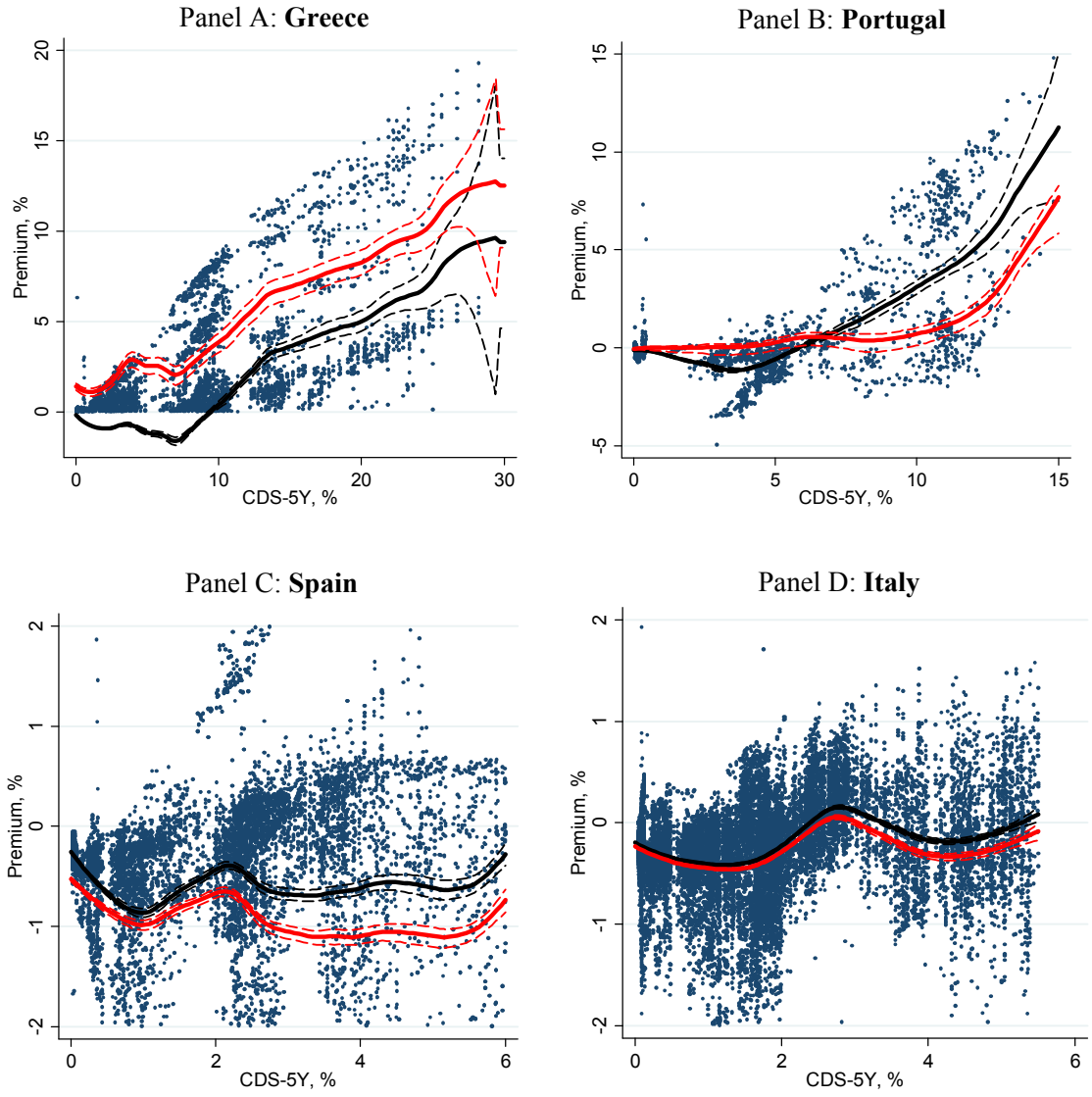


Figure 6.5: Estimated cubic relationship between foreign law premium and CDS spread

This figure plots linear combinations of the coefficients from the regressions in levels for different values of CDS spreads. For example, in panel A, this means that a shift in the CDS spread from 0 to 10% has no significant effect; from 0 to 15%, it raises the premium by ca. 5%; from 0 to 20, by ca. 8%. The analogous interpretation holds for the other countries.

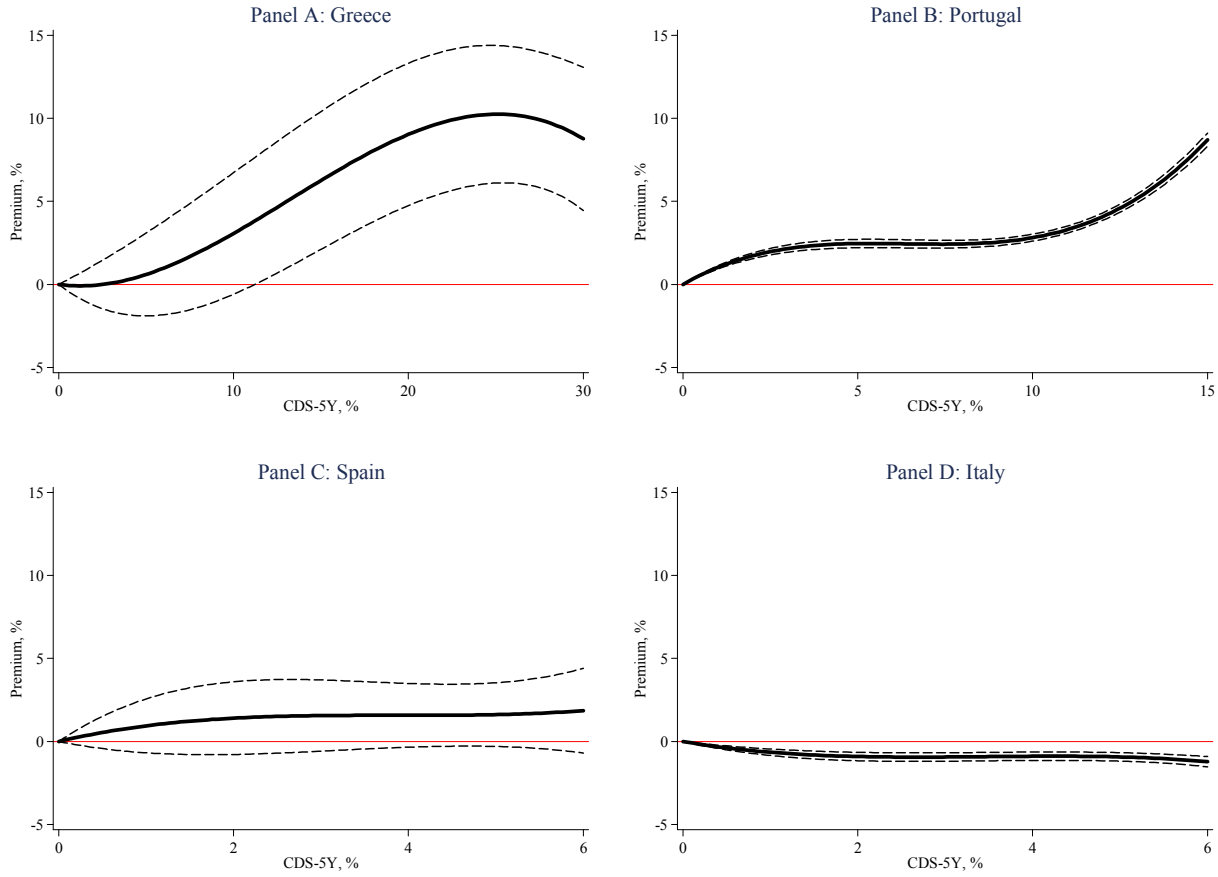


Figure 6.6: Estimated non-linear relationship between change in foreign law premium and change in CDS spread

This figure plots linear combinations of the coefficients from the regressions in differences for different values of CDS spreads. For example, in panel A, this means that a shift in the CDS spread at a CDS level of 0% has a smaller effect (ca. 0.2) than at a CDS level of 12% (ca. 0.25). The analogous interpretation holds for the other countries.

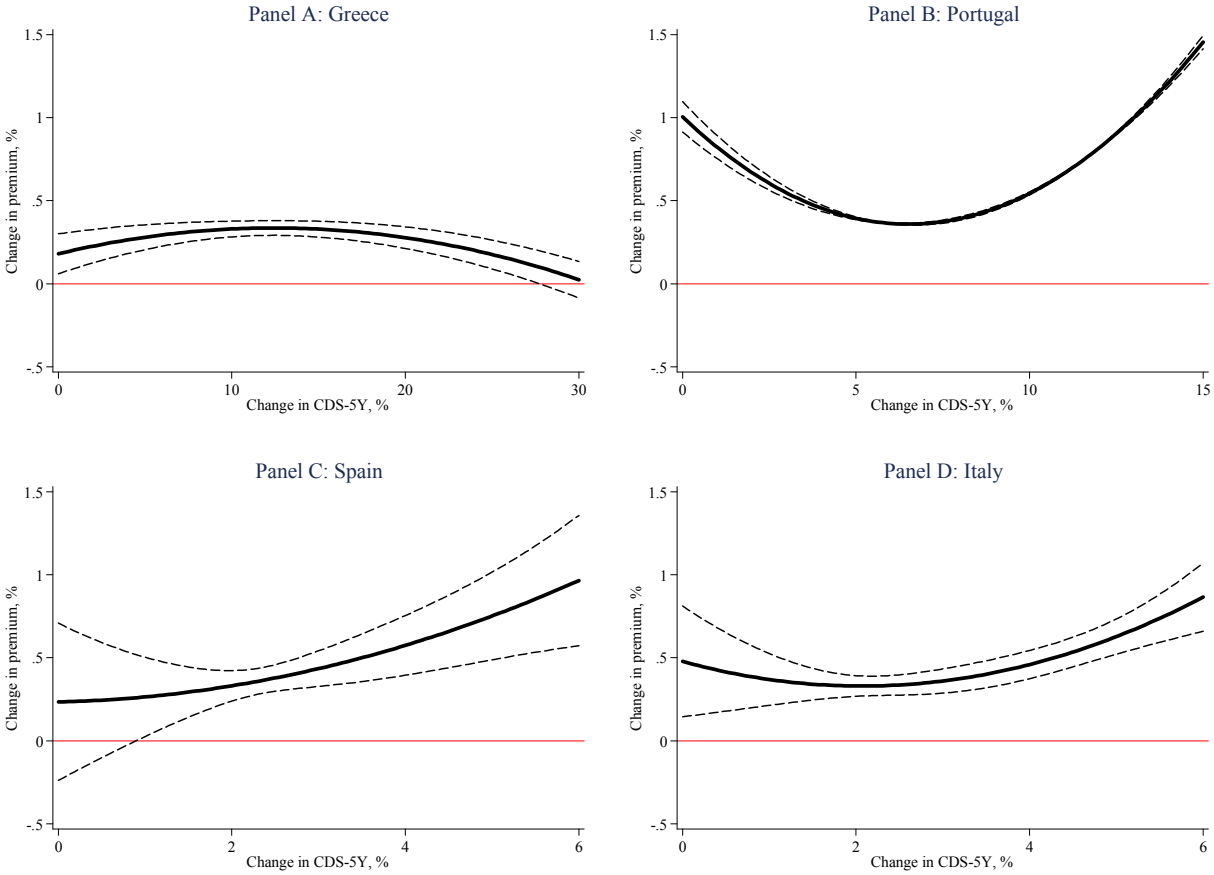


Figure 6.7: Bond-by-bond relation between credit risk and legal premium

This figure plots the coefficients on the CDS spread from bond-by-bond regressions according to equation(6.15, with the premium as well as the CDS spread in levels. The coefficients are estimated using only the data for the current quarter. Only coefficients significant at the 95% level are shown.

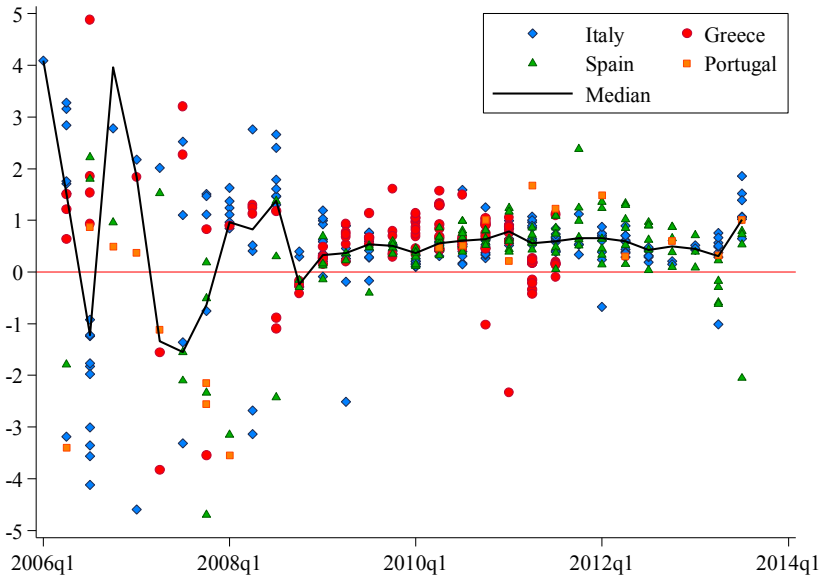
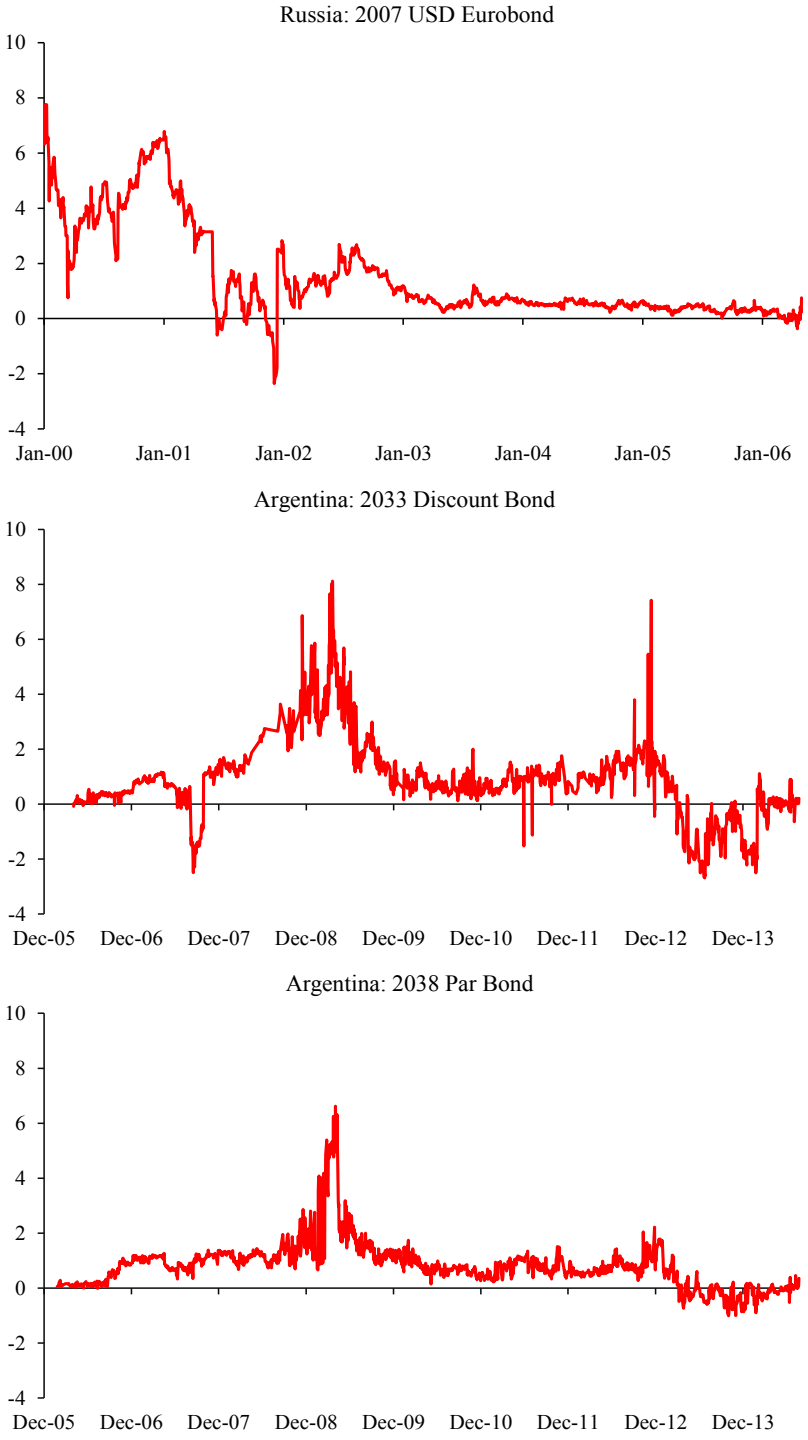


Figure 6.8: Foreign law premia in Russia and Argentina

This figure shows the yield difference between bonds issued by the same government under different jurisdictions. For Russia, the yield difference is computed between the English-law, USD-denominated Eurobond (US78307AAB98, due 2007) and the respectively imputed yields of Russian-law, USD denominated MinFin6 (RU0001337966, due 2006) and MinFin5 (RU0004146083, due 2008) bonds. The bonds for Argentina are the USD denominated exchange bonds from the 2005 debt restructuring (Discounts due 2033: local law ARARGE03E113, New York law US040114GL81; Par due 2038: local law ARARGE03E097, New York law US040114GK09).



# Tables

Table 6.1: Descriptive statistics

| | Observations | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Premium | 81,824 | 0.242 | 5.201 | -33.374 | 98.860 |
| ΔPremium | 81,724 | 0.005 | 0.467 | -67.617 | 25.066 |
| CDS | 79,261 | 2.409 | 5.326 | 0.019 | 50.474 |
| ΔCDS | 79,164 | 0.006 | 0.279 | -15.118 | 9.985 |
| Bid-ask | 77,778 | 0.489 | 1.156 | 0.000 | 29.952 |
| ΔBid-ask | 77,678 | 0.000 | 0.320 | -18.381 | 27.787 |
| Time to maturity (years) | 81,824 | 5.619 | 5.992 | 0.003 | 35.060 |
| Distress period | 81,824 | 0.124 | 0.329 | 0.000 | 1.000 |

Table 6.2: Pooled results

The table reports results from regressions based on equations 6.15 and 6.16. All models include bond fixed effects, and Hubert-White standard errors are reported in parentheses below the coefficients. The dependent variable in columns 1-3 is the legal premium in levels as in equation 6.15. Column 1 presents pooled results of all countries. Column 2 reports country-specific results by interacting the CDS premium with a country dummy. Column 3 is the cubic model as in equation 6.16. In columns 4-6, the dependent variable is the first difference of the premium as in equation 6.17. Column 4 shows pooled results and column 5 results with interactions and between the countries and CDS spreads. Column 6 reports results from the first-differenced cubic model as in equation 6.18.

| | Premium | | | ΔPremium | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CDS | 0.98*** | 0.18 | -0.35* | | | |
| | (0.18) | (0.11) | (0.20) | | | |
| $CDS^2$ | | | 0.07*** | | | |
| | | | (0.02) | | | |
| $CDS^3$ | | | -0.00*** | | | |
| | | | (0.00) | | | |
| ΔCDS | | | | 0.22*** | 0.09** | 0.55*** |
| | | | | (0.06) | (0.04) | (0.06) |
| CDS ×ΔCDS | | | | | | -0.01 |
| | | | | | | (0.01) |
| $CDS^2$ × ΔCDS | | | | | | 0.00 |
| | | | | | | (0.00) |
| Bid-ask | 0.09 | 0.33 | 0.33 | | | |
| | (0.25) | (0.29) | (0.31) | | | |
| ΔBid-ask | | | | -0.08 | -0.08 | -0.08 |
| | | | | (0.08) | (0.08) | (0.08) |
| Time to maturity | 0.45*** | 0.13 | -0.05 | -0.00** | -0.00** | -0.00** |
| | (0.12) | (0.10) | (0.06) | (0.00) | (0.00) | (0.00) |
| CDS or ΔCDS × | | | | | | |
| Belgium | | -0.37 | | | 0.04 | |
| | | (0.28) | | | (0.06) | |
| Finland | | -0.16 | | | 0.14* | |
| | | (0.23) | | | (0.08) | |
| Greece | | 0.81*** | | | 0.11* | |
| | | (0.16) | | | (0.07) | |
| Italy | | -0.08 | | | 0.41*** | |
| | | (0.08) | | | (0.05) | |
| Portugal | | -0.06 | | | 0.62*** | |
| | | (0.13) | | | (0.04) | |
| Slovakia | | -0.05 | | | -0.10* | |
| | | (0.11) | | | (0.06) | |
| Spain | | -0.27* | | | 0.46*** | |
| | | (0.14) | | | (0.08) | |
| Constant | -4.55*** | -2.01** | -0.26 | 0.02*** | 0.02*** | 0.02*** |
| | (1.13) | (0.80) | (0.44) | (0.01) | (0.01) | (0.01) |
| R2 B | 0.32 | 0.51 | 0.56 | 0.01 | 0.01 | 0.01 |
| R2 W | 0.52 | 0.55 | 0.56 | 0.02 | 0.02 | 0.03 |
| R2 O | 0.33 | 0.44 | 0.54 | 0.02 | 0.02 | 0.03 |
| Obs | 75247 | 75247 | 75247 | 75150 | 75150 | 75150 |
| No. Bonds | 96 | 96 | 96 | 96 | 96 | 96 |

Note: $^{*}p < 0.1$,$^{**}$ $p < 0.05$,$^{***}$ $p < 0.01$.

Table 6.3: Country results: GIPS (levels)

The table shows results from country-by-country regressions similar to the linear model in equation 6.15 (results in uneven column numbers) and the cubic model in equation 6.16 (results in even column numbers), but without the country interaction term. The dependent variable is the foreign law premium in levels. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | Premium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Greece | | Italy | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| CDS | 1.05*** | -0.43 | -0.08*** | -0.89*** | 0.19*** | 1.21*** | 0.13** | 1.23 |
| | (0.20) | (0.39) | (0.02) | (0.14) | (0.00) | (0.06) | (0.05) | (1.15) |
| $CDS^2$ | | 0.07*** | | 0.27*** | | -0.20*** | | -0.32 |
| | | (0.02) | | (0.05) | | (0.01) | | (0.38) |
| $CDS^3$ | | -0.00*** | | -0.03*** | | 0.01*** | | 0.03 |
| | | (0.00) | | (0.01) | | (0.00) | | (0.04) |
| Bid-ask | 0.60 | 0.66 | 0.22*** | 0.11 | -0.16*** | -0.12*** | 0.10 | 0.10 |
| | (0.63) | (0.69) | (0.05) | (0.07) | (0.00) | (0.00) | (0.07) | (0.07) |
| Time to maturity | 1.10* | -0.46 | -0.07*** | -0.18*** | 0.06** | 0.10** | 0.29 | 0.46* |
| | (0.56) | (0.53) | (0.02) | (0.02) | (0.02) | (0.02) | (0.17) | (0.23) |
| Constant | -11.75** | 0.82 | 0.22* | 1.38*** | -0.50*** | -1.24*** | -3.04* | -5.06* |
| | (4.67) | (3.17) | (0.12) | (0.22) | (0.03) | (0.06) | (1.41) | (2.40) |
| R2 B | 0.17 | 0.55 | 0.01 | 0.01 | 0.03 | 0.03 | 0.06 | 0.05 |
| R2 W | 0.56 | 0.57 | 0.08 | 0.17 | 0.19 | 0.30 | 0.10 | 0.14 |
| R2 O | 0.29 | 0.56 | 0.00 | 0.01 | 0.09 | 0.04 | 0.07 | 0.07 |
| Obs | 12560 | 12560 | 22002 | 22002 | 2346 | 2346 | 10111 | 10111 |
| No. Bonds | 18 | 18 | 21 | 21 | 4 | 4 | 12 | 12 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

Table 6.4: Country results: ABFS (levels)

The table shows results from country-by-country regressions similar to the linear model in equation 6.15 (results in uneven column numbers) and the cubic model in equation 6.16 (results in even column numbers), but without the country interaction term. The dependent variable is the foreign law premium in levels. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | Premium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Austria | | Belgium | | Finland | | Slovakia | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| CDS | 0.00 | -0.96 | -0.23 | -1.83* | 0.11 | -1.63 | 0.12* | -0.42 |
| | (0.12) | (1.43) | (0.23) | (0.61) | (0.07) | (1.08) | (0.07) | (0.40) |
| $CDS^2$ | | 0.86 | | 1.02* | | 3.97 | | 0.26 |
| | | (1.21) | | (0.32) | | (2.07) | | (0.36) |
| $CDS^3$ | | -0.20 | | -0.18 | | -2.70* | | -0.03 |
| | | (0.29) | | (0.06) | | (1.20) | | (0.09) |
| Bid-ask | 0.68 | 0.48 | -3.13 | -2.08 | 0.00 | 0.00 | -0.06 | -0.05 |
| | (0.76) | (0.52) | (2.53) | (2.25) | (0.01) | (0.01) | (0.07) | (0.06) |
| Time to maturity | -0.02 | -0.06 | 0.40** | 0.20*** | 0.08 | 0.08 | 0.01 | -0.03 |
| | (0.08) | (0.14) | (0.07) | (0.00) | (0.06) | (0.05) | (0.02) | (0.03) |
| Constant | -0.48* | -0.12 | -2.50** | -0.92 | -0.70 | -0.46 | 0.03 | 0.47* |
| | (0.27) | (0.72) | (0.43) | (0.84) | (0.37) | (0.44) | (0.09) | (0.23) |
| R2 B | 0.00 | 0.08 | 0.62 | 0.54 | 0.75 | 0.75 | 0.68 | 0.44 |
| R2 W | 0.01 | 0.04 | 0.16 | 0.18 | 0.18 | 0.19 | 0.05 | 0.08 |
| R2 O | 0.00 | 0.03 | 0.21 | 0.17 | 0.44 | 0.43 | 0.00 | 0.14 |
| Obs | 15983 | 15983 | 2116 | 2116 | 2922 | 2922 | 7207 | 7207 |
| No. Bonds | 20 | 20 | 3 | 3 | 5 | 5 | 13 | 13 |

Note: $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 6.5: Country results: GIPS (first differences)

The table shows results from country-by-country regressions similar to the linear model in equation 6.17 (results in uneven column numbers) and the cubic model in equation 6.18 (results in even column numbers), but without the country interaction term. The dependent variable is the foreign law premium in first differences. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | ΔPremium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Greece | | Italy | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| ΔCDS | 0.20*** | 0.66*** | 0.49*** | 0.28* | 0.70*** | 1.85*** | 0.55*** | 0.31 |
| | (0.06) | (0.11) | (0.04) | (0.15) | (0.00) | (0.08) | (0.08) | (0.22) |
| CDS ×ΔCDS | | -0.02* | | 0.02 | | -0.43*** | | -0.02 |
| | | (0.01) | | (0.09) | | (0.02) | | (0.13) |
| $CDS^2 \times \Delta CDS$ | | 0.00 | | 0.01 | | 0.03*** | | 0.02 |
| | | (0.00) | | (0.01) | | (0.00) | | (0.02) |
| ΔBid-ask | -0.23 | -0.24 | -0.00 | -0.00 | 0.04*** | 0.04*** | 0.01 | 0.01 |
| | (0.27) | (0.27) | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) | (0.01) |
| Time to maturity | -0.02* | -0.02* | -0.00 | -0.00 | -0.02* | -0.01 | -0.00 | -0.00 |
| | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) |
| Constant | 0.15** | 0.15** | 0.00 | 0.00 | 0.03* | 0.03 | 0.00 | -0.00 |
| | (0.06) | (0.07) | (0.00) | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) |
| R2 B | 0.05 | 0.05 | 0.00 | 0.00 | 0.08 | 0.08 | 0.03 | 0.09 |
| R2 W | 0.03 | 0.04 | 0.06 | 0.07 | 0.10 | 0.13 | 0.02 | 0.02 |
| R2 O | 0.02 | 0.03 | 0.06 | 0.07 | 0.10 | 0.13 | 0.02 | 0.02 |
| Obs | 12542 | 12542 | 21981 | 21981 | 2342 | 2342 | 10098 | 10098 |
| No. Bonds | 18 | 18 | 21 | 21 | 4 | 4 | 12 | 12 |

Note: $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$.

Table 6.6: Country results: ABFS (first differences)

The table shows results from country-by-country regressions similar to the linear model in equation 6.17 (results in uneven column numbers) and the cubic model in equation 6.18 (results in even column numbers), but without the country interaction term. The dependent variable is the foreign law premium in first differences. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | ΔPremium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Austria | | Belgium | | Finland | | Slovakia | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| ΔCDS | 0.09** | -0.28*** | 0.12 | -0.17 | 0.20** | 0.27 | -0.02 | 0.17 |
| | (0.04) | (0.08) | (0.06) | (0.23) | (0.05) | (0.41) | (0.05) | (0.14) |
| CDS ×ΔCDS | | 0.42*** | | 0.33 | | -1.02 | | -0.12 |
| | | (0.13) | | (0.16) | | (1.31) | | (0.22) |
| $CDS^2$ × ΔCDS | | -0.10* | | -0.08 | | 1.34 | | 0.01 |
| | | (0.05) | | (0.03) | | (1.06) | | (0.07) |
| ΔBid-ask | 0.02 | 0.02 | -0.24 | -0.24 | -0.02*** | -0.02*** | 0.01 | 0.01 |
| | (0.06) | (0.06) | (0.44) | (0.44) | (0.00) | (0.00) | (0.02) | (0.02) |
| Time to maturity | -0.00 | -0.00 | -0.00 | -0.00 | 0.00** | 0.00** | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Constant | 0.00 | -0.00 | 0.01 | 0.01 | -0.00** | -0.00** | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| R2 B | 0.11 | 0.06 | 0.95 | 0.94 | 0.03 | 0.04 | 0.27 | 0.35 |
| R2 W | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 |
| R2 O | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Obs | 15963 | 15963 | 2113 | 2113 | 2917 | 2917 | 7194 | 7194 |
| No. Bonds | 20 | 20 | 3 | 3 | 5 | 5 | 13 | 13 |

Note: $^{*}p < 0.1$,$^{**}$ $p < 0.05$,$^{***}$ $p < 0.01$.

Table 6.7: Error correction model

The table shows results from the cubic error correction model in equation 6.20. The dependent variable is the foreign law premium in first differences. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | ΔPremium | | | |
|---|---|---|---|---|
| | Greece | Italy | Portugal | Spain |
| | 1 | 2 | 3 | 4 |
| Premium(t-1) | -0.01* | -0.10*** | -0.09 | -0.11 |
| | (0.00) | (0.02) | (0.04) | (0.09) |
| ΔCDS | 0.80*** | 0.07 | 1.67*** | 0.32 |
| | (0.11) | (0.18) | (0.06) | (0.24) |
| ΔCDS×CDS(t-1) | -0.04*** | 0.17 | -0.35*** | -0.01 |
| | (0.01) | (0.11) | (0.01) | (0.15) |
| ΔCDS × $CDS^2$(t-1) | 0.00*** | -0.01 | 0.02*** | 0.02 |
| | (0.00) | (0.01) | (0.00) | (0.02) |
| CDS(t-1) | -0.02*** | -0.12*** | 0.18 | 0.12 |
| | (0.01) | (0.03) | (0.09) | (0.15) |
| $CDS^2$(t-1) | 0.00*** | 0.04*** | -0.03 | -0.03 |
| | (0.00) | (0.01) | (0.01) | (0.05) |
| $CDS^3$(t-1) | -0.00*** | -0.00*** | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| ΔBid-ask | -0.24 | -0.00 | 0.04*** | 0.01 |
| | (0.27) | (0.01) | (0.00) | (0.01) |
| Time to maturity | -0.01 | -0.02*** | -0.00 | 0.04 |
| | (0.00) | (0.00) | (0.01) | (0.04) |
| Constant | 0.03 | 0.17*** | -0.15 | -0.49 |
| | (0.03) | (0.04) | (0.09) | (0.44) |
| R2 B | 0.01 | 0.00 | 0.19 | 0.00 |
| R2 W | 0.04 | 0.11 | 0.15 | 0.08 |
| R2 O | 0.04 | 0.01 | 0.05 | 0.01 |
| Obs | 12542 | 21981 | 2342 | 10098 |
| No. Bonds | 18 | 21 | 4 | 12 |

Note: $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 6.8: ECB eligibility (levels)

The table reports a similar specification to the one used in Table 6.3. The dependent variable is again the foreign law premium in levels. The only difference is that we include a binary indicator if a bond was eligible for credit operations with the ECB in a given month. Since this data is only publicly available from April 2010 onwards, the sample period is restricted to this period. None of the Italian foreign law bonds in this period were eligible as collateral with the ECB, which is why we cannot estimate results using Italian data. The pooled, Greece, and Spain regressions include bond fixed effects; since only one Portuguese foreign law bond was pending in this period, the Portuguese model cannot include a fixed effect. Inference in all regressions is based on Hubert-White standard errors.

| | Premium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled | | Greece | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| CDS | 1.00*** | -0.35* | 0.92*** | -4.67*** | 0.22*** | 1.47*** | 0.06 | 2.53*** |
| | (0.21) | (0.20) | (0.26) | (1.08) | (0.02) | (0.18) | (0.05) | (0.63) |
| $CDS^2$ | | 0.07*** | | 0.21*** | | -0.23*** | | -0.76*** |
| | | (0.02) | | (0.05) | | (0.03) | | (0.20) |
| $CDS^3$ | | -0.00*** | | -0.00*** | | 0.01*** | | 0.07*** |
| | | (0.00) | | (0.00) | | (0.00) | | (0.02) |
| Bid-ask | 0.07 | 0.33 | 0.38 | 0.43 | -0.15*** | -0.11*** | 0.06 | 0.08 |
| | (0.23) | (0.31) | (0.58) | (0.65) | (0.04) | (0.04) | (0.06) | (0.06) |
| Time to maturity | 0.15 | -0.05 | -2.26 | -12.62*** | 0.07*** | 0.10 | 0.65** | 0.67** |
| | (0.12) | (0.06) | (2.43) | (2.34) | (0.02) | (0.08) | (0.26) | (0.26) |
| ECB eligible | 0.24 | | -1.52 | -1.30 | 0.37*** | 0.11 | 0.29 | 0.29 |
| | (1.16) | | (5.32) | (5.25) | (0.02) | (0.08) | (0.18) | (0.17) |
| Constant | -4.60*** | -0.26 | 8.56 | 123.23*** | 0.03 | -3.42 | -6.03** | -8.67*** |
| | (1.53) | (0.44) | (20.77) | (20.32) | (0.03) | (0.44) | (2.12) | (2.58) |
| R2 B | 0.49 | 0.56 | 0.22 | 0.11 | n/a | n/a | 0.13 | 0.13 |
| R2 W | 0.49 | 0.56 | 0.52 | 0.56 | 0.23 | 0.34 | 0.25 | 0.27 |
| R2 O | 0.43 | 0.54 | 0.35 | 0.09 | 0.23 | 0.34 | 0.09 | 0.09 |
| Obs | 35603 | 75247 | 5847 | 5847 | 892 | 892 | 5518 | 5518 |
| No. Bonds | 68 | 96 | 13 | 13 | 1 | 1 | 10 | 10 |

Note: $^{*}p < 0.1$,$^{**}$ $p < 0.05$,$^{***}$ $p < 0.01$.

Table 6.9: ECB eligibility (first differences)

The table reports a similar specification to the one used in Table 6.5. The dependent variable is again the foreign law premium in first differences. The only difference to the previous model is that we include a binary indicator if a bond was eligible for credit operations with the ECB in a given month. Since this data is only publicly available from April 2010 onwards, the sample period is restricted to this period. None of the Italian foreign law bonds in this period were eligible as collateral with the ECB, which is why we cannot estimate results using Italian data. The pooled, Greece, and Spain regressions include bond fixed effects; since only one Portuguese foreign law bond was pending in this period, the Portuguese model cannot include a fixed effect. Inference in all regressions is based on Hubert-White standard errors.

| | ΔPremium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled | | Greece | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| ΔCDS | 0.22*** | 0.55*** | 0.20*** | 0.73*** | 0.69*** | 1.87*** | 0.58*** | 1.07*** |
| | (0.06) | (0.06) | (0.06) | (0.11) | (0.09) | (0.51) | (0.08) | (0.23) |
| CDS ×ΔCDS | | -0.01 | | -0.02** | -0.01 | -0.44*** | | -0.41** |
| | | (0.01) | | (0.01) | (0.01) | (0.16) | | (0.13) |
| $CDS^2 \times \Delta CDS$ | | 0.00 | | 0.00 | -0.01 | 0.03*** | | 0.07*** |
| | | (0.00) | | (0.00) | (0.02) | (0.01) | | (0.02) |
| ΔBid-ask | -0.08 | -0.08 | -0.24 | -0.24 | | 0.04 | 0.01 | 0.01 |
| | (0.08) | (0.08) | (0.28) | (0.28) | | (0.03) | (0.01) | (0.01) |
| Time to maturity | -0.01*** | -0.00** | -0.12*** | -0.13*** | | -0.01 | -0.00*** | -0.00** |
| | (0.00) | (0.00) | (0.03) | (0.03) | | (0.01) | (0.00) | (0.00) |
| ECB eligible | -0.04 | | -0.10 | -0.10 | 0.04 | -0.00 | -0.00* | -0.00 |
| | (0.03) | | (0.08) | (0.08) | (0.03) | (0.02) | (0.00) | (0.00) |
| Constant | 0.07*** | 0.02*** | 0.94*** | 1.03*** | 0.03 | 0.02 | 0.03*** | 0.02* |
| | (0.02) | (0.01) | (0.22) | (0.22) | (0.03) | (0.03) | (0.01) | (0.01) |
| R2 B | 0.01 | 0.01 | 0.07 | 0.07 | n/a | n/a | 0.02 | 0.02 |
| R2 W | 0.02 | 0.03 | 0.03 | 0.04 | 0.18 | 0.22 | 0.16 | 0.18 |
| R2 O | 0.02 | 0.03 | 0.01 | 0.01 | 0.18 | 0.22 | 0.14 | 0.16 |
| Obs | 35581 | 75150 | 5847 | 5847 | 892 | 892 | 5514 | 5514 |
| No. Bonds | 68 | 96 | 13 | 13 | 1 | 1 | 10 | 10 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

Table 6.10: Ratings

The table reports regressions as in 6.15 and 6.16, but replacing the CDS spread with credit ratings by Standard and Poor's, linearly transformed to a numerical scale. The regressions also do not include country-specific constants. Column 1 reports results in levels, and column 2 in first differences.

| | Premium | ΔPremium |
|---|---|---|
| Rating | -1.42*** | |
| | (0.34) | |
| ΔRating | | -0.13*** |
| | | (0.04) |
| Bid-ask | 0.51 | |
| | (0.47) | |
| ΔBid-ask | | -0.08 |
| | | (0.08) |
| Time to maturity | 0.51*** | -0.00** |
| | (0.16) | (0.00) |
| Constant | 22.02*** | 0.02*** |
| | (5.25) | (0.01) |
| R2 B | 0.25 | 0.01 |
| R2 W | 0.28 | 0.00 |
| R2 O | 0.14 | 0.00 |
| Obs | 77778 | 77678 |
| No. Bonds | 99 | 99 |

Note: $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 6.11: Foreign law bonds

| Country | ISIN | Issue date | Maturity date | Coupon (%) | Amount issued (USD m) | Governing law | Currency |
|---|---|---|---|---|---|---|---|
| Austria | XS0048303423 | 02/03/1994 | 02/03/2009 | 3.75 | 590 | England | JPY |
| Austria | CH0008375153 | 01/27/1998 | 01/27/2006 | 3.25 | 2,519 | Switzerland | CHF |
| Austria | XS0092819753 | 01/05/1999 | 10/05/2009 | 5.25 | 1,700 | England | USD |
| Austria | CH0006111394 | 04/21/1999 | 08/21/2009 | 3.00 | 1,287 | Switzerland | CHF |
| Austria | XS0096779417 | 04/28/1999 | 04/28/2006 | 5.50 | 1,000 | England | USD |
| Austria | XS0136383733 | 09/28/2001 | 12/04/2006 | 4.50 | 750 | England | USD |
| Austria | CH0013587024 | 01/25/2002 | 01/25/2012 | 3.38 | 1,120 | England | CHF |
| Austria | XS0143275252 | 02/22/2002 | 02/22/2012 | 5.50 | 600 | England | USD |
| Austria | XS0143683612 | 03/07/2002 | 08/31/2007 | 5.00 | 600 | England | USD |
| Austria | CH0014100918 | 05/14/2002 | 05/14/2007 | 3.00 | 560 | England | CHF |
| Austria | XS0153786974 | 08/30/2002 | 08/30/2010 | 4.38 | 1,200 | England | USD |
| Austria | XS0155222671 | 10/04/2002 | 10/04/2006 | 3.00 | 750 | England | USD |
| Austria | XS0163904617 | 03/06/2003 | 03/30/2007 | 2.63 | 400 | England | USD |
| Austria | XS0167894616 | 05/12/2003 | 05/12/2010 | 3.50 | 500 | England | USD |
| Austria | XS0170724479 | 06/25/2003 | 06/25/2013 | 3.25 | 3,100 | England | USD |
| Austria | XS0186999743 | 03/03/2004 | 05/27/2011 | 3.63 | 1,250 | England | USD |
| Austria | US052591AR54 | 05/19/2004 | 05/19/2014 | 5.00 | 1,300 | England | USD |
| Austria | XS0372004761 | 06/25/2008 | 06/25/2013 | 3.25 | 300 | England | USD |
| Austria | CH0103325715 | 07/14/2009 | 07/14/2016 | 2.50 | 1,008 | England | CHF |
| Austria | US052591AW40 | 06/17/2011 | 06/17/2016 | 1.75 | 1,000 | England | USD |
| Austria | XS0749005186 | 02/21/2012 | 10/19/2029 | 3.56 | 148 | England | EUR |
| Austria | XS0749005343 | 02/21/2012 | 10/19/2029 | 2.45 | 29 | England | EUR |
| Belgium | XS0026163435 | 06/28/1990 | 06/28/2010 | 9.20 | 500 | England | USD |
| Belgium | BE0364162249 | 04/05/2002 | 04/05/2022 | 0.00 | 68 | England | EUR |
| Belgium | BE6254011339 | 06/14/2013 | 06/17/2048 | 3.60 | 68 | Germany | EUR |
| Finland | US317873AY36 | 02/29/1996 | 02/15/2026 | 6.95 | 300 | New York | USD |
| Finland | US317873BD89 | 03/06/2002 | 03/06/2007 | 4.75 | 1,500 | New York | USD |
| Finland | XS0410355365 | 01/27/2009 | 05/16/2011 | 1.50 | 2,000 | England | USD |
| Finland | US31788DAA28 | 10/19/2010 | 10/19/2015 | 1.25 | 2,000 | England | USD |
| Finland | US31788DAB01 | 03/17/2011 | 03/17/2016 | 2.25 | 2,000 | England | USD |
| Finland | FI4000068663 | 09/04/2013 | 09/15/2018 | 1.13 | 6,802 | Germany | EUR |
| Greece | GB0000766039 | 09/06/1985 | 09/06/2010 | 10.75 | 128 | England | GBP |
| Greece | JP530000CQB3 | 11/16/1994 | 11/16/2009 | 7.10 | 197 | Japan | JPY |
| Greece | JP530000CR76 | 07/14/1995 | 07/14/2015 | 5.80 | 197 | Japan | JPY |
| Greece | JP530000AS10 | 01/31/1996 | 01/31/2006 | 4.20 | 394 | Japan | JPY |
| Greece | JP530000BS19 | 01/31/1996 | 02/01/2016 | 5.25 | 295 | Japan | JPY |
| Greece | JP530000CS83 | 08/22/1996 | 08/22/2016 | 5.00 | 394 | Japan | JPY |
| Greece | XS0071095045 | 11/08/1996 | 11/08/2016 | 4.50 | 394 | England | JPY |
| Greece | XS0078057725 | 07/03/1997 | 07/03/2017 | 4.50 | 295 | England | JPY |
| Greece | XS0079012166 | 08/08/1997 | 08/08/2017 | 3.80 | 492 | England | JPY |
| Greece | XS0079012679 | 08/08/1997 | 08/08/2007 | 2.90 | 492 | England | JPY |
| Greece | US423324AC66 | 03/04/1998 | 03/04/2008 | 6.95 | 1,750 | New York | USD |
| Greece | XS0085654068 | 03/31/1998 | 03/31/2008 | 5.75 | 2,720 | England | EUR |
| Greece | XS0097010440 | 04/30/1999 | 04/30/2019 | 3.00 | 246 | England | JPY |
| Greece | XS0110307930 | 04/14/2000 | 04/14/2028 | 6.14 | 272 | England | EUR |
| Greece | CH0018062676 | 03/18/2004 | 03/18/2011 | 2.38 | 560 | Switzerland | CHF |
| Greece | XS0191352847 | 04/30/2004 | 07/17/2034 | 5.20 | 1,360 | England | EUR |
| Greece | CH0021839524 | 07/05/2005 | 07/05/2013 | 2.13 | 728 | Switzerland | CHF |
| Greece | XS0372384064 | 06/25/2008 | 06/25/2013 | 4.63 | 1,500 | England | USD |
| Italy | US465410AH18 | 09/27/1993 | 09/27/2023 | 6.88 | 3,500 | New York | USD |
| Italy | XS0108238543 | 02/23/2000 | 02/23/2010 | 1.80 | 984 | New York | JPY |
| Italy | US465410AW84 | 02/22/2001 | 02/22/2011 | 6.00 | 2,000 | New York | USD |
| Italy | US465410AX67 | 04/05/2001 | 04/05/2006 | 5.25 | 2,000 | New York | USD |
| Italy | XS0136860920 | 10/10/2001 | 10/10/2006 | 0.38 | 1,968 | New York | JPY |
| Italy | XS0137815246 | 10/25/2001 | 10/25/2006 | 4.38 | 5,000 | New York | USD |
| Italy | US465410BA55 | 03/01/2002 | 06/15/2012 | 5.63 | 3,000 | New York | USD |
| Italy | US465410BD94 | 09/04/2002 | 09/14/2007 | 3.63 | 3,000 | New York | USD |
| Italy | US465410BG26 | 02/27/2003 | 06/15/2033 | 5.38 | 2,000 | New York | USD |
| Italy | US465410BF43 | 02/27/2003 | 06/15/2013 | 4.38 | 2,000 | New York | USD |

*continues on next page*

Table 4.4: Foreign law bonds (continued)

| Country | ISIN | Issue date | Maturity date | Coupon (%) | Amount issued (USD m) | Governing law | Currency |
|---|---|---|---|---|---|---|---|
| Italy | US465410BH09 | 07/03/2003 | 07/15/2008 | 2.50 | 2,000 | New York | USD |
| Italy | US465410BK38 | 03/03/2004 | 05/15/2009 | 3.25 | 2,000 | New York | USD |
| Italy | US465410BM93 | 06/30/2004 | 12/14/2007 | 3.75 | 2,000 | New York | USD |
| Italy | US465410BN76 | 01/21/2005 | 01/21/2015 | 4.50 | 4,000 | New York | USD |
| Italy | US465410BP25 | 05/09/2005 | 06/16/2008 | 4.00 | 3,000 | New York | USD |
| Italy | US465410BQ08 | 01/25/2006 | 01/25/2016 | 4.75 | 2,000 | New York | USD |
| Italy | US465410BS63 | 06/12/2007 | 06/12/2017 | 5.38 | 2,000 | New York | USD |
| Italy | US465410BT47 | 06/04/2008 | 07/15/2011 | 3.50 | 2,500 | New York | USD |
| Italy | US465410BU10 | 10/05/2009 | 10/05/2012 | 2.13 | 2,500 | New York | USD |
| Italy | US465410BV92 | 01/26/2010 | 01/26/2015 | 3.13 | 2,500 | New York | USD |
| Italy | US465410BW75 | 09/16/2010 | 09/16/2013 | 2.13 | 2,000 | New York | USD |
| Portugal | GB0006964760 | 05/20/1986 | 05/20/2016 | 9.00 | 257 | England | GBP |
| Portugal | FR0000108359 | 05/13/1996 | 05/13/2008 | 6.63 | 829 | France | EUR |
| Portugal | FR0000583429 | 04/03/1997 | 04/03/2007 | 5.63 | 1,114 | France | EUR |
| Portugal | XS0082026054 | 11/20/1997 | 03/26/2008 | 5.75 | 617 | England | EUR |
| Portugal | XS0498724888 | 03/25/2010 | 03/25/2015 | 3.50 | 1,250 | England | USD |
| Slovakia | DE0003525804 | 09/28/1999 | 09/28/2006 | 9.50 | 163 | Luxembourg | EUR |
| Slovakia | DE0001074763 | 04/14/2000 | 04/14/2010 | 7.38 | 680 | England | EUR |
| Slovakia | XS0192595873 | 05/20/2004 | 05/20/2014 | 4.50 | 1,360 | England | EUR |
| Slovakia | XS0249239830 | 03/27/2006 | 03/26/2021 | 4.00 | 1,360 | England | EUR |
| Slovakia | XS0299989813 | 05/15/2007 | 05/15/2017 | 4.38 | 1,360 | England | EUR |
| Slovakia | XS0430015742 | 05/21/2009 | 01/21/2015 | 4.38 | 2,720 | England | EUR |
| Slovakia | CH0181915585 | 04/25/2012 | 04/25/2022 | 2.75 | 196 | Switzerland | CHF |
| Slovakia | CH0181379774 | 04/25/2012 | 04/25/2018 | 2.13 | 364 | Switzerland | CHF |
| Slovakia | US831588AB47 | 05/21/2012 | 05/21/2022 | 4.38 | 1,500 | England | USD |
| Slovakia | CH0206594498 | 04/16/2013 | 10/16/2019 | 1.38 | 448 | Switzerland | CHF |
| Slovakia | CH0206594506 | 04/16/2013 | 10/16/2023 | 2.13 | 196 | Switzerland | CHF |
| Slovakia | JP570300AD69 | 06/25/2013 | 06/24/2016 | 0.72 | 254 | Japan | JPY |
| Slovakia | JP570300BD68 | 06/25/2013 | 06/25/2018 | 0.99 | 41 | Japan | JPY |
| Spain | GB0008326562 | 02/27/1985 | 03/24/2010 | 11.75 | 103 | England | GBP |
| Spain | XS0075681345 | 04/17/1997 | 04/17/2017 | 3.13 | 197 | England | JPY |
| Spain | XS0075723360 | 04/21/1997 | 04/21/2017 | 3.10 | 197 | England | JPY |
| Spain | XS0089378938 | 07/28/1998 | 07/28/2008 | 5.88 | 1,500 | England | USD |
| Spain | XS0096272355 | 04/06/1999 | 04/06/2029 | 5.25 | 342 | England | GBP |
| Spain | XS0225227528 | 07/20/2005 | 07/20/2010 | 4.13 | 1,000 | England | USD |
| Spain | XS0363874081 | 05/14/2008 | 06/17/2013 | 3.63 | 2,000 | England | USD |
| Spain | XS0416150950 | 03/05/2009 | 03/05/2012 | 2.75 | 1,000 | England | USD |
| Spain | US84633PAA12 | 09/17/2009 | 09/17/2012 | 2.00 | 2,500 | England | USD |
| Spain | XS0565340758 | 12/02/2010 | 12/02/2030 | 2.92 | 197 | England | JPY |
| Spain | XS0619977258 | 05/06/2011 | 05/06/2036 | 5.60 | 456 | England | EUR |
| Spain | US84633PAB94 | 02/27/2013 | 03/06/2018 | 4.00 | 2,000 | England | USD |

# Appendix

Table A1: Unit root tests

Reported are panel unit root tests as suggested by Choi (2001). Ho in all tests is that all bonds are I(1). The hypothesis is tested using the Dickey-Fuller procedure with 3 lags.

| | Premium | | | | | |
|---|---|---|---|---|---|---|
| | No trend, no drift | | Trend | | Drift | |
| | Statistic | p | Statistic | p | Statistic | p |
| Inverse $\chi^2$ | 758.82 | 0.00 | 710.93 | 0.00 | 1255.17 | 0.00 |
| Inverse normal | -13.80 | 0.00 | -12.27 | 0.00 | -20.02 | 0.00 |
| Inverse logit t | -18.96 | 0.00 | -17.64 | 0.00 | -28.05 | 0.00 |
| Modified inv. $\chi^2$ | 28.43 | 0.00 | 26.01 | 0.00 | 53.50 | 0.00 |
| | CDS | | | | | |
| | No trend, no drift | | Trend | | Drift | |
| | Statistic | p | Statistic | p | Statistic | p |
| Inverse $\chi^2$ | 127.79 | 1.00 | 126.46 | 1.00 | 447.05 | 0.00 |
| Inverse normal | 3.96 | 1.00 | 3.51 | 1.00 | -9.41 | 0.00 |
| Inverse logit t | 3.93 | 1.00 | 3.38 | 1.00 | -8.46 | 0.00 |
| Modified inv. $\chi^2$ | -3.28 | 1.00 | -3.34 | 1.00 | 13.19 | 0.00 |

Table A2: Cointegration tests

The table reports results from cointegration tests as suggested by Westerlund (2007) and Persyn and Westerlund (2008). The test statistics $G_\tau$ and $G_\alpha$ are group-mean tests, which test the null that the legal premium and CDS spread is cointegrated for at least one bond. The panel statistics $P_\tau$ and $P_\alpha$ impose that the cointegrating relationship is common across all bonds.

| | No trend, no drift | | Drift | | Trend | |
|---|---|---|---|---|---|---|
| | Statistic | p | Statistic | p | Statistic | p |
| $G_\tau$ | -3.58 | 0.00 | -3.90 | 0.00 | -4.12 | 0.00 |
| $G_\alpha$ | -58.70 | 0.00 | -65.45 | 0.00 | -73.76 | 0.00 |
| $P_\tau$ | -27.64 | 0.00 | -35.02 | 0.00 | -36.60 | 0.00 |
| $P_\alpha$ | -15.59 | 0.00 | -21.73 | 0.00 | -23.59 | 0.00 |

## Table A3: Excluding outliers (levels)

The table shows results from regressions based on equations 6.15 and 6.16 in samples restricted to exclude outliers. Specifically, for each country, we drop the 1st and 99th percentile of the premium. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | Premium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Greece | | Italy | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| CDS | 0.90*** | -0.46 | -0.10*** | -0.82*** | 0.19*** | 1.21*** | 0.09** | 0.83 |
| | (0.12) | (0.33) | (0.02) | (0.12) | (0.00) | (0.06) | (0.04) | (1.00) |
| $CDS^2$ | | 0.06*** | | 0.26*** | | -0.19*** | | -0.21 |
| | | (0.02) | | (0.05) | | (0.01) | | (0.34) |
| $CDS^3$ | | -0.00*** | | -0.03*** | | 0.01*** | | 0.02 |
| | | (0.00) | | (0.01) | | (0.00) | | (0.03) |
| Bid-ask | -0.05 | 0.02 | 0.21*** | 0.11* | -0.16*** | -0.12*** | 0.09 | 0.09 |
| | (0.14) | (0.17) | (0.04) | (0.06) | (0.00) | (0.00) | (0.06) | (0.06) |
| Time to maturity | 1.30*** | -0.13 | -0.07*** | -0.17*** | 0.06** | 0.10** | 0.23 | 0.35* |
| | (0.32) | (0.36) | (0.01) | (0.02) | (0.02) | (0.02) | (0.15) | (0.18) |
| Constant | -11.36*** | 0.09 | 0.29*** | 1.24*** | -0.49*** | -1.23*** | -2.53* | -3.97* |
| | (2.56) | (2.59) | (0.10) | (0.20) | (0.03) | (0.06) | (1.17) | (1.84) |
| R2 B | 0.20 | 0.59 | 0.01 | 0.01 | 0.02 | 0.02 | 0.06 | 0.06 |
| R2 W | 0.63 | 0.65 | 0.09 | 0.19 | 0.20 | 0.30 | 0.10 | 0.12 |
| R2 O | 0.30 | 0.65 | 0.01 | 0.01 | 0.09 | 0.04 | 0.10 | 0.09 |
| Obs | 12262 | 12262 | 21562 | 21562 | 2345 | 2345 | 9905 | 9905 |
| No. Bonds | 18 | 18 | 21 | 21 | 4 | 4 | 12 | 12 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

## Table A4: Excluding outliers (first differences)

The table shows results from regressions based on equations 6.17 and 6.18 in samples restricted to exclude outliers. Specifically, for each country, we drop the 1st and 99th percentile of the premium's first differences. All regressions include bond fixed effects, and inference is based on Hubert-White standard errors.

| | ΔPremium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Greece | | Italy | | Portugal | | Spain | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| ΔCDS | 0.21*** | 0.70*** | 0.47*** | 0.21 | 0.70*** | 1.86*** | 0.55*** | 0.33 |
| | (0.06) | (0.10) | (0.03) | (0.14) | (0.00) | (0.08) | (0.08) | (0.19) |
| CDS ×ΔCDS | | -0.02* | | 0.08 | | -0.44*** | | -0.03 |
| | | (0.01) | | (0.08) | | (0.02) | | (0.11) |
| $CDS^2 \times \Delta CDS$ | | 0.00 | | -0.00 | | 0.03*** | | 0.02 |
| | | (0.00) | | (0.01) | | (0.00) | | (0.02) |
| ΔBid-ask | -0.18 | -0.19 | -0.01 | -0.01 | 0.04*** | 0.04*** | 0.01 | 0.01 |
| | (0.25) | (0.26) | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) | (0.01) |
| Time to maturity | -0.02 | -0.02 | -0.00** | -0.00** | -0.02 | -0.01 | 0.00 | 0.00 |
| | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) |
| ECB eligible | 0.16** | 0.15* | 0.01** | 0.00** | 0.04* | 0.03* | -0.02 | -0.02 |
| | (0.07) | (0.07) | (0.00) | (0.00) | (0.01) | (0.01) | (0.02) | (0.02) |
| Constant | 0.21*** | 0.70*** | 0.47*** | 0.21 | 0.70*** | 1.86*** | 0.55*** | 0.33 |
| | (0.06) | (0.10) | (0.03) | (0.14) | (0.00) | (0.08) | (0.08) | (0.19) |
| R2 B | 0.03 | 0.03 | 0.00 | 0.01 | 0.10 | 0.10 | 0.06 | 0.06 |
| R2 W | 0.04 | 0.05 | 0.08 | 0.08 | 0.11 | 0.14 | 0.03 | 0.04 |
| R2 O | 0.02 | 0.03 | 0.08 | 0.08 | 0.11 | 0.14 | 0.03 | 0.03 |
| Obs | 12244 | 12244 | 21541 | 21541 | 2341 | 2341 | 9892 | 9892 |
| No. Bonds | 18 | 18 | 21 | 21 | 4 | 4 | 12 | 12 |

Note: $^{*}p < 0.1$,$^{**}p < 0.05$,$^{***}p < 0.01$.

## Erklärung

Ich bezeuge durch meine Unterschrift, dass meine Angaben über die bei der Abfassung meiner Dissertation benutzten Hilfsmittel, über die mir zuteil gewordene Hilfe sowie über frühere Begutachtungen meiner Dissertation in jeder Hinsicht der Wahrheit entsprechen.

Mainz, den 01.03.2015 Julian Schumacher