ECONOMIC SUSTAINABLE DEVELOPMENT AND CAPITAL MARKET PERCEPTION

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List of Abbreviations

AG	Aktiengesellschaft
AR	Abnormal Return
BDEW	Bundesverband der Energie und Wasserwirtschaft (German Association for Energy and Water Industries)
BMWi	Bundesministerium für Wirtschaft und Technologie (Federal Ministry of Economics and Technology)
BVK	Bundesverband deutscher Kapitalbeteiligungsgesellschaften (Venture Capital Association)
CA(A)R	Cumulative (Averaged)Abnormal Return
CAGR	Compound Annual Growth Rate
CAPM	Capital Asset Pricing Model
CSR	Corporate Social Responsibility
EBITDA	Earnings Before Interests, Taxes, Depreciation and Amortization
EC	European Commission
EE	Erneuerbare Energie (Renewable Energy)
EP(FI)	Equator Principles (Financial Institution)
EPBD	Energy Performance of Buildings
EREC	European Renewable Energy Council
ETS	Emission Trading System
EU	European Union
FI	Financial Institutions
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GHG	Greenhouse Gas
IEA	European Energy Agency
IFC	International Finance Cooperation
IPO	Initial Public Offering
kWh	Kilowatt Hour
MC	Market Capital
MLA	Mandated League Arranger
N/A	Not Available
NEF	New Energy Finance (Bloomberg)
OLS	Ordinary Least Squares (regression)

PE	Private Equity
RE	Renewable Energy
TWh	Terawatt Hour
USEPA	United States Environmental Protection Agency
VC	Venture Capital

1. Introduction

The flood and nuclear disaster in Fukushima affected not only the population living in the north east of Japan, but rather corroborated the idea of a 'green' and 'sustainable' development in policy, education and economy. This event exemplified the risks resulting from nuclear energy and a potential phase out and served to drive the growing awareness of environmental and social issues, thus bringing the debate on sustainable development to a temporary climax.

In his meta-review on climate economics Heal (2009) asks for "*what do we have to assume to make an economic case for prompt and significant action to reduce greenhouse gas emission?*" While natural scientists commonly justify intervention as a way of preventing environmental harm, the economic perspective is diverse and partly contrary to that of natural scientists. It is not just that there is uncertainty and a lack of knowledge as to the right policy and the appropriate procedure when implementing sustainable development, but rather a wrong approach is frequently put forward. Barbier (2011), for example, claims that institutional rigidities and transaction costs are the most formidable barriers which tend to reinforce a resource-based development. In theory and practice multilayered questions remain open. In view of the urgency of (economically) sustainable development, specialized knowledge is absolutely imperative.

In order to contribute to this complex issue a closer consideration of the latest developments are summarized. The trend towards economic sustainable development has been observable for about two decades and is mainly attributable to two reasons. On the one hand, a political motivation in conjunction with a steadily growing influence of non-governmental organizations (NGO) plays a key role, and on the other, this trend has been identified by private and public companies as an economically viable area.

With the publication of the Brundtland Report in 1987, the notion of 'sustainable development' was phrased for the first time. Subsequent policy efforts date back to the United Nations Conferences on Environment and development in Rio de Janeiro (1992) or the Conference of the Parties in Kyoto (1997). A paradigm change was launched and the incorporation of sustainable criteria in policy, education and economy became widespread. Following the commonly used definition of the Brundtland commission the aim is a "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" One way of achieving these aims is the transformation of the energy sector from conventional resources to renewable energy.

This inevitably involves political guidelines and regulatory frameworks that prompt companies – in particular in the energy sector – to invest in and develop renewable energy resources. Examples are EU directives containing binding reference targets for gross inland energy consumption from renewable energies[1] or the German Renewable Energy Source Act (Erneuerbare Energien Gesetz - EEG)[2] that came into force in 2000 and has since been copied by several European economies.

The economic intention to pursue sustainable business strategies can be justified in different ways. Minimizing the consumption of resources reduces costs in general; from a marketing perspective a 'sustainable image' could lead to increased customer demand and lastly a consideration of environmental and social issues can reduce risks and could minimize legal accusation.

Financing the implementation of sustainable strategies or the transformation of the energy sector is one of the most challenging issues confronting us. In order to implement the energy concept of the German government, for example, additional investments of approximately € 550 billion are necessary up to 2050 (BMWi, 2012). The tight timeframe, the enormous amount of money that has to be invested to realize relevant projects, the high grade of uncertainty regarding the climate, global political development and the remaining amount of fossil energy resources are the main reasons for perceived financing constraints.

In this cumulative dissertation the author takes on tackles the question as to what initiatives or means can help to shed light on the complexity of economic sustainable development. In doing so, the focus is on a capital market. Analyzing capital markets is relevant for two reasons. First, the aim that policy initiative pursues. The idea of political guidelines or regulatory frameworks is, for example, to foster private investments. Political initiatives target on raising the attractiveness of investments or reducing the risk investors have to bear. There-

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1 Directive 2001/77/EC quotes "[…] the need to promote renewable energy sources as a priority measure given that their exploitation contributes to environmental protection and sustainable development".

2 EEG, §1 Section 1, "The purpose of this Act is to facilitate a sustainable development of energy supply, particularly for the sake of protecting our climate and the environment, […] ".

fore, by analyzing capital markets, a link between those initiatives and the perception of capital markets could be revealed. Second, in order to finance growth and development, companies need to invest. A higher company value or a reduced risk perceived by capital market participants makes it easier for these companies to obtain finance via capital markets. Determining a link between policy initiatives and capital markets perception allows for a potential valuation of the initiatives.

The three stand-alone papers of this dissertation focus on the question of whether regulatory changes or (voluntary) disclosures impact on corresponding companies. This contributes to the strand of research on how to implement a sustainable economic development. In particular, this work addresses the question of whether capital markets value (voluntary) announcements or unexpected events which concern information that can affect an economic sustainable strategy. Two measures are under consideration: a company's market capitalization (MC) and a company's (systematic) risk. The market capitalization reflects the present value of a company's future cash flows. A change in that parameter indicates that the capital markets have modified their forecast of company's future cash flows or the corresponding investor's required rate of return. The systematic risk (in the Capital Asset Pricing Model labeled as the beta factor) assesses the sensitivity of company returns to market returns in general. Estimating these two variables can lead to conclusions about the interaction of economic sustainable development and capital markets perception.

Two industry sectors which are assigned an important role in the success of economic sustainable development are addressed in this cumulative dissertation. These industries include the energy sector, comprising conventional and renewable energy generation, and the financial industry. The (renewable) energy industry is undergoing a cruel transformation process, which started a decade ago and will last for more than a couple of decades. However, existing technologies for power generation from renewable resources and energy distribution are still insufficient to establish growing markets. The reasons for the transformation are manifold, but among them, there is one main driver. The development of the renewable energy industry is strongly politically promoted. Without political support or benevolent subsidies, renewable energy could not compete with cheap energy generated from conventional resources. The perceived dependency of the renewable energy industry provides emits a suitable out-of-sample analysis.

The second industry I will analyze is the financial industry. Project finance as a method of funding large infrastructure, energy or industry projects has become more important over the past decade. The role of the private financial sector, in particular, plays a predominant role here. Through their decision to finance a project, financial institutions make a significant contribution to whether projects are launched or not. This crucial role puts the financial institutions industry under increasing public pressure to consider the potential environmental and social harm of the project. This constitutes a link between public awareness and economic sustainable development. A second reason is that environmental and social issues bear a 'new' class of risk which considerably affects the success or the failure of the project. A growing awareness of environmental and social issues on the part of by financial institutions could help to minimize these risk factors and, thereby, reduce the risk of a credit default.

The results and the implications of this dissertation contribute on the one hand to theoretical findings relating to economic sustainable development and on the other include some suggestions for practitioners. Theoretical findings contribute to the gap in literature dealing with the coherency between economic sustainable development and capital market perception. From a practitioner's point of view, the papers include suggestions for three groups of interest. First, for managers of public companies in the (renewable) energy or the financial industry, the results indicate whether and how a company's market value and the systematic risk shifts if political decisions regarding supporting frameworks and fixed subsidies are announced or events such as the Fukushima nuclear disaster occur. The timing of equity issues could be one implication of these results. Second, the results suggest to politicians that shaping reliable and stable frameworks could ensure returns and reduce the risk of affected companies. This corroborates methods of start-up financing for industries such as the renewable energy sector. Third, investors looking out for attractive investments regarding return and risk are encouraged to invest in those companies.

This cumulative dissertation comprises three stand-alone papers. Each of the papers includes an introduction, a data and methodology part, description of the results and concluding remarks. All papers have already been published or accepted for publication. The following part of the introduction summarizes each paper and outlines in brevity respective key elements of the three single papers.

Regulatory changes and market reactions – the European renewable energy market

This paper investigates whether potential policy changes impact on the return or the (systematic) risk of young renewable energy companies in Europe. In the recent past manifold reports and conventions have revealed the urgent need for a transformation of the energy sector from the utilization of conventional to renewable resources (e.g. Conference of the Parties, Kyoto, 1997; Stern Review on the Economics of Climate Change, 2006). The discussion about the climate change and the involved controversy on the development of climate protection schemes has become increasingly important. In this debate positive voices postulate the urgent need to support initiatives, whereas negative arguments stress the high costs or ineffectiveness of the initiatives. Political directives intended to push forward the transformation of the European energy sector from the utilization of conventional to renewable resources can be seen as regulatory acts. These market interventions prompt the debate about the impact on the risk/return profile of the companies affected.

As a first step the study applies an event study approach in order to examine the impact of regulatory announcements on the company´s market value. Twelve regulatory events which occurred between 2006 and 2010 are examined. These events comprise announcements by e.g. the European Commission, the European Council or the Parliament. The tested sample includes eleven renewable energy companies located in Europe. Each of the companies was backed by venture capital or private equity when it went public. In a second step a time-varying beta calculation is used to determine the changes in the systematic stock return risk of the company. A rolling OLS regression is used to compute daily beta factors for the period from 2006 to 2010.

The results reveal positive abnormal returns, in particular when the announcement deals with the EU-climate package or the following Directive 2009/28/EC. Announcements during the initial stage of the development of a Directive do not affect capital markets so much, whereas announcements concerning (final) approvals are strongly perceived by capital markets. Results in the second part of the analysis indicate a decreasing shift of the beta factor for the announcements with statistically significant positive abnormal returns, i.e. the more binding announcements. This proves a negative correlation between abnormal stock returns and beta variation. As no announcement is perceived statistically negative by capital markets (i.e. no announcement shows significant negative abnormal returns) a correlation between negative abnormal returns and

an increasing beta factor cannot be proven, but results slightly indicate this relationship.

Implications derived from the results highlight the importance of policy initiatives and the corresponding regulatory announcements in Europe. Positive regulation announcements reduce systematic risk and provide attractive investment possibilities.

The nuclear disaster in Japan and expected cost of capital for German energy providers: A note from an efficient market perspective

The nuclear disaster in Fukushima has not only led to a much more intense debate on the future of nuclear energy as a bridging technology, but also raises the question of the cost of a nuclear phase-out for the energy providers. An advanced transition to an energy system primary based on renewable energies requires large additional investments – in particular from the big energy providers – in new technologies, distribution systems or energy storage. These investments need to be financed. The rate of the transition is highly dependent on policy target settings or the impending phase-out. A quicker transition rate is accompanied by increased costs. The energy providers do not yet have the appropriate technology at hand. Thus, costs for advanced technology development or cornerstone projects raise the amount that has to be invested by i.e. energy provider.

A so far neglected dimension in the debate is based on the cost of capital. Cost of capital must be considered in order to finance future investments in renewable energy technology and distribution systems. These costs – in particular when considering stock markets – are priced by the (systematic) risk perceived by capital markets. This study, therefore, phrases two research questions. First, do equity shareholders suffer an immediate loss after the nuclear disaster of Fukushima? Second, does the (systematic) risk and, therewith, the cost of capital perceived by capital market participants increase? These questions allow inferences to the question as to what this implies for future financing costs.

The methodology section comprises two steps. Beginning with the first research question, an event study approach is applied, estimating abnormal returns for German energy providers following the nuclear disaster of Fukushima. In order to elaborate the second research question a rolling beta coefficient for German energy companies is estimated.

The results suggest that capital market perception clearly distinguishes between energy providers operating nuclear power plants and energy providers which do not include nuclear power in their energy portfolio. German energy providers operating nuclear power plants suffer a loss of shareholder value and experience a remarkable increase in the beta factor (i.e. cost of capital). By contrast, a provider without nuclear power plants in its energy portfolio shows a slightly decrease of future cost of capital. This suggests increasing financing costs for future projects for energy providers with nuclear power plants. Both effects (the loss in shareholder value and increasing cost of capital) impact the financial performance of these power companies and limit their ability to make a significant contribution to investment in energy policy. A potential implication for public policy is the cost of the uncertainty about a potential phase-out is.

Sustainable Project Finance, the Adoption of Equator Principles, and Shareholder Value Effects

This paper deals with financial institutions and their voluntary adoption of the Equator Principles (EP). The EP are a code of conduct for the banking industry, launched in 2003, that address environmental and social issues in project finance. Today over 70 financial institutions worldwide adopt the EP, including the global players of the financial industry. An increasing worldwide project finance volume and a growing awareness of economic sustainable development raise the question of whether a more serious consideration of those issues enhances the firm value and improves company's performance. While in literature this has partly been addressed, this study contributes and extends this existing strand in the following ways. First, it analyzes whether the impact of the EP has changed empirically between 2003 and 2011. Second, the performance of adopting financial institutions is investigated. Third, trends in the project finance market are identified.

The analysis is divided into two steps. In the first part an event study methodology considering the market model and conditional variance is applied. The second part comprises an MLA League Table Analysis comparing short-term and long-term performance of financial institutions adopting EP and non-adopting financial institutions. Finally, the effects of EP-compliant projects on the project finance market are analyzed.

The results show that financial institutions adopting the EP in the earlier period (2003 -2006) gained positive abnormal returns, while all others did not

cause any capital market reactions. A further subsample classified by region indicates a slightly positive abnormal return for financial institutions from OECD countries. These results indicate that the reputational risk hypothesis is one of the main drivers in adopting a voluntary code of conduct such as the Equator Principles. Applying the League Table Analysis results suggests that adopters outperform non-adopters in terms of number of projects and market share. Although results could be slightly biased by the market entry of non reporting financial institutions, as for example the State Bank of India, results are assumed to be robust. Focusing on the project finance market, the results reveal a steady quota for EP-compliant projects in western countries, but a dramatic decrease in non OECD countries. This reinforces the reputational risk hypothesis, but although results here could be biased by the market entry of non-reporting financial institutions.

The implication is that it is beneficial for financial institutions to adopt voluntary codes of conduct such as the EP and within a broader scope they should be encouraged to foster and adopt responsible identities. From a policy perspective, results implicate that developing standard settings pertaining to environmental and social issues in the financial sector should be encouraged.

2. Regulatory Changes and Market Reactions – The European Renewable Energy Market

Abstract

Political directives intended to push forward the transformation of the European energy sector from the utilization of conventional to renewable resources can be seen as regulatory acts and therefore give rise to the debate about the impact on the risk/return profile of the companies affected. This paper investigates whether political decisions influence the risk/return-profile of young technology-based companies from the cleantech industry. As a first step we apply an event study approach in order to examine the impact of regulatory announcements on the company´s market value. As a second step a time-varying beta calculation is used to determine the changes in the systematic stock return risk of the company. The results concord with theoretical findings in general. The stricter the regulation, the more negative the company´s abnormal stock return and the higher the systematic risk, and vice versa.

Trillig J. 2012. Regulatory changes and market reactions – the European renewable energy market. *International Journal of Entrepreneurship and Small Business* ***15***(1): 116-129.

2.1 Introduction

Energy markets are shifting from using natural resources to renewable energies (RE). Existing technologies in the renewable energy sector, however, are insufficient to accomplish climate and ecological aims. Over the past decades policy makers have passed several political directives that have led to increased entrepreneurial activity. Young technology-based companies are focusing their research and development programs in particular on energy generation, energy storage and intelligent energy allocation. Conventional power generation, however, is still cheaper than transforming solar or wind energy into electrical power. European countries are launching economic development schemes to boost renewable energies and finally achieve grid parity. This situation gives reason to

investigate whether political decisions influence the risk/return-profile of young technology-based companies from the cleantech industry and how the effect impacts young companies. Young companies in particular struggled with the 2008 financial crisis and were exposed to high risk. To determine this argument we analyze the cost of capital before and after the crisis. We expect to find that the announcement of initializing positive political frameworks leads to increased technological development accompanied by attractive risk/return-profiles and therefore provides valuable opportunities for venture capital investments.

In this paper we conduct our analysis in two steps. First, we examine whether political decisions regarding renewable energies are taken into consideration by capital markets. Since there is evidence that this is the case, we ask how they influence the valuation of the company. Second, we assess how the systematic stock return risk of the company performs over time, or rather around the announcement date. Our sample includes companies from the entire European renewable energy sector (wind, solar, hydro …). We assume a predominant share of venture capital within the financial structure of the companies in the pre IPO stage. This is postulated since we determine the analysis in order to examine profitable early stage alternatives. When analyzing the sample, we use the event study methodology as shown in MacKinlay (1997). The market model is used to measure expected performance of stock market reactions; cumulative abnormal returns (CAR) serve as evidence for event-induced valuation effects in security returns. The events under review concern political decisions regarding regulatory frameworks for the energy market. We focus on decisions made at European level. Significant CAR indicate that capital market participants attach importance to the announcement of political decisions. Our findings indicate more significant positive CAR when European directives are enacted than when they are announced and we interpret this as an indicator that capital markets do not completely anticipate legal acts. In a second step we estimate systematic risk in form of beta coefficients over time. On the basis of the variance and covariance of a compromised portfolio we highlight shifts in the risk valuation of the company. Results show that changes in the political framework for the energy sector promoting renewable energies lead to lower risk valuation for these companies.

We examine whether the capital market reacts to the announcement of new policy frameworks promoting the renewable energy sector and beyond that leads to a reduction in the systematic risk of the companies. These impacts, partly anticipated by the capital market, provide attractive risk/return-profiles for companies in the renewable energy sector and favor early stage financing.

This paper is organized as follows: section 2.2 presents an introduction to the development of the renewable energy market and the political intention in Europe. In section 2.3 the applied methodology and the data is explained. The results found are discussed in section 2.4 and finally section 2.5 closes with a brave conclusion.

2.2 Background / the European Renewable Energy Market

The discussion about the climate change and the ensuing controversy on the development of climate protection schemes has gained more and more importance over the past decades. The White Paper published by the European Union (EU) in 1997 contained binding reference targets[3] for gross inland energy consumption from renewable energies for the first time. These targets were increased by Directive 2001/77/EC in 2001 and recently again by Directive 2009/28/EC in 2009. These efforts are a response to the manifold reports (e.g. Stern Report 2006, IPPC 2007) imploring politicians, economists and researchers to push for the transformation away from conventional energy generation to renewable energy.

Existing technologies in the renewable energy sector, however, are insufficient to accomplish climate and ecological aims. The production costs of RE still exceed the costs of energy generated from oil or coal. The transformation of solar energy into electricity costs approximately 0.52 - 0.62 €/kWh, wind energy 0.096 - 0.180 €/kWh dependent on on/offshore installations, biomass 0.096 €/kWh, whereas conventional resources come to 0.033 €/kWh for coal, 0.042 €/kWh for gas and 0.050 - 0.085 €/kWh for nuclear power (European Commission, 2008; Wissel et al., 2008). Hence, the promotion of renewable energies through public schemes is essential in order to raise the technological level onto a competitive basis with conventional energy production. Jacobsson & Bergek (2004) argue that the prevailing issue is not the potential of renewable energy technologies, but the realization and the transformation of this potential. They discuss the transformation of the energy sector from conventional resources to renewable energies and enumerate challenges which arise. Three criteria are identified which are distinctive for this sector and have to be taken into account when thinking about a transformation. First, the energy sector is huge,

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3 The White paper set a target of 12% of gross inland energy consumption from renewable energies for the EU-15 by 2010, of which electricity would represent 22.1%.

so that transformation will take a long time even with high growth rates. Second, new market formation is a widely debated topic and there is no one solution. Third, a well-established system of energy producers and energy providers already exists which fights against replacement by new companies.

The different directives enacted by the EU require national governments to implement promotion schemes in each member state. Every EU country implements different promotion strategies and some of them seem to be more favorable than others with regard to the proportion of RE. Due to different national frameworks (e.g. definition of installed RE, geographical and technical differences) there is no obvious superiority of any strategy and the success depends on the adjustment and the integration of the promotion schemes within each framework (Reiche and Bechberger, 2004). The effectiveness in terms of reducing greenhouse gas (GHG) and the cost efficiency of these programs is widely discussed. Without expanding the controversy about efficiency too far, we want to enumerate some arguments: the efficiency of segmented market regulation with an Emission Trading System (ETS) and a non-ETS sector (Böhringer et al., 2009) and the potential excess costs for binding renewable energy targets (Boeters and Koornneef, 2010).

There is much evidence that regulation affects a company´s systematic stock return risk and therefore the risk/return profile. Riddick (1992) shows theoretical and empirical results that suggest a diminution of systematic risk in a regulated firm compared to an unregulated firm. In contrast, Havenner et al. (2001) examine an increase in systematic risk during periods of regulatory change. In connection with the privatization of public utilities in the UK, Parker (2003) argues that the regulatory risk depends on the variable types of regulation and the applied practice. Alexander & Irwin (1996), on the other hand, show that the rate on return regulation[4] induces a lower risk relative to price caps[5] because of a higher guarantee of profits. Cambini & Rondi (2009) analyze whether investment decisions of European energy utilities during the period 1997 to 2007 change with the regulatory framework. They find more investment activity in connection with incentive regulation than under rate on return regulation. Finally, Paleari & Redondi (2005) endorse the results from Peltzman (1976) and show that the company´s overall risk correlates with the regulation of the com-

4 Rate on return regulation constrains the interest yields of the invested money.

5 Price cap regulation limits the highest price for a good.

pany. The stricter the regulation, the more negative the company´s abnormal return and the higher the systematic risk, and vice versa.

A decrease in systematic risk – resulting from positive regulatory frameworks – in young technology-based companies could be an attractive incentive for investors. In particular, early stage financiers could value the modified risk/return profiles and hence be induced to expand their investments. An active investment environment during early stage financing is widely assumed to be an indicator for disproportionately high innovation and development. This situation could be helpful to overcome the transformation difficulties of the energy sector in Europe.

The paper includes two further preconditions. In view of the 2008 financial crisis, we subdivide the analysis into a pre- and a post-crisis period. Small and innovative companies in particular struggled during the crisis and were exposed to high risk. Hence, the impact of regulation before and after the crisis should be compared. The sample contains solely companies which were joined by a venture capital company during the pre-IPO phase. Since venture capital companies are specialized in young innovative branches, we expect our results to be reinforced through this precondition.

The purpose of this analysis is to investigate whether announcements of changes in promotion schemes for renewable energy on a European level affect systematic risk and thus lead to variations in the risk profile of RE-companies. Furthermore we want to fill the existing gap in research related to regulation and promotion schemes for young technology-based companies, in this case represented by companies from the renewable energy sector. In line with Peltzman's theory adopted here, we expect risk exposure to decline in companies which are included in promotion schemes and therefore offer an attractive risk/return-profile for investors. In our analysis we assume that softer regulation is equivalent to generating positive frameworks for the renewable energy branch and hence positive abnormal returns are expected when appropriate announcements are published.

2.3 Methodology

2.3.1 The Data

The identification of the exact event date regarding regulatory events begins with a definition of a regulatory event. For this we follow the definition used by Binder (1985) which describes activities following from government and par-

liamentary intervention as a regulatory event. The determination of renewable energy rates by the European Commission is for example a well-defined regulatory event.

Table 1: List of Regulatory Events

No.	*Event date*	*Description*
1	8 Mar 2006	The European Commission (EC) published the "Green book" with its objective to assure a sustainable, competitive and safe energy supply within the EU.
2	24 Mar 2006	Spring summit of the European Council; European Heads of State and Heads of Government agree to the proposal of the Green book.
3	10 Jan 2007	The idea was then taken over by the European Commission in January 2007 in its Communication on a Renewable Energy Road Map [COM(2006) 848 final].
4	9 Mar 2007	Spring summit of the European Council; European Heads of State and Heads of Government gave their green light to this binding target at the March 2007 Summit.
5	19 Oct 2007	The EC published a concept for a Directive that contains a change from the introduction of a GHG trading scheme to an introduction of fixed targets for renewable energies in 2020. This Directive should be presented in Jan 2008.
6	22 Jan 2008	The European Commission published its proposal for a Directive on the promotion of the use of energy from renewable energy [COM(2008) 19 final].
7	12 Dec 2008	The European Council enacts the EU-climate-package.
8	17 Dec 2008	The European parliament passes the EU-climate-package with overwhelming majority.
9	6 Apr 2009	The Directive 2009/28/EC was adopted by the Council.
10	23 Apr 2009	Directive 2009/28/EC of the European Parliament and of the Council; published on 5. Jun 2009 and hence became law.
11	25 Jun 2009	The Directive 2009/28/EC entered into force.
12	18 Jun 2010	The recast of Directive 2010/31/EU on the Energy Performance of Buildings (EPBD) was published in the Official Journal of the EU, amending Directive 2002/91/EC. The recast introduces for the first time a European-wide definition of 'nearly zero energy buildings'.

In order to identify the event data we browsed the database of *Frankfurter Allgemeine Zeitung,* one of the leading daily newspapers for politics, business and economics in Germany. The research timeframe starts on 1 Jan 2006 and ends on 30 Nov 2010. We gathered any information dealing with the renewable energy sector and political decisions on a European level. In order to identify the first date at which the information was published, we crosschecked the events

with the press release database of important European renewable energy associations.[6] A list with the selected events is given in Table 1 below.

The search for companies matching the stated preconditions was based on a selection from Bloomberg New Energy Finance (NEF), expanded by companies found through personal research. The Bloomberg NEF list included companies which match the following criteria: renewable energy (solar, wind, biomass, geothermal), completed IPO, located within the European Union. No filter was available for the proportion of the overall sales volume of the company generated by renewable energy, i.e. the sample includes firms that do not generate revenues exclusively from the renewable energy sector, but at least more than 50% from this sector. Neither was there a filter to determine whether the company was backed by venture capital or private equity when it went public. Due to the absence of this option, we reviewed the IPO prospectuses or contacted the investor relations department of each of the companies.

Table 2: List of Sample Companies

Company	*Country*	*Branch*	*VC-Company*
Aleo solar AG	GER	Solar	Hannover Finanz
Bosch Solar Energy AG*	GER	Solar	Ventizz, equitrust, nwk nordwest Kapitalbeteiligungsgesellschaft
Centrosolar AG	GER	Solar	Heliad Equity
Conergy AG	GER	Solar	Grazia Equity, Capital Stage
Hansen Transmission Int.	BEL	Wind	N/A
ISRA Vision AG	GER	Solar	N/A
Meyer + Burger AG	SUI	Solar	N/A
Q-Cells AG	GER	Solar	Apax Partners, IBG Sachsen-Anhalt, DKB Wagniskapital
Schmack Biogas AG	GER	Biomass	BayBG, S-Refit, SAM Private Equity
Theolia SA	FRA	Wind	N/A
Vergnet SA	FRA	Wind	N/A

* Founded in 1997 under Ersol Solar Energy AG, on 12 Aug 2008 acquired by Robert Bosch GmbH.

6 European Renewable Energy Council (EREC) and International Energy Agency (IEA).

Our sample (Table 2) consists of eleven companies from the Cleantech sector (solar, wind, biomass). Seven companies come from the solar branch, three from the wind sector and only one company belongs to the biomass sector. Most of them (seven) are German, two French one each Swiss and Belgian. The high percentage of German solar companies is due to the extensive subsidies in this sector.

For the companies located in Germany we could use data provided by the German Private Equity and Venture Capital Association (BVK). The daily share price was taken from Datastream for a period from 1 Jan 2006 to 30 Nov 2010 and used to calculate the daily returns of each company.

2.3.2 The Event-Study Methodology

When analyzing the sample, we use the event study methodology as shown in MacKinlay (1997). Abnormal returns are used as an indicator to estimate whether there are market reactions to regulatory announcements. As a measure for abnormal stock returns the daily returns of the companies were compared to estimated expected market returns as follows:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \ , \tag{2.1}$$

where $R_{i,t}$ is the stock return of company i on day t and $E(R_{i,t})$ is the expected stock return on day t respectively. As a benchmark for the expected return the market model, as shown below, is applied (Binder, 1985; Dnes et al., 1998). The required alpha and beta are estimated from an Ordinary Least Squares (OLS) regression of the daily market returns. The daily returns of the market are represented by daily returns of EUROSTOXX 50.The random error term is represented by $e_{i,t}$:

$$E(R_{i,t}) = \alpha_i + \beta_i * R_{m,t} + e_{i,t} \tag{2.2}$$

The OLS regression is applied for the estimation period of 120 days before the event. A cap of 30 days between estimation period and announcement date prevents any influence from the event on the estimated returns. The abnormal returns are summed across the days of the event period (t_1 to t_2). That is given by

$$CAR_i = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{2.3}$$

Cumulative averaged abnormal returns (*CAAR*) are the average across all companies and zero in the event-period is the null hypothesis to be tested. This indicates that there is no impact of the announcements on the stock prices.

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_i \tag{2.4}$$

Testing the significance, we apply a standard t-test. We assume normally distributed returns with zero mean.

Given that testing regulatory events with an event study entails some difficulties, we apply two more test statistics to ensure the correctness of our results. First, Boehmer et al. (1991) discuss whether there is an event-induced increase in the variance of returns. They demonstrate that typically the null hypothesis is too often rejected for reasons of event-induced variance and suggest a cross-sectional test applied to normalized event-period returns. Second, we use a modified t-test as presented in Johnson (1978). Since the assumption of independent, identically distributed observations is not unquestioned in this case, the modified variable reduces the effect of possible population skewness.

Earlier in this paper we discussed the problems connected with the applicability of event studies for regulatory events. It is therefore important to mention some assumptions we postulated in order to achieve results that are as unbiased as possible (Lamdin, 2001). Compared to events such as acquisition announcements, for example, it is very difficult to determine the exact date of regulatory changes. These difficulties lead to a dilution of the overall results. Given the typically long process of enacting legal regulations, information usually appears on the market before the actual event occurs. The event study exhibits less powerful results (Brown and Warner, 1980, 1985) and could wrongly deny the impact of an event. To avoid this mistake, several event windows are used. This enables us to verify for each event when the information entered the market. The length of the event window varies between -20 and -1 before the event and 1 to 20 days after.

The sample taken as a basis for the analysis contains different companies from the same sector. Other events than the ones used in our analysis could also influence the returns in the same way and lead to an “industry effect”. Thus, it is important to distinguish between the analyzed effect and an impact that could result from any other event. Otherwise we may obtain significant AR, not only because of the underlying event but also as a result of the unconsidered event. To preclude this we carefully study the market behavior during the event dates.

In line with the Peltzman (1976) model and the Paleari & Redondi model (2005), we expect that announcements concerning the creation of positive frameworks for the renewable energy sector in Europe will lead to positive abnormal returns for the companies in this sector.

Since the announcements do not always include specific statements and European Directives first have to be transformed into national law which may entail some changes in content, we do not expect each event to lead to significantly positive AR.

2.3.3 The Change in Beta

In capital asset pricing theory the β-factor stands for systematic risk and describes the percentage of the covariance (*cov()*) of the return of company *i* to the return of the market index and the variance (*var()*) of the market index, as shown in the expression below:

$$\beta_i = \frac{\text{cov}(R_i, R_m)}{\text{var}(R_m)} \tag{2.5}$$

R_i stands for the return of company *i*, R_m for the market return.

Abnormal returns and beta variation show a positive correlation. Therefore we calculate a daily beta for the time period from 1 Jan 2006 to 30 Nov 2010, including information from 60 days before and 60 days after each day. We therefore estimate a 120-day β-factor for each day in the time period. We expect that generating positive frameworks for the development of young technology-based companies will lead to an increase in *AR* and therefore decrease the overall risk for these companies. This could be equalized with a decrease of the β-factor and therefore influence the cost of capital.

2.4 The Empirical Analysis

The event study methodology implies several difficulties when applied to regulatory announcements. Our results show reactions from the capital market to the regulatory event dates of a statistical significance at 5% level for eight events and at 1% level for five events. This gives reason to argue that it is possible to measure the influence of political or regulatory decisions on companies from the renewable energy sector. However, we are not able to exclude the effects on the sample of the events we did not consider.

We used event windows of different length for two reasons in order to avoid any misconceptions. First, the determination of the exact event date following regulatory announcements proves somewhat difficult so that we want to make sure that we capture the market reaction even if we set a slightly biased event date. If the announcement appeared on the market earlier or later and had an impact on the stock market returns, the event windows with the longer periods show significant results whereas the small windows do not show any reaction. This could be an indication that we should verify and recalculate the market reaction. Second, it is not clear how quickly the information reaches the market. Political decisions on a European level are typically not as close to the market as national decisions. Therefore event windows of different lengths enable us to crosscheck if there was no market reaction to the event date or if the duration of information diffusion took some days.

The analysis shows (Table 3) that the results of the different event windows regarding one certain event do not differ significantly. Even event 1 shows different tendencies among the windows before and after the event, i.e. it switches the algebraic sign on more than one occasion. The remaining events show almost the same tendency in the different event windows. If we look at the explanatory power of the 5-day event window after the event, there is strong evidence that this window includes all market reactions. Only one window (no. 10) does not have the same algebraic sign as the windows including more days after the event. This indicates an adequate determination of the event dates and allows us to use these dates and the resulting effects for the following analysis.

The results indicate abnormal returns for events 3, 7, 8, 9, 10 with a statistical significance at the 1% level. As event no. 3 does not show significant abnormal stock returns in the 5- or 10-day event window we cannot exclude any other effect that causes the abnormal returns in the 20-day window and for this reason we exclude event no. 3 from the following analysis. Each of the remaining events deals with the EU-climate-package[7] and the following Directive 2009/28/EC. On 12 Dec 2008 the EU-climate-package was approved by the European Council and the cumulative abnormal return was equal to 9.04 percent in the 5-day window and 13.29 percent in the 10-day window. Similar results emerged on 17 Dec 2008 when the European Parliament passed the EU-climate

7 The EU-climate-package aims to ensure that the EU will achieve its climate targets by 2020: a 20% reduction in greenhouse gas emissions, a 20% improvement in energy efficiency and a 20% share for renewables in the EU energy mix.

package, with cumulative abnormal returns of 9.43% (5-day window) and 14.02% (10-day window). When Directive 2009/28/EC was adopted by the Council on 6 Apr 2009 and passed by the EU Parliament and the Council on 23. Apr 2009, the CAR were lower and in one case even negative (2.59/-0.64, 14.39/4.97). The agreement reached by the European Council and the European Parliament seem to be the most important decision as far as the market is concerned. Initial steps in the development of a Directive on a European level do not effect capital markets reactions so much.

Table 3: Cumulative Abnormal Stock Returns for the 5-, 10- and 20-day Event Window

No.	*Date*	*Cum. abnormal return [%]*			*No.*	*Date*	*Cum. abnormal return [%]*		
		5-day	*10- day*	*20-day*			*5-day*	*10-day*	*20-day*
1	8 Mar 2006	2.34	-3.34*	5.02	7	12 Dec 2008	9.04**	13.29***	20.08***
2	24 Mar 2006	2.40	6.85**	12.13	8	17 Dec 2008	9.43***	14.02***	15.97***
3	10 Jan 2007	4.67	4.30	17.09***	9	6 Apr 2009	2.59	14.39***	17.69***
4	9 Mar 2007	1.57	2.59*	2.55	10	23 Apr 2009	-0.64	4.97**	10.00***
5	19 Oct 2007	1.95	7.11	4.30	11	25 Jun 2009	0.66	1.38	-5.57
6	22 Jan 2008	-0.23	-3.19	-13.52**	12	18 Jun 2010	4.23**	2.45	3.48

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Two further arguments also emerge from our analysis. First, there are no abnormal stock returns in the 5-day event window and only five abnormal return rates for all windows in the period from 2006 to mid-2008. But half of the events from the second part of the analysis show significant abnormal stock returns in the 5-day window and, in addition, eleven abnormal return rates in all windows. This could be due to the fact that the market attaches greater importance to the decisions of the European regulators and therefore reacts more strongly to changes. However, there is an alternative reason for this finding if we argue that the implications for the renewable energy branch arising from the first events do not have the same importance as the later events. Second, the fact that there are no abnormal stock returns in the 5-day event window in the period from 2006 to mid-2008, but three in the second part, points to the necessity for a speedier allocation of information about political decisions to the renewable energy sector. In particular, the event on 18 Jun 2010 shows AR in the 5-day window, but not in the 10- or 20-day window. This shows that the new information is fully anticipated within a five day period and does not affect later days. How-

ever, the same alternative reason exists here as for the first finding if we consider the different significance of the events for the companies.

Figure 1 presents the time-varying beta-factors calculation from the equal-weighted portfolio. The two dashed lines represent the beginning (1 Jan 2008) and the end (1 Jun 2009) of the economic crisis in 2008. We marked this period so that it is easier to compare the impact of regulatory decisions before and after the crisis. The five events before the crisis do not show a significant decrease in beta, even though event nos. 1, 2 and 4 indicate a slight decline in beta. This conforms to the significant positive abnormal stock returns showed in Table 3.

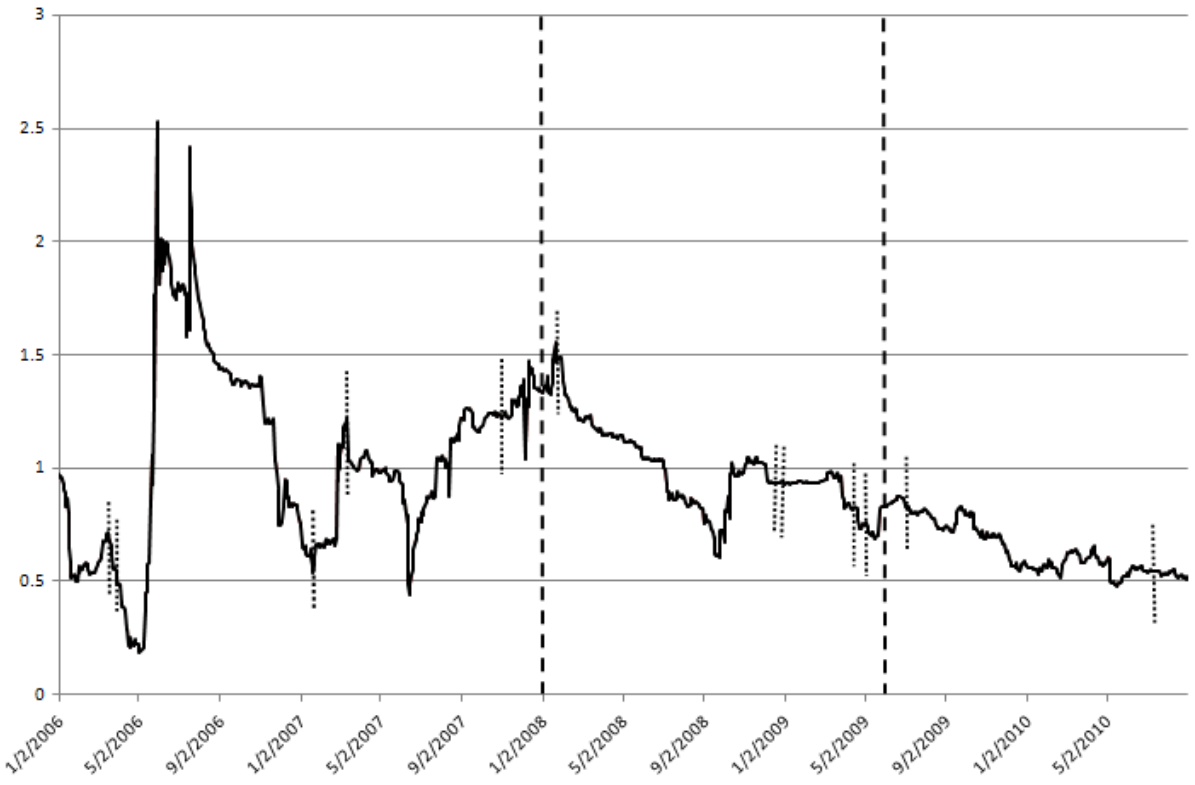

Figure 1: Time-varying Beta of the Sample Companies from 2006 to End 2010

The two events with high abnormal stock return rates (no. 9 and 10) show an additional significant decline in beta. Not only in short term but also in long term view, this decline continues and confirms the Peltzman theory that abnormal returns and beta-factor variations are correlated.

On 18 Jun 2010 Directive 2010/31/EC was published in the Official Journal of the EU[8]. It contained for the first time a pan-European definition of "nearly zero energy buildings". This regulation generated positive abnormal stock returns and additionally a decrease in beta. Due to the end of the timeline we cannot prove whether this decrease is consistent or if beta will rise again in the long term perspective.

In order to determine whether beta level has changed over time we have to analyze the relatively high volatility in the pre-crisis period. One reason for the volatility in the beginning of the time period could be the lack of sufficient companies. At the beginning of 2006 the sample contains 6 companies, but only three of them were listed long enough to calculate an estimation period. In mid-2006 three new companies were listed and added to the sample, in Jun and Sep 2007 the remaining two companies were included. Another reason could be that five out of the six companies included in the sample at the beginning belong to the solar branch. This branch was in trouble at this time because of a severe shortage of silicon. The solar boom in the first years of 2000 led to an enormous demand for silicon which could not be satisfied by the existing production capacity. The shortfall and the rising silicon price created high uncertainty for the entire market.

Nevertheless, there is a clear tendency in 2007 towards beta between 0.7 and 1.3. The period after the crisis shows a considerably less volatile beta-factor exhibiting a constant decrease to between 0.8 and 0.5. Events nos.7-10 in particular have reference to the introduction of Directive 2009/28/EC and seem to cause and reinforce the decline of the beta-factor. Nevertheless, this decline is probably not solely attributable to the regulatory changes. Greater experience with these innovative technology companies on the part of the market and a broader acceptance of renewable energies by the public may also lead to a decrease in the risk perception.

The results from the event study show that this methodology is an appropriate measure for political or regulatory announcements concerning the renewable energy branch. Furthermore, the analysis indicates positive abnormal stock returns accompanied by a diminution of the beta-factor when there is an occurrence of events with a positive influence on an economic framework. These results concord with the theoretical findings we discussed earlier in this paper.

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8 Legal acts published in the Official Journal of the EU are binding and hence become law.

2.5 Conclusion

The transformation of the European energy market from conventional to renewable energies is a widely debated field in European policy. European policy makers are making various efforts to push this transformation forward. These political directives can be seen as regulation acts which lead to the debate about the impact on the risk/return profile of the companies affected. Existing work in this area is amended for the case of the renewable energy sector in Europe.

We use a classic event study and a time-varying beta calculation and apply these methodologies to our sample. Our results reveal (i) the capital market shows significant reactions (in terms of abnormal stock returns) to regulatory announcements on a European level, (ii) these abnormal stock returns show a negative correlation to beta variations and (iii) abnormal stock returns are positive in case of positive announcements concerning the political framework. This indicates that policy makers have an influence on attractive risk and return proportions of the analyzed companies.

Our presumption for the examination is that the CAPM beta-factor is an appropriate measure for systematic risk. With the methodology we tested twelve regulatory events in the period from 2006-10. Each of these events refers to regulatory announcements promoting renewable energies. The applied sample includes eleven companies from the renewable energy sector in Europe which were joined by a venture capital company during the pre-IPO phase. The requirement of the involvement of a VC-company stems from the assumption that participation underpins the expected results. In a first step the event study approach shows the impact of the twelve events. In a second step we continue with a calculation of time-varying beta-factors. Due to the crisis in the middle of the analyzed time period we focus on the period before and after the 2008 crisis, so that the effect of the events to beta-factors could be compared. During the pre-crisis period no valid conclusions can be made, since no abnormal stock returns occur and a high volatility in the beta calculation is observable for this period. The results after the crisis concord with the theoretical assumptions and prove a negative correlation between abnormal stock returns and beta variation.

The implications of our results highlight the importance of political decisions on the generation and establishment of incentive schemes for the development of renewable energies in Europe. Positive regulation announcements reduce systematic risk and provide attractive investment possibilities. However, several limitations of this implication have to be mentioned. The size of the sample and the length of the analyzed period are small. In particular, the first

part of the period contains only few companies. Despite careful examination of the event dates, we cannot rule out other effects than those included. In an analysis over a longer period, this fact could dilute our results and should be taken into account.

Developments of this paper mainly apply to the limitations mentioned above. To amplify the sample, companies without participation of a venture capital company could be included. Different alternatives could be the creation of subsamples for countries or branches.

3. Die Atomkatastrophe in Japan und die Kapitalkostenerwartungen für deutsche Energieerzeuger: Eine Note aus Sicht effizienter Finanzmärkte

Zusammenfassung

Die Atomkatastrophe in Fukushima hat nicht nur für eine stark intensivierte Debatte über die Zukunft der Kernenergie als Brückentechnologie auf dem Weg zur Versorgung durch regenerative Energieformen geführt, sondern auch die Frage nach den Kosten eines Atomausstiegs für die Stromkonzerne aufgeworfen. Ein in der Diskussion bislang vernachlässigter Aspekt richtet sich hierbei auf die Kapitalkosten, die anzusetzen sind, um künftige Investitionen in erneuerbare Energieerzeugung und leistungsstarke Netze zu finanzieren. Diese Kapitalkosten mit Blick auf über die Börse aufzunehmendes Eigenkapital werden insbesondere durch das vom Kapitalmarkt wahrgenommene (systematische) Risiko determiniert. Für dieses Risiko deuten die hier ermittelten Ergebnisse auf einen sichtbaren Anstieg hin, was als Hinweis für höhere Finanzierungskosten zu interpretieren ist.

Schiereck D, Trillig J. 2011. Die Atomkatastrophe in Japan und die Kapitalkostenerwartungen für deutsche Energieversorger: Eine Note aus Sicht effizienter Finanzmärkte. *Zeitschrift für Umweltpolitik & Umweltrecht* ***2***: 133-144.

3.1 Problemstellung

Die Katastrophe um das Atomkraftwerk in Fukushima hat zu einer stark intensivierten politischen Debatte über die Zukunft der Kernenergie in Deutschland geführt. Die bislang als notwendig bewertete Brückentechnologie auf dem Weg zu einer Energieversorgung durch regenerative Energieformen wird wahrschein-

lich früher als ursprünglich vorgesehen vom Netz gehen. Die sich daraus abzeichnenden finanziellen Konsequenzen lassen sich aus betriebswirtschaftlicher Sicht in kurzfristige Gewinnrückgänge und langfristige Kapitalkosteneffekte differenzieren. Kurzfristig werden die Gewinne der Stromkonzerne, die ihre Atomkraftwerke vom Netz nehmen müssen, durch diese Maßnahmen reduziert. Die unmittelbaren Gesamtfolgen eines Ausstiegs aus der Atomenergie für die betroffenen Unternehmen hängen u.a. aber auch davon ab, ob staatliche Entschädigungszahlungen geleistet werden und wie zukünftig stärker ausgelastete Kohlekraftwerke wirtschaften. Von langfristiger Bedeutung sind vor allem die Konsequenzen auf die Eigenkapitalkosten der Stromkonzerne. Ob auch die Investitionsvolumina durch eine frühere Energiewende betroffen sind, weil bspw. durch technologischen Fortschritt Wind- und Solarparks in späteren Jahren günstiger werden, steht bislang nicht im Blickpunkt der Debatte.

Ein zügigerer Umstieg auf eine vorrangige Stromproduktion aus erneuerbaren Energien erfordert große Investitionen, für die insbesondere auch Eigenkapital zur Finanzierung benötigt wird. Die Kosten für dieses Eigenkapital richten sich nach den Risikoeinschätzungen der Investoren am Kapitalmarkt. Durch die nun wahrscheinlich frühere Abschaltung von Kernkraftwerken sinkt die Stabilität der Einnahmen bei den Betreibern. Viele Technologien zur Erzeugung von Strom aus erneuerbaren Quellen besitzen noch keine langfristige Praxiserfahrung (Offshore-Windparks, Geothermie, Solarthermie etc.) und notwendige Ergänzungsinvestitionen für eine Energiewende in Hochspannungsüberlandleitungen und Pumpspeicherkraftwerke verzögern sich durch den Widerstand von Bürgerinitiativen. Als Konsequenz für den plötzlichen Bedeutungsanstieg dieser zahlreichen Risikoquellen liegt die Vermutung nahe, dass Investoren in Stromversorger ihre Risikoeinschätzung ändern und deshalb zukünftig höhere Renditen auf ihr investiertes Eigenkapital fordern.

Die Frage, ob ein vorzeitiger Atomausstieg zu einer Erhöhung der Kapitalkosten führt, hat zwei gesamtwirtschaftlich sehr bedeutsame Implikationen. Zum einen könnten Veränderungen in den Kapitalkosten mit den zur Diskussion stehenden Entschädigungszahlungen für die Stilllegung der Atomkraftwerke verrechnet werden, und zwar in beide Richtungen. Sinkende Kapitalkosten schmälern die Opportunitätskosten des Ausstiegs für die Stromkonzerne, höhere steigern sie. Zum anderen drücken die Veränderungen der Kapitalkosten auch die Erwartungen des Kapitalmarktes bezüglich des Erfolgs des Ausstiegs an. Ein stärkerer Anstieg des wahrgenommenen Risikos ist als Indikator für größere Be-

sorgnis hinsichtlich eines schnellen, erfolgreichen Umstiegs auf erneuerbare Energien zu interpretieren.

Die nachfolgend genutzte Methodik zur Ermittlung von Risikoveränderungen basiert auf Aktienkursreaktionen im Nachgang zur Atomkatastrophe in Fukushima. Ein entsprechendes Vorgehen muss sich der generellen Frage nach der Verlässlichkeit solcher Daten widmen, die zunächst einmal den großen Vorteil haben, sehr unmittelbar zur Verfügung zu stehen. Kapitalmärkte haben sich – entgegen der landläufigen Meinung – bei großen Katastrophen als durchaus sehr rational und effizient in der Informationsverarbeitung erwiesen (Kleidt et al., 2009; Schiereck and Zeidler, 2009). Terroranschläge, Erdbeben und Wirbelstürme wurden ganz überwiegend sofort in einer Form in Aktienkurse eingerechnet, dass spätere Adjustierungen nicht notwendig waren. Deshalb ist auch im hier vorliegenden Fall davon auszugehen, dass die durch die Atomkatastrophe in Fukushima generierten veränderten Erfolgs- und Risikoeinschätzungen für Stromproduzenten in Deutschland unverzerrt in die Aktienbewertungen eingeflossen sind. Vor diesem Hintergrund richtet sich die nachfolgende Analyse auf zwei Aspekte:

Welchen unmittelbaren spezifischen Wertverlust haben die Aktionäre als Eigenkapitalgeber von Stromkonzernen durch die Atomkatastrophe in Japan erfahren?

Wie hat sich das vom Finanzmarkt wahrgenommene systematische Eigenkapitalrisiko für die Stromkonzerne verändert und welche Auswirkungen sind daraus auf zukünftige Finanzierungskosten abzuleiten?

Zur Beantwortung dieser Fragen wird nachfolgend zunächst in Abschnitt 3.2 kurz auf die heutige Bedeutung der Atomenergie für die deutschen Stromkonzerne eingegangen, bevor Abschnitt 3.3 Datensatz und Methodik der empirischen Auswertung vorgestellt. Abschnitt 3.4 präsentiert die erzielten Ergebnisse und interpretiert sie danach auch. Zum Abschluss fasst Abschnitt 3.5 die zentralen Erkenntnisse zusammen und gibt einen Ausblick.

3.2 Die Bedeutung der Kernenergie für deutsche Stromkonzerne

Der deutsche Energiemarkt stellt mit 13,3 Exajoule (2009) den größten Primärenergieverbraucher in Europa dar. Fast ein Viertel des Bruttostroms wird aus Kernenergie gewonnen, der auf Kernenergie basierende Anteil der Bruttostro-

merzeugung betrug 2009 etwa 22,4%[9] (138TWh). Trotz der schon intensiven Förderungen und des schnellen Ausbaus erneuerbarer Energien nimmt die Energiegewinnung aus Kernenergie somit aktuell noch einen wichtigen Platz im deutschen Energiesystem ein, und ein Ausstieg erfordert den Ersatz dieses Anteils am Energiemix durch alternative Produktion.

Die beiden größten Energieproduzenten in Deutschland (E.ON und RWE) erzeugen Analystenschätzungen zufolge 30% bzw. 17% ihres operativen Erfolgs (EBITDA) mit der Produktion und dem Verkauf von Kernenergie. Dieser hohe Anteil erzeugt eine tiefgreifende Abhängigkeit der Energieversorger gegenüber den strukturellen Brüchen, die in direktem Zusammenhang mit der Kernenergie stehen (z.B. Ausstieg aus der Kernenergie, Ausstieg aus dem Ausstieg). Zusätzlich zu den seit Beginn der Stromgewinnung aus Kernenergie wahrgenommenen Risiken wurden durch die Erdbeben- und Flutkatastrophe in Japan weitere Risikofelder deutlich. So sehen sich die Betreiber von Kernreaktoren noch nicht bezifferten Kosten durch die mögliche Auflage zusätzlicher Sicherheitseinrichtungen und den Bau von Flutbarrieren gegenüber. Zudem gewinnt die Diskussion über den sicheren Betrieb der älteren Reaktoren erneute Brisanz, und eine dauerhafte Abschaltung dieser Reaktoren ist als nicht unwahrscheinlich anzusehen. Eben diese alten Einrichtungen jedoch tragen einen prozentual großen Anteil zum Gewinn der Energieversorger bei, da sie in den Bilanzen als größtenteils abgeschrieben gelten und somit keine Gewinn mindernden Wertanpassungen verursachen.

3.3 Datenbasis und Untersuchungsmethodik

Im folgenden Abschnitt wird zum einen auf die Zusammensetzung des Datensatzes und zum anderen auf die ökonometrischen Grundlagen der Modellierung für die weiteren empirischen Auswertungen eingegangen. Die Methodik erlaubt es, in aggregierten Form zu erfassen, wie insbesondere Akteure an den internationalen Kapitalmärkten strukturelle Veränderungen nach der Atomkatastrophe in Japan beurteilen und in ihre Werturteile für den Aktienkurs und das systematische Eigenkapitalrisiko der Energieversorgungsunternehmen in Deutschland einordnen.

9 BMWi (2010), Energie in Deutschland.

3.3.1 Datensatz

Die Untersuchung konzentriert sich auf börsennotierte Energieversorgungsunternehmen, die auf dem deutschen Markt tätig sind. Den Markt für (Kern-) Energieversorgung teilen sich vier große Marktteilnehmer auf (RWE, E.ON, Vattenfall und EnBW). Die in Deutschland agierende, aber zum nicht börsennotierten, schwedischen Mutterkonzern gehörende Vattenfall ist eine 100%ige Tochter des Mutterkonzerns und kann somit nicht für die Analyse verwendet werden. Allerdings empfiehlt es sich, neben Stromproduzenten mit dem Geschäftsfeld Kernenergie auch ein Vergleichsunternehmen ohne diese Form der Energieerzeugung einzubeziehen, um eine nationale Vergleichsgröße nutzen zu können. Dazu wird die Mannheimer Versorgungs- und Verkehrsgesellschaft Energie AG (MVV) eingebracht, die in ihrem Energiemix keinen Atomstrom produziert (Tabelle 4). Durch diese vier Energieerzeuger ist zumindest ansatzweise auch der Bundesverband der Energie- und Wasserwirtschaft (BDEW) abgebildet, in dem die gesamte deutsche Energiewirtschaft vertreten ist. In diesem Verband kam es Anfang April auf einer außerordentlichen Sitzung zu einem heftigen Streit zwischen den vier Atomkraftbetreibern und den kommunalen Versorgern. Unterschiede in den Kapitalmarktreaktionen für die MVV einerseits und vor allem den beiden großen im Streubesitz gehaltenen E.ON und RWE andererseits liefern einen sehr rationalen betriebswirtschaftlichen Hintergrund für diesen Streit. Die EnBW wird hier der Vollständigkeit halber auch erfasst, angesichts des öffentlichen Anteilsbesitzes von über 98% und nur sehr geringfügiger Börsenhandelsaktivität sind hier Kapitalmarktdaten aber weniger aussagekräftig. Die Kursreihen der Unternehmen sind dem Datenanbieter Datastream entnommen.

Table 4: Energiemix der Versorgungsunternehmen

	Streubesitz [%]	Energiemix [%]				
		Kernenergie	Gas	Kohle	EE	Sonstige
EnBW	1,85	51,0		34,5*	10,5	4,0
E.ON	~ 85,00	26,0	35,0	28,0	9,0	2,0
MVV	18,50	-	6,6	68,9	11,2	13,3
RWE	~ 80,00	20,0	25,0	35,0	20,0	-

Daten aus Konzernberichten 2009/10 entnommen.
* Angabe für alle konventionellen Energieträger.

3.3.2 Ereignisstudie

Zur Messung der Auswirkungen der Atomkatastrophe auf die Börsenkurse (Fama et al., 1969) der Energieversorger wird eine Ereignisstudie (MacKinlay, 1997) angewandt. Mit dieser Methodik wurden in der Vergangenheit immer wieder auch unerwartete Großschadensfälle wie Naturkatastrophen (Kleidt et al., 2009.) oder Terroranschläge (Schiereck & Zeidler, 2009) auf die Aktienrenditen betroffener Unternehmen erfolgreich analysiert. Die Methodik gilt entsprechend als internationaler Standard einer kapitalmarktnahen Auswertung.

Anhand einer Ereignisstudie werden Aktienrenditen eines Unternehmens mit den Renditen eines Aktiengesamtmarktes verglichen, wobei ein Aktienindex als Vertreter des Aktienmarktes das allgemeine Marktverhalten abbildet und somit als Referenzgröße dient. Es werden mögliche abnormale Aktienrenditen (AR – Abnormal Returns) ermittelt, die als Indikator für die Bewertung eines Ereignisses durch den Kapitalmarkt für die untersuchten Unternehmen zu interpretieren sind. In Formel 3.1 wird die Ermittlung der Differenz zwischen der tatsächlich beobachteten Aktienrendite ($R_{i,t}$) des Unternehmens i am Tag t und der (ohne Eintreten des zu analysierenden Ereignisses) erwarteten Rendite ($E(R_{i,t})$) am Tag t abgebildet:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{3.1}$$

Zur Schätzung der Referenzgröße (erwartete Rendite) wird das Marktmodell (Formel 3.2) verwendet (Binder, 1985). Die Koeffizienten α_i und β_i werden hierbei mittels einer linearen Regression (OLS) über Aktienindexrenditen geschätzt, die für eine Schätzperiode im Vorfeld des Ereignisses von 200 Tagen herangezogen werden. Diese täglichen Marktrenditen werden hier durch die Indexrenditen des DAX widergespiegelt. Der Fehlerterm der Regressionsschätzung ist durch $e_{i,t}$ repräsentiert:

$$E(R_{i,t}) = \alpha_i + \beta_i * R_{m,t} + e_{i,t} \tag{3.2}$$

Um mögliche Einflüsse des zu beurteilenden Ereignisses auf die vorgelagerte Schätzperiode bei der ex ante erwarteten Aktienrendite zu vermeiden, wird ein 30-Tage Fenster zwischen Schätzperiode und Ereignis eingeschoben. Anschließend werden die abnormalen Renditen für jeden Tag im ausgewerteten Zeitfenster um das Ereignis ermittelt und aufaddiert. Die dabei errechneten kumulierten abnormalen Renditen (*CAR* – Cumulative Abnormal Return) bilden

den Gesamteffekt eines Ereignissen für jedes einzelne Unternehmen über verschiedene Zeitintervalle (Ereignisfenster: t_1 bis t_2):

$$CAR_i = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{3.3}$$

Die CAR werden für alle erfassten Unternehmen gleich gewichtet addiert, und anhand des arithmetischen Mittels wird ein Mittelwert gebildet (*CAAR* – Cumulative Averaged Abnormal Returns):

$$CAAR = \frac{1}{N} \sum_{i=1}^{N} CAR_i \tag{3.4}$$

Die zu testende Nullhypothese entspricht einer kumulierten durchschnittlichen abnormalen Aktienrendite (CAAR) von Null. Diese Annahme entspricht dem Tatbestand, dass das Ereignis keinen Einfluss auf den Aktienkurs der Unternehmen nimmt. Für den Test auf Signifikanz werden ein Standard t-Test und zwei weitere statistische Testverfahren angewandt. Zum einen berücksichtigt das Verfahren von Boehmer et al. (1991) einen häufig beobachteten ereignisinduzierten Anstieg der Varianz der Aktienrenditen innerhalb des Ereignisfensters. Dies ist darauf zurückzuführen, dass unerwartete Ereignisse zu überdurchschnittlichen Handelsaktivitäten führen, die wiederum in einer erhöhten Schwankung der Kursreihen resultieren können. Die Nullhypothese wird daher beim Standard t-Test zu häufig abgelehnt. Zum anderen wird anhand eines modifizierten t-Tests (Johnson, 1978) eine mögliche schiefe in der Verteilung der AR berücksichtigt, die ebenfalls dazu führt, die Annahme unabhängiger und normalverteilter AR nicht zu erfüllen.

3.3.3 Risikomodellierung

Das Renditerisiko, das einem Unternehmen beigemessen wird und das die Basis für die Renditeforderungen der Aktionäre bildet, kann anhand der Volatilität der erwirtschafteten Renditen gemessen werden.[10] Grundsätzlich unterteilt man dabei das Risiko in zwei Teilbereiche, das systematische und das unsystematische Risiko. Das unsystematische Risiko beinhaltet einzelwirtschaftliche Risiken, die im jeweiligen Unternehmen selbst veranlagt sind. Dagegen ruht das systemati-

10 Dieser Ansatz stammt aus der Modernen Portfoliotheorie und geht auf Markowitz (1952) zurück.

sche Risiko auf marktinhärenten Veränderungen. Das systematische Risiko kann daher nicht wie das unsystematische durch Diversifikation (effiziente Portfoliozusammensetzung) von Kapitalanlegern vermieden werden. Es wird über den Betafaktor erfasst und beziffert den Teil des gesamten Anlagerisikos, für dessen Übernahme ein Investor eine Kompensation verlangt, da er dieses Risiko nicht eliminieren kann.

Die Kosten für das durch die Katastrophe von Fukushima ausgelöste veränderte Risiko lassen sich in vereinfachter Weise auf den Fremdkapital- und den Eigenkapitalanteil des Unternehmens aufteilen. Fremdkapitalkosten werden dabei von Fremdkapitalgebern und Ratingagenturen im Rahmen von entsprechenden Bewertungsverfahren ermittelt und sind im Allgemeinen leicht zugänglich. Die Kosten für den Eigenkapitalanteil und damit die Bestimmung der Kosten für das systematische Eigenkapitalrisiko lassen sich nur anhand von Kapitalmarktdaten ermitteln. Als Basis dient ein kapitalmarkttheoretisches Gleichgewichtsmodell, das von Sharpe (1964) vorgestellte Capital Asset Pricing Model (CAPM). Der in Formel 3.5 abgebildete Zusammenhang zeigt die Komponenten der unter Einbeziehung des systematischen Risikos einer Aktienanlage ermittelten Eigenkapitalkosten:

$$R_i = R_f + \beta_i * (R_m - R_f) \tag{3.5}$$

Dabei bezeichnet R_f den risikolosen Zinssatz, R_m die Rendite des Marktportfolios und β_i die spezifische, systematische Risikomenge des Unternehmens. Der Betafaktor bezieht sich dabei nicht auf den Teil des Risikos, der durch Diversifikation zu Null verringert werden kann (unsystematisches Risiko), sondern nur auf das systematische Risiko des Unternehmens. Er beschreibt dabei, inwieweit sich das Eigenkapitalrisiko unternehmensindividuell verändert, auch wenn keine Änderung der Marktrendite oder des risikofreien Anlagezinses eintritt. Formal ergeben der Quotient aus der Kovarianz (*kov()*) der Rendite der Anlage mit der Rendite des Marktportfolios und der Varianz (*var()*) der Marktrendite den Betafaktor:

$$\beta_i = \frac{kov(R_i, R_m)}{\mathrm{var}(R_m)} \tag{3.6}$$

Im Rahmen dieser Analyse wird eine Verschiebung des Betafaktors als eine Änderung des systematischen Eigenkapitalrisikos interpretiert. Dieser Ansatz findet in der Literatur weit verbreitete Anwendung (Riddick, 1992; Havenner et

al., 2001; Paleari and Redondi, 2005). Die Differenz aus Aktienmarktrendite und risikofreiem Zins wird Marktrisikoprämie genannt.

3.4 Ergebnisse

Die Vorstellung der Ergebnisse zur Beantwortung unserer beiden Forschungsleitfragen erfolgt in zwei Schritten. Zunächst wird analysiert, ob signifikante Kursreaktionen bei den Energieversorgungsunternehmen stattgefunden haben. Darauf folgend werden die sich ändernden Risikoeinschätzungen für die vier Unternehmen aus Sicht des Kapitalmarktes über Veränderungen in den Betafaktoren ermittelt.

3.4.1 Ergebnisse Ereignisstudie

Die kumulierten durchschnittlichen Aktienkursreaktionen aller vier Energieversorgungsunternehmen sind in Table 5 dargestellt. Am Tag der Atomkatastrophe (11.03.2011) sind insignifikant positive abnormale Renditen (1,15%) zu beobachten. Die verheerenden Konsequenzen, die der Tsunami für die Atomreaktoren an der japanischen Nordostküste nach sich zieht, wurden erst nach Börsenschluss (MEZ) in ihrer Tragweite offensichtlich. An den beiden folgenden Handelstagen stellen sich signifikant negative (-2,31% und -3,68%) Aktienrenditen ein, die trotz der kleinen Stichprobe hohe statistische Signifikanzniveaus erreichen. Die Ereignisse in Fukushima haben somit zu einem sehr großen Verlust an Aktionärsvermögen bei den Anteilseignern der deutschen Stromerzeuger geführt. Allein für E.ON bedeutet eine negative abnormale Rendite von 3% eine Minderung der Börsenkapitalisierung von mehr als einer Milliarde Euro.

Table 5: Kumulierte Aktienkursrenditen der vier deutschen Energieversorger

	Cumulative Abnormal Return		t-Test	Boehmer Test	Johnson Test	
Event window	Mean	Median	t-value	z-score	J-value	Nobs
[-3;-1]	0.82%	0.96%	1.540	1.606	1.514	4
[±0; ±0]	1.15%	1.49%	2.669***	2.546*	1.747	4
[±0;+1]	-2.31%	-2.69%	-3.098***	-3.357**	-2.364*	4
[±0;+2]	-3.68%	-4.44%	-3.116***	-3.354**	-2.326	4
[±0;+5]	-1.78%	-2.25%	-1.154	-1.114	-1.069	4

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Da nur drei der vier untersuchten Energieversorger (EnBW, E.ON, RWE) Strom aus Kernenergie produzieren und verkaufen, ist zu erwarten, dass die Kapitalmarktreaktionen auf die Atomkatastrophe für die jeweiligen Energieanbieter unterschiedlich ausfallen. In Tabelle 6 sind die Werte nur für die kumulierten durchschnittlichen Aktienrenditen der Atomstrom anbietenden Versorger aufgelistet. Der Kursrückgang fällt in den ersten beiden Tagen noch stärker aus als bei der Untersuchung aller Unternehmen. Zudem bleibt nun festzustellen, dass auch im zeitlich längsten Ereignisfenster der Rückgang von -3,05% auf statistisch belastbarem Niveau bleibt. Dieser Effekt wird verständlich, wenn man berücksichtigt, dass der einzige nicht Atomstrom anbietende Versorger MVV bereits ab dem dritten Tag nach der Katastrophe einen positiven Kursverlauf verzeichnet.

Table 6: Kumulierte Aktienrenditen der drei Atomstromanbieter (EnBW, E.ON, RWE)

	Cumulative Abnormal Return		t-Test	Boehmer Test	Johnson Test	
Event window	Mean	Median	t-value	z-score	J-value	Nobs
[-3;-1]	0.50%	0.40%	0.836	0.888	0.930	3
[±0; ±0]	0.94%	1.37%	1.750*	1.665	1.305	3
[±0;+1]	-2.31%	-3.08%	-2.247**	-2.377	-1.696	3
[±0;+2]	-3.70%	-5.24%	-2.269**	-2.384	-1.655	3
[±0;+5]	-3.05%	-4.23%	-2.117**	-2.181	-1.582	3

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

3.4.2 Ergebnisse zur Veränderung der Betafaktoren

Die Veränderung des systematischen Aktienrisikos und damit der Eigenkapitalkosten kann anhand einer Verschiebung des Betafaktors eines Unternehmens veranschaulicht werden. Figure 2 zeigt die Betafaktoren der vier Versorger, die rollierend für einen 100-Tage-Zeitraum berechnet werden.

Der Verlauf der Koeffizienten von RWE und E.ON folgt leicht versetzt dem gleichen Schema und bewegt sich für das Jahr 2010 zwischen 0,6 und 0,8. Beide Energieanbieter zeigen ab dem Handelstag nach der Atomkatastrophe einen deutlichen Anstieg der Betafaktoren. Ihr systematisches Risiko steigt deutlich an. Der Koeffizient für RWE steigt um ein Viertel seines vorherigen Wertes auf 0,7 und verläuft auch in den Folgetagen tendenziell steigend. Für den Versorger E.ON ist ein etwas schwächerer Sprung auf einen Wert etwas unter 0,7 zu ver-

zeichnen. Auch hier gilt es sich zu verdeutlichen, welcher Gesamteffekt beobachtet wird. Bei typischen Marktrisikoprämien, die in jüngsten Umfragen bei aktuell über 5% liegen, induziert der beobachtete Anstieg von Beta um mehr als 0,2 einen Anstieg der Eigenkapitalkosten um mehr als einen Prozentpunkt. Ein Stromkonzern mit einer Marktbewertung von 50 Mrd. Euro hat damit eine Verteuerung seines Eigenkapitals um 500 Mio. Euro zu verzeichnen.

Bei EnBW ist keine merkliche Verschiebung des Beta Koeffizienten festzustellen, was angesichts der bereits erwähnten kaum vorhandenen Handelsaktivität in der Aktie nicht verwundert. Analysteneinschätzungen zur Folge weist EnBW für in 2010 ein Beta von 0,49[11] auf.

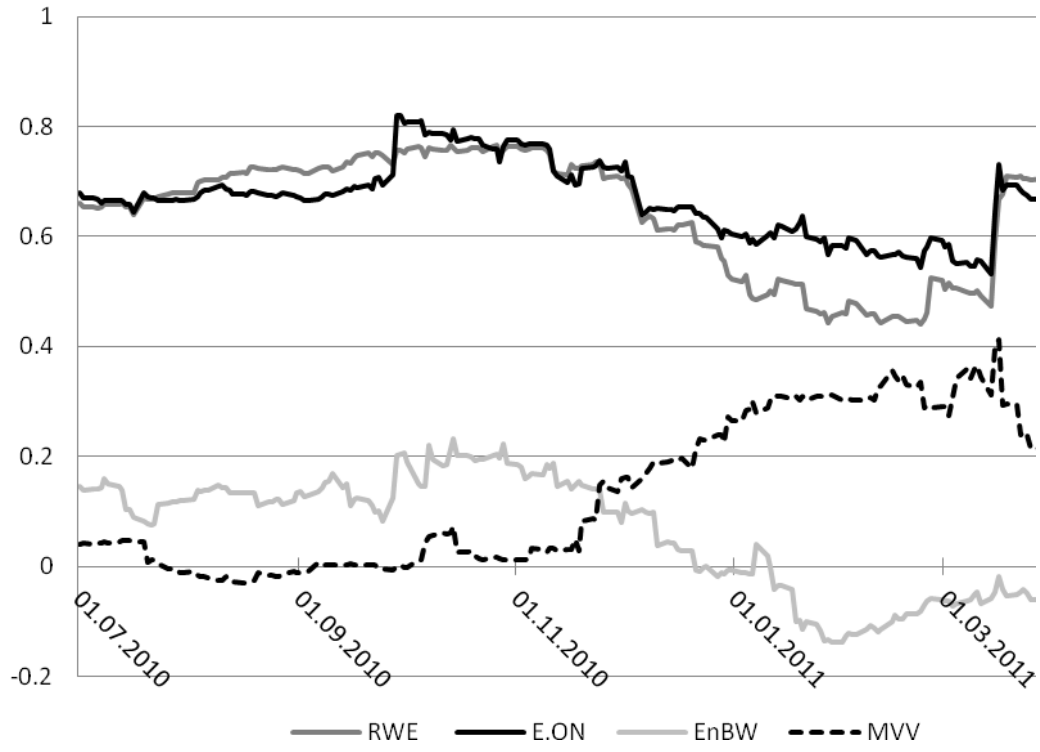

Figure 2: Zeitlich veränderliche Beta-Koeffizienten der vier Energieversorger

11 Informationen des Datenanbieters Thomson Reuters.

Für den Energieanbieter MVV, der keinen Atomstrom produziert, ist im Gegensatz zu RWE und E.ON tendenziell eine Verringerung von Beta zu beobachten. Figure 2 illustriert dies und zeigt ein Absinken des Eigenkapitalrisikos in der Folge der Ereignisse des 11. März um ein Drittel auf etwa 0,2. Tendenziell ist ein weiteres Absinken des Wertes zu erkennen.

Zusammenfassend lässt sich eine deutliche Erhöhung des durch den Markt bewerteten Eigenkapitalrisikos der Atomstrom anbietenden Energieversorger RWE und E.ON feststellen. Der Energieanbieter MVV, der keinen Atomstrom in seinem Energiemix einschließt, zeigt eine merkliche Verringerung des Eigenkapitalrisikos und damit verbunden auch niedrigere Eigenkapitalkosten.

3.5 Zusammenfassung und Ausblick

Die Auswertungen der Kapitalmarktreaktionen nach der Atomkatastrophe von Fukushima zeigen, dass die Betreiber von Kernkraftwerken in Deutschland einen deutlichen Verlust an Aktionärsvermögen und eine sichtbare Erhöhung ihrer Eigenkapitalkosten hinnehmen mussten. Beide Effekte belasten die finanzielle Leistungsfähigkeit dieser Stromkonzerne und beschränken ihre Fähigkeiten, einen signifikanten Investitionsbeitrag zur Energiewende zu leisten. Es empfiehlt sich deshalb, für die Suche nach möglichen Investoren andere Unternehmen zu adressieren. Dies könnte auch zu einer Anbieterstruktur im deutschen Energiemarkt führen, die weniger von den heute dominanten vier großen Konzernen geprägt ist.

4. Sustainable Project Finance, the Adoption of the Equator Principles, and Shareholder Value Effects

Abstract

Recent trends in the project finance industry include increasing volume and a growing awareness of sustainable development. This has raised the question of whether and a how voluntary code of conduct such as the Equator Principles (EP) could enhance their impact on the project finance industry. We apply an event study methodology, and also consider the market model and conditional variance. We find positive abnormal returns for financial institutions adopting the EP, which supports the reputational risk hypothesis. Furthermore, we document that adopters outperform the global project finance market, especially in terms of market share. However, we do not find evidence that non-adopters are excluded from lending syndicates. Results include practical recommendations for environmental policy.

Eisenbach S, Schiereck D, Trillig J, Flotow P v. 2012. Sustainable Project Finance, the Adoption of the Equator Principles, and Shareholder Value Effects. *Business Strategy and the Environment* (forthcoming).

4.1 Introduction

The importance of project finance as a method of funding large infrastructure and industrial assets has grown dramatically in recent years. Infrastructure projects, traditionally bankrolled by public bodies or strictly regulated monopolies, have become increasingly important to private sector firms. This trend is expected to continue growing (Esty and Sesia, 2010). According to the Dealogic Projectware Database, global project volume more than tripled from 2003 to 2011, from U.S. $113.4 billion to U.S. $408.3 billion, with Asia being the fastest growing regional market. And project finance has become almost equally widespread in less developed countries as a facilitator of economic growth (Kleimeier and Versteeg, 2010).

Project-financed assets are characterized by high initial investments of up to several billion dollars, and long but limited project lives. The financing, which usually includes a large share of bank debt, is based solely on predictable and ideally stable cash flows from operations. And, because risk is such an important factor in calculating cash flows, risk management plays a critical role in the structuring of projects (Case, 1999; Esty, 2004). Typical project finance risks are related to construction and operation of facilities, technological reliability, commodity and financial market conditions, the host country's legal framework, and any force majeure events.

Esty and Sesia (2010) note that a further class of risks stems from environmental and social issues, considered one of the major trends in project finance. Large-scale developments, such as roads, airports, power plants, oil and gas pipelines, metal processing plants, and dams, can have significantly adverse impacts on the environment and on local communities, particularly when undertaken in remote, ecologically sensitive areas.

Concern over environmental and social topics, however, is not a new phenomenon. Gassner (2012) describes the historical relationship between environmental interests and rising costs to companies. Public awareness of these issues grew dramatically during the 1960s, driven largely by high-profile cases such as the construction of the Central European Pipeline from Northern Italy to Southern Germany. A more recent case is described by Ray (2008). In 2005 Credit Suisse First Boston (CSFB) was put under public pressure to withdraw as financial advisor from the Sakhalin Project. The $ 12 billion gas and oil project planned by Shell was associated with numerous environmental and social violations. Finally, CSFB decided to withdraw from the project. Recently, Canadian banks have come under fire by environmentalists for providing loans to oil and gas companies. These companies use the capital to extract oil from the sands in Alberta, an area some have deemed ecologically sensitive. However, given that Canadian banks typically possess a high exposure to environmental issues, Weber (2012) considers these banks "Best in Class" in handling environmental and social issues.

The increasing project finance volume, combined with the growing awareness of environmental and social issues, raises the question of whether a more serious consideration of those issues within the business model, firstly, enhances the firm value and secondly, improves company's performance. One way companies could take this into account is to adopt (voluntary) codes of conducts. In 2003 several commercial banks and the International Finance Cooperation (IFC) developed a voluntary code of conduct setting environmental and social perfor-

mance standards in the project finance industry. Our research question, therefore, investigates whether adopting guidelines such as the Equator Principles (EP) can boost financial institutions (FIs) and the overall project finance industry. A large body of literature has analyzed this impact (Heal, 2005; Wright and Rwabizambuga, 2006; Scholtens and Dam, 2007; Macve and Chen, 2010; Conley and Williams, 2011; Wright, 2012). We contribute and extend this existing strand of literature in the following ways. First, we study whether the impact of the EP has empirically changed over time, i.e., whether the capital markets react differently to financial institutions that were early adopters of EP than to later adopters. To the best of our knowledge no study exists that analyses empirically this, recent time period and thus, no evidence exists of a potential development of the EP. Second, we analyze the performance of Equator Principles Financial Institutions (EPFIs) in the project finance industry. The aim is to assess whether adopters outperform the global project finance market and if performance parameters such as project volume, number of projects or market share develop differently between adopters and non-adopters. No study is known to the authors that analyzes differences in performance of adopting and non-adopting FIs. Third, we identify trends in EP projects.

The remainder of this paper is organized as follows. Section 4.2 presents an introduction to the Equator Principles, and gives an overview of the theoretical background. Section 4.3 explains the applied methodology and describes our dataset. Section 4.4 gives our results, and section 4.5 provides a brief conclusion.

4.2 Theoretical Background

In order to address environmental and social risks in project finance, a voluntary code of conduct for the banking industry was launched in June 2003. Nine commercial banks supported by the IFC drafted the so called Equator Principles. These principles directly refer to policies and guidelines of the World Bank and provide a common general framework according to which each adopting institution develops internal policies, procedures and standards. The principles are intended to guide project financiers on how to address negative environmental and social impacts of their projects.[12] The EP were substantially revised in 2006 (EP II) and the update process for the EP III was launched mid 2011. Today, over

12 For more details about the intention of the EP e.g. Wright and Rwabizambuga (2006), Conley and Williams (2011), Esty et al. (2007).

seventy institutions have adopted the EP which are now generally considered the market standard (see the Appendix for a complete list).

Various types of research have been conducted in recent years on the impact of the Equator Principles. The predominant feature is the interview-based study, which analyzes EP performance from a qualitative perspective (e.g. Esty et al., 2007; O'Sullivan and O'Dwyer, 2008; Macve and Chen, 2010; Conley and Williams, 2011; Wright, 2012). The results mainly relate to a successful implementation of a voluntary code of conduct pertaining to social and environmental risk, but remain critical of real environmental benefits and a perceived lack of accountability. A second important strand focuses on how financial institutions relate to sustainable development (Missbach, 2004; Heal, 2005; Richardson, 2005; Coulson, 2009; Carnevale et al., 2012), and how environmental issues are incorporated into credit risk management (Weber et al., 2008; Bauer and Han, 2010; Weber et al., 2010; Weber, 2012). The majority of studies reveal that FIs are becoming aware that they are vulnerable through environmentally and socially inadequate behavior of their clients. Further, they are subject to increasing public pressure to exert influence on the clients' appropriate behavior. Weber et al. (2010) and Weber (2012) provide results indicating that FIs increasingly incorporate environmental issues into their credit risk management.

Another strand of research links environmental governance with the company's economic performance. Adopting the EP could be interpreted as incorporating environmental governance into the business model of FIs and thereby following binding performance standards in the project finance industry. Tang et al. (2012) find that a green reputation is one of the key mediators for transforming environmental governance into economic performance gains. Furthermore, Rodriguez-Melo and Mansouri (2011) identify stakeholder engagement as the important issue in sustainable development and implicate „*that to gain competitive advantage companies should embark on long-term strategic alliances which adopt the proposals of environmental non-governmental organizations and closely follow public opinion.*"

In one of the few primarily quantitative studies, Scholtens and Dam (2007) use an empirical analysis and find that financial institutions adopting the EP differ significantly from non-adopters along social, ethical, and environmental lines. Nevertheless, Scholtens and Dam (2007) also find that shareholders do not react to disclosures that financial institutions have adopted the EP. And, to the best of our knowledge, no empirical analysis exists for the 2007-2012 period. We would expect to find different capital market reactions for this period, due

not only to increasing environmental awareness, but also to fundamental revisions of the EP that were undertaken in 2006.

The moderate impact of the EP that most studies have found is attributable to the EP's limited scope, as well as the lack of implementation standards, accountability, and transparency (Esty et al., 2007; BankTrack, 2010). Since then the EP have been revised twice; a potentially intensified cooperation between FIs and NGOs as well as an increased importance of social and environmental issues in credit risk management are noticeable. The substantial 2006 revision was meant to address some of the early critiques, as well as to account for updated IFC (International Finance Corporation) policies. The revision also broadened its scope, and made the EP more applicable to smaller projects and project expansions, as well as to project finance advisory activities. Other major changes included increased inclusion of social risks, the creation of a grievance mechanism, an increased number of covenants in the loan documentation, and the introduction of a requirement for EPFIs to report on their implementation of the EP (Principle 10).

However, the EP experienced renewed criticism in 2010, which generally faulted the lack of progress in advancing the EP (BankTrack, 2010). The EP Association Steering Committee approved the newly published IFC Performance Standards at the end of 2011, and announced the launch of EP III for year-end 2012. Because the EP are based on IFC Performance Standards, it is essential that they capture any changes within these standards. The changes in the IFC Performance Standards relate mainly to increased information access (expanding the scope of information, increasing transparency regarding financial intermediary investments and advisory services) and a stronger requirement for FIs "*to develop and implement Environment and Social Management Systems commensurate with their E&S risks*" (IFC, 2012). The 2006 revisions and the ongoing debate over the second round of revisions coming at year-end 2012 have aided somewhat in overcoming the major criticisms, and have strengthened the EP's influence. But the impact of the enhanced EP has not, to the best of our knowledge, been empirically analyzed yet.

The continuous updating process promotes awareness of setting performance standards among all market participants. One of the EP's key values is the standardization and institutionalization of procedures to address social and environmental issues, with the goal of increasing consistency within EPFI project finance operations. And, through using the EP, bankers are more likely to have the same vocabulary and similar expectations for project sustainability performance (Scholtens and Dam, 2007; Wright, 2012). Beyond financial institu-

tions, the same argument can be considered valid for all other market participants, which emphasizes the reach of the EP. The establishment of the EP has led to increased involvement with NGOs, and simplified communications with project sponsors (Conley and Williams, 2011). Nowadays, the latter tend to be more aware of social and environmental challenges, so they approach banks with more advanced project proposals. They also realize that projects must be EP-compliant to obtain sufficient funding.

The EP have also intensified cooperation between adopting institutions, thus many of the bankers involved have become acquainted and begun to communicate on a regular basis. An established working relationship tends to simplify the allocation and coordination of the project finance process. Recent interview-based studies (e.g. Conley and Williams, 2011) suggest that this trend has increased significantly over the last several years, thus further highlighting the importance of having an objective and updated analysis of the impact of the EP.

Within the realm of project finance, controlling for risk is key to success. Financial institutions have naturally broadened their risk perspective beyond the typical project finance risks (e.g., operational, legal) to include environmental and social risks (Esty and Sesia, 2010). In fact, social and environmental issues are increasingly influencing both credit and reputational risk.

Weber et al. (2010) argue that considering sustainability criteria in credit risk management can improve the predictability of risk and risk management, thus confirming the findings of Coulson (2009) and Wagner (2009). Goss and Roberts (2011) find that banks lending to borrowers with environmental or social concerns require these firms to pay a higher loan spread than they otherwise would. Although the spread is small and thus the impact incidental, Goss and Roberts (2011) conclude that banks obviously consider corporate social responsibility concerns to be somewhat risky. Weber (2012) conducts an interview-based analysis for Canadian financial institutions, and suggests that, at least with respect to credit risk management, environmental risks are managed to avoid financial risk.

Business strategies that simultaneously increase efficiency and reduce environmental impact are referred to as “eco-efficient” strategies. Sinkin et al. (2008) (for U.S. companies) and Al-Najjar (2012) (for U.K. companies) show higher market values for companies that have adopted eco-efficient strategies. They posit that fewer input factors, as well as benefits from government regulation, competition, and better access to capital, are the reasons for the higher market values. Recent research on the advantages of considering social and en-

vironmental issues in credit risk management and the value-generating effect of adopting eco-efficient strategies seems to predict increased interest in the EP.

We thus expect to see positive share price reactions after the announcement of a project finance firm's adoption of the EP. During volatile times, an empirical analysis of these effects would need to control for conditional variance in financial time series, where there is no general assumption of constant variance. The effects of volatility clustering have been explored in several studies (e.g. French et al., 1987). Thus, a time-dependent change in variance (heteroscedasticity) of financial returns is very likely, particularly during upward- or downward-trending economic periods.

However, since the implementation of the EP, the 2008 worldwide financial crisis has given reason to assume there is conditional variance in the stock returns of financial institutions. Our research relates to this issue because we enhance the existing strand of literature by using an empirical model that accounts for asset return heteroscedasticity to estimate the impact of the EP.

In summary, the basis for the motivation of our analysis and its contributions to the literature come from 1) the lack of empirical studies that analyze the 2007-2012 period, 2) the improvements in the EP made by the 2006 revisions and the ongoing debate over potential 2012 revisions, 3) the potentially intensified cooperation between FIs and NGOs, 4) the increased importance of social and environmental issues in credit risk management, and 5) the assumption of heteroscedasticity in FI asset returns.

4.3 Data and Methodology

4.3.1 Event Study

We use the event study approach suggested by MacKinlay (1997) to quantify the potential effects of EP adoption announcements. This method is commonly used to measure the effect on company value of corporate events such as mergers and acquisitions, equity issues, earnings announcements, and management changes. But it is also commonly used to analyze the results of the adoption of voluntary codes (such as the EP) (Nowak et al., 2006; Scholtens and Dam, 2007), partnerships with, e.g., the USEPA Climate Leaders program (Keele and DeHart, 2011), the publication of "green" company rankings (Amato and Amato, 2012), or "environmental investments" (Halme and Niskanen, 2001). In the context of this analysis, we interpret stock price reactions to EP adoptions as the capital market's evaluation of a company's commitment to conduct its project finance

business under EP guidelines. We can also interpret abnormal announcement returns as a reflection of all the expected future benefits and costs, and thus the changes in expected future cash flows that would result from this corporate decision.

We use traditional event study methodology. We follow the specifications of Savickas (2003) and Aktas et al. (2007), and consider the conditionally heteroscedastic behavior of volatility during the estimation period. While these authors suggest controlling for GARCH effects in the test statistics, we instead consider such effects in estimating the regression coefficients (α_i and β_i in Equation (4.1)). We expect financial institutions' stock returns to be affected by, e.g., the early 2000 crisis or the 2008 financial crisis, but Corhay and Tourani Rad (1996) argue that "*Even though there is no intrinsic interest in estimating the conditional variance, the market model should be estimated by maximum likelihood in order to obtain a more efficient estimator of the regression parameters.*"

The abnormal return is the difference between the actual return and the benchmark return. We estimate the benchmark returns by using Brown and Warner's (1985) market model:

$$E(R_{i,t}) = \alpha_i + \beta_i * R_{m,t} + e_{i,t} \tag{4.1}$$

Here, $E(R_{i,t})$ is the expected stock return of EPFI *i*, and $R_{m,t}$ is the return of the market index on day t. By estimating Equation 4.1, we assume the error term follows a GARCH (1,1) process, and the variance of the error term is conditional on the specific information set I_{t-1}:

$$e_{i,t} \mid I_{t-1} \sim N(0, \sigma_t^2) \ . \tag{4.2}$$

The information set contains all the past returns up to and including *t-1*. The conditional variance, denoted as σ_t^2, is conditional on the information set, which we assume is not random because it is observable. Furthermore, the error term is normally distributed with 0 mean and a variance of:

$$\sigma_t^2 = \omega + \gamma * e_{t-1}^2 + \delta * \sigma_{t-1}^2 \ . \tag{4.3}$$

We estimate the parameters by using maximum likelihood estimation, with an estimation period from 180 to 21 days prior to the event. In Equation 4.1, the MSCI World Financials Index is used to represent the market.

We can define the abnormal return for every day *t* as follows:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{4.4}$$

where $R_{i,t}$ represents the actual daily return. The abnormal return is then combined over different event windows. Letting t_1 and t_2 denote the beginning and the ending day of a time window under observation, the cumulative abnormal return of security *i* is thus:

$$CAR_i = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{4.5}$$

In order to assess the statistical significance of the results, we use a standard two-tailed t-test, a modified t-test as proposed by Boehmer et al. (1991), and a modified t-test as proposed by Johnson (1978). All have the joint null hypothesis that the mean and median cumulative abnormal returns in every observed period $[t_1, t_2]$ equal 0.

4.3.2 MLA League Table Analysis

Beyond the analysis of capital market reactions, a further means to assess the success of EPFIs is the examination of League Tables over time. League Tables rank players in the project finance arena according to project volume, number of projects, or market share. For this analysis, we obtain mandated lead arranger (MLA) League Tables (for the Top 200) for the 2000-2011 period from Dealogic Projectware. EPFIs acting in the role of an MLA can exert the most influence on project design, and thus play a critical role in implementing the EP, even though the scope of the EP has been extended to include project finance advisory activities. We consider two sets of League Tables here, one that includes all global projects, and one that includes all developing country projects.

In the first step, we determine the ranking of each EPFI with regard to project volume for both the year of EP adoption as well as the three years prior to and after adoption, respectively. We exclude any EPFIs that were not in the top 100 or higher in any of these seven years, as we assume these institutions do not have significant project finance operations.

Next, for each EPFI, we compare project volume, number of projects, and market share prior to and after EP adoption. We conduct short-term (ST) and long-term (LT) analyses. For the short-term analysis, we compare the years preceding and subsequent to the adoption year. For the long-term analysis, we compare the averages of the respective values for the three years preceding and

subsequent to the adoption year. The latter analysis is possible for institutions that adopted the EP in 2008 or earlier. We calculate absolute values as well as relative changes compared to the market in order to control for strong and weak project finance market periods.

We find that the most meaningful results are the relative increases in the respective parameters from before EP adoption to afterward. To put the relative increases into perspective, however, we must compare them to overall market development. The reference value in the short-term analysis is the three-year growth rate (3YGR), which can be calculated from the compound annual growth rate (CAGR).

By averaging over the three-year period prior to and after adoption, the long-term analysis can essentially be seen as comparing the respective values three years before adoption with the values three years afterward. The corresponding seven-year growth rate (7YGR) is thus calculated analogously.

4.3.3 Sample

Our initial sample comprised eighty-five financial institutions, which we collected from the official homepage from the EP (equator-principles.com). Seventy-seven[13] of these companies currently use the EP. The remaining eight companies had also adopted the EP, but not in their current incarnation. For example, Itaú Unibanco S.A. was created in 2008 by a merger of Unibanco, which announced EP adoption on 6 January 2004, and Banco Itaú, which announced adoption on 8 December 2004. Note that the company with the most recent announcement is Banco Mercantil del Norte S.A., which announced EP adoption on 12 March 2012.

Our sample covers approximately nine years, which allows us to control for potential changes in effects after the July 2006 revision. Public data come from Datastream, and we excluded any companies for which public data was not available. This further shrank our sample to forty-six companies. Two companies were excluded due to stock illiquidity, i.e. they showed a constant share price for the entire estimation and event period. This left a final sample of forty-

13 As of June 2012, the seventy-seven adopting financial institutions were comprised of seventy-five EPFIs and two associates. According to the official definition from the EP website, “An Associate is a financial institution that is not active in project finance and adopts the Equator Principles (EP) as part of its broader approach to sustainability.”

four financial institutions. Table 7 presents descriptive statistics for the sample companies.

Table 7: Descriptive Statistics of Sample Companies

	All Adopters		Early Adopters		Late Adopters		OECD		Other	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
MC ($mil)	35064.4	40668.3	39537.6	45889.5	29348.7	33236.6	44227.5	42885.6	6658.8	5866.6
TA ($bil)	6137.49	25250.93	10425.27	33395.41	658.67	575.54	8008.12	28901.16	338.52	380.58
E/A	4.98	2.40	4.62	2.38	5.44	2.42	4.44	2.17	6.66	2.41
ROAE	2.73	3.08	2.31	3.49	3.23	2.48	2.56	3.28	3.21	2.45
#	41		23		18		31		10	

This table reports the descriptive statistics of the sample companies. MC denotes market capitalization; TA denotes total assets; E/A denotes equity to assets and ROAE denotes return on average equity.

4.4 Results

4.4.1 Short-Term Stock Market Reactions

Table 8: EP Adopter CARs

This table reports the means and medians of financial institutions' cumulative abnormal returns (CARs) around EP adoption. We test the CARs for statistical significance using a standard two-tailed t-test, a modified t-test as proposed by Boehmer et al. (1991), and a modified t-test as proposed by Johnson (1978). We test for statistical significance of the median CAR by using the Wilcoxon signed-rank test. Nobs denotes the number of financial institutions in the event study.

	Cumulative Abnormal Return		t-Test	Boehmer et al. (1991) Test	Johnson (1978) Test	Wilcoxon Signed-Rank Test	
Event Window	Mean	Median	t-value	z-score	j-value	z-score	Nobs
[-10;+10]	-0.20%	0.24%	-0.136	0.060	-0.138	-0.070	44
[-5;+5]	0.42%	0.24%	0.541	0.900	0.534	-0.782	44
[-3;+3]	0.35%	0.00%	0.563	0.538	0.572	-0.070	44
[0;0]	-0.01%	0.17%	-0.047	0.080	-0.047	-0.058	44
[0;+2]	-0.06%	-0.06%	-0.122	-0.391	-0.122	-0.257	44
[0;+3]	0.80%	0.44%	1.798*	1.643	1.813*	-1.447	44
[0;+5]	0.58%	0.17%	0.975	0.887	0.983	-0.607	44
[+1;+5]	0.59%	0.15%	0.849	0.778	0.856	-0.922	44
[-5;-1]	-0.16%	-0.01%	-0.254	0.247	-0.260	-0.012	44

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8 gives our findings for stock price reactions upon EP announcements. We show CARs for the day of the announcement, as well as for several event windows of up to ten days before and ten days after the announcement. To control anticipatory effects and reactions after the announcement we show the event windows [-5;-1] and [+1;+5], respectively.

The results exhibit slightly negative but insignificant CARs for the event day and the event window including the two following days. Nevertheless, we examine positive and partially statistically significant CARs for the [0;+3], [0;+5], and [+1;+5] windows. We find that the lag time between the announcement and the reaction is within the normal range. However, there are two plausible explanations for any delays: 1) the announcement of the adoption of a voluntary code of conduct is not considered as important as, e.g., the announcement of a merger or an acquisition; thus the market takes time to process the information, and 2) stakeholders and the operational areas of financial institutions tend to be spread out globally. Time differences could cause lags in market reactions.

Table 9 compares CARs for FIs that adopted the EP before the 2006 revision with those that adopted afterward. We find positive and significant CARs for the early adopters, who induced market reactions leading to a 1.26% average rise in equity on the event day and for the following three days [0;+3]. We find no significant results, however, for the late adopters, but we observe a two-day lag to the announcement in this subsample. Thus, contrary to other studies, such as, e.g., (Scholtens and Dam, 2007) we find positive CARs for this group of adopters.

Table 9: Early/Late EP Adopter CARs

This table reports the means and medians of subsamples of financial institutions' cumulative abnormal returns (CARs) around EP adoption. We test the CARs for statistical significance using a standard two-tailed t-test, a modified t-test as proposed by Boehmer et al. (1991), and a modified t-test as proposed by Johnson (1978). We test for statistical significance of the median CAR by using the Wilcoxon signed-rank test. Nobs denotes the number of financial institutions in the event study.

	Cumulative Abnormal Return		t-Test	Boehmer et al. (1991) Test	Johnson (1978) Test	Wilcoxon Signed-Rank Test	
Event Window	Mean	Median	t-value	z-score	j-value	z-score	Nobs
Panel A: Early Adopters							
[-10;+10]	-0.85%	0.45%	-0.485	0.019	-0.511	-0.067	25
[-5;+5]	0.58%	0.20%	0.554	1.344	0.530	-1.117	25
[-3;+3]	0.01%	0.02%	0.030	0.373	0.030	-0.121	25
[0;0]	0.02%	0.13%	0.073	-0.151	0.075	-0.121	25
[0;+2]	0.81%	0.36%	1.750*	1.503	1.848*	-1.601	25
[0;+3]	1.26%	0.76%	2.483**	2.275**	2.590**	-2.112**	25
[0;+5]	1.06%	0.81%	2.235**	2.101**	2.260**	-1.843*	25
[+1;+5]	1.04%	0.86%	1.960*	2.182**	1.938*	-2.166**	25
[-5;-1]	-0.48%	-0.05%	-0.543	0.047	-0.566	-0.040	25
Panel B:Late Adopters							
[-10;+10]	0.65%	-1.66%	0.257	0.062	0.266	-0.040	19
[-5;+5]	0.21%	0.28%	0.176	-0.084	0.180	-0.040	19
[-3;+3]	0.79%	-0.18%	0.608	0.402	0.627	-0.121	19
[0;0]	-0.05%	0.29%	-0.110	0.235	-0.112	-0.121	19
[0;+2]	-1.19%	-1.02%	-1.486	-1.518	-1.494	-1.449	19
[0;+3]	0.20%	-0.33%	0.252	0.101	0.256	-0.080	19
[0;+5]	-0.05%	-1.03%	-0.040	-0.351	-0.031	-0.644	19
[+1;+5]	0.00%	-1.04%	0.001	-0.389	0.010	-0.644	19
[-5;-1]	0.26%	0.10%	0.269	0.302	0.273	-0.080	19

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 10 gives CARs for FIs according to country. Panel A shows all EPFIs headquartered in OECD countries; panel B shows all EPFIs headquartered in other countries. In this subsample, we find positive but mainly insignificant CARs for EPFIs in OECD countries. The exception is the event day itself, where we observe an AR of 0.45% with statistical significance at a 10% level. For the EPFIs in the other countries, we find a significantly negative AR of -1.25% on the event day. The event windows with more days reveal insignificantly positive or negative CARs.

Furthermore, we observe an opposite market reaction for this subsample on the event day only, but not on the event windows for the following days. We interpret this to suggest differing market reactions, but we cannot determine whether this result is caused solely by the EPFI OECD/other country differentiation.

Table 10: OECD/Other EP Adopter CARs

This table reports the means and medians of subsamples of financial institutions' cumulative abnormal returns (CARs) around EP adoption. We test the CARs for statistical significance using a standard two-tailed t-test, a modified t-test as proposed by Boehmer et al. (1991), and a modified t-test as proposed by Johnson (1978). We test for statistical significance of the median CAR by using the Wilcoxon signed-rank test. Nobs denotes the number of financial institutions in the event study.

	Cumulative Abnormal Return		t-Test	Boehmer et al. (1991) Test	Johnson (1978) Test	Wilcoxon Signed-Rank Test[a]	
Event Window	Mean	Median	t-value	z-score	j-value	z-score	Nobs
Panel A: OECD							
[-10;+10]	-0.78%	0.68%	-0.480	0.003	-0.495	-0.243	32
[-5;+5]	0.34%	0.07%	0.372	1.006	0.362	-0.542	32
[-3;+3]	0.37%	0.05%	0.641	0.801	0.649	-0.467	32
[0;0]	0.45%	0.35%	1.874*	1.814*	1.882*	-1.851*	32
[0;+2]	0.06%	0.02%	0.116	-0.048	0.116	-0.150	32
[0;+3]	0.71%	0.44%	1.542	1.565	1.562	-1.402	32
[0;+5]	0.02%	0.06%	0.027	0.228	0.025	-0.206	32
[+1;+5]	-0.44%	0.07%	-0.673	-0.471	-0.683	-0.112	32
[-5;-1]	0.33%	0.07%	0.421	1.106	0.408	-1.085	32
Panel B: Other							
[-10;+10]	1.36%	-2.55%	0.421	0.111	0.456	-	12
[-5;+5]	0.62%	0.79%	0.421	0.047	0.421	-	12
[-3;+3]	0.30%	-0.29%	0.174	-0.122	0.196	-	12
[0;0]	-1.25%	-1.54%	-2.719**	-2.267**	-2.619**	-	12
[0;+2]	-0.37%	-0.81%	-0.454	-0.725	-0.442	-	12
[0;+3]	1.05%	0.22%	0.937	0.665	0.946	-	12
[0;+5]	2.09%	0.25%	1.355	1.163	1.421	-	12
[+1;+5]	3.34%	2.12%	1.977*	1.891*	2.136*	-	12
[-5;-1]	-1.47%	-3.33%	-1.326	-1.338	-1.270	-	12

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
[a] We do not apply the Wilcoxon signed-rank test in Panel B because of the small number of observations.

We find statistically significant positive CARs for financial institutions that adopted the EP between 2004 and April 2012. In fact, when differentiating by time of adoption, we note that positive CARs appear over different event windows for early adopters.

It is important to note that, first, our results contradict those of earlier studies (e.g., Scholtens and Dam, 2007). Although we find smaller CARs than those for, e.g., merger and acquisition announcements, we believe we have proven the existence of abnormal market reactions. Second, our results reveal that, despite increased awareness of environmental and social issues, the capital market reactions to EP adoption announcements weakened. We expected the capital markets to react more strongly to adoption announcements of later adopters than to early adopters, due to the intervening growth in environmental and social awareness.

This development leads us to conclude that reputational risk may be a main driver of adopting a voluntary code of conduct such as the EP. This is strengthened by the fact that most of the early adopters are headquartered in OECD countries, as well as the breakdown in Table 10, which suggests that FIs in more competitive environments generate higher CARs. For this line of reasoning, we follow Wright and Rwabizambuga (2006), who argue that FIs in more competitive environments have stronger motivations to manage their reputations. Moreover, "close-to-consumer" companies (a financial institution is typically close to the consumer) are more likely to invest in environmental or social activities than their counterparts (Haddock-Fraser and Tourell, 2010). The authors suggest that reputation with consumers/society is a business motivator for them.

Moreover, there are several potential reasons for the marginal market reactions. Scholtens and Dam (2007) argue that these announcements are "*literally […] no news,*" because the banks are already conforming to the EP. Furthermore, the lack of transparency and accountability inherent in the EP – a source of the criticism by NGOs and other stakeholders – means that companies tend to neglect their tenets in regular daily business anyway.

Scholtens and Dam (2007) also note that the share of total revenue generated from project finance is immaterial to the market value of financial institutions, and they question any link between "*good moral standards and good business.*" Transparency was improved in the 2006 revision – and it is likely to be reinforced again at the end of 2012 – but it is still prejudicial to accountability and obviously did not lead to a change in the results. We favor the first argument and follow, for example, Esty and Sesia (2010), who claim that the EP have become standard in project finance and do not indicate any unique attributes of a bank's risk management.

4.4.2 Cross-Sectional Analysis

To analyze the CAR drivers in more detail, we next apply a cross-sectional analysis. We design two models to capture the possible influences of the various factors on the CAR. The first model includes the two identical dummy variables we used to create the subsamples in the event study. We therefore control for the validity of the prior results. In the second model, we add a set of control variables. The cross-sectional analysis includes twenty-eight companies, but sixteen had insufficient data available.

Our model is expressed as:

$$CAR_{i,t} = \alpha_i + \beta_1 d\_time + \beta_2 d\_region + \beta_3 MC_t + \beta_4 (E/A)_t + \beta_5 ROAE_t + \beta_6 (PV/A)_t + \beta_7 (BBA - AAA)_t + e_t \quad (4.6)$$

where $CAR_{i,t}$ is the excess return observed for the [0;+3] event window; *d_time* is a dummy variable equal to 1 if the financial institution adopted the EP before July 2006, and 0 otherwise; *d_region* is a dummy variable equal to 1 if the financial institution is headquartered in an OECD country, and 0 otherwise; *MC* is the size of the financial institution measured as the logarithm of market capitalization; *E/A* is the financial structure measured as the ratio of equity to total assets; *ROAE* represents the operating profit measured as the return on average equity; *PV/A* stands for project volume/total assets in the year of adoption; and *BBA-AAA* is the difference between the monthly yield changes on corporate bonds rated BAA and AAA. *MC*, *E/A*, and *ROAE* are calculated in the quarter before adoption; *BAA-AAA* is considered in the quarter of adoption.

Panel A in Table 11 reports the correlation coefficients for the dummy variables and a set of control variables. The correlations among the factors are relatively low, except for the correlations between region of headquarter (*d_region*) and market capitalization (*MC*) and between *d_region* and *BAA-AAA*, which are considerably higher (0.6130/0.4895). As a further robustness check, we calculate variance inflation factors (VIFs). VIFs higher than 5 indicate multicollinearity. The dummy *d_region* shows the highest VIF but does not exceed 5. Thus, we do not expect to find any multicollinearity among the variables.

Panel B of Table 11 reports the results of the cross-sectional analysis. In model 1, the dummy variable *d_time* is positive and *d_region* is negative, but both variables are insignificant. While *d_time* confirms the event study results,

d_region contradicts the results in Table 11. We explain the insignificance of the coefficients by 1) the relatively small (but statistically significant) CARs in the event study, and 2) the different methodology applied. In the event study, we calculate a return in excess of the market, but in the cross-sectional analysis, the excess return is used only as a dependent variable.

Table 11: CARs and Economic Variables

Panel A: Correlation Coefficients for Economic Variables

	d_time	d_region	MC	E/A	ROAE	PV/A	BBA-AAA
d_time	1.0000						
d_region	0.1997	1.0000					
MC	-0.0776	0.6130	1.0000				
E/A	0.0038	-0.3292	-0.0898	1.0000			
ROAE	-0.2830	-0.1988	-0.1593	0.0599	1.0000		
PV/A	-0.3185	-0.2397	-0.2365	0.3845	0.0102	1.0000	
BBA-AAA	-0.2821	-0.4895	-0.1252	0.2242	0.2494	-0.0594	1.0000
VIF	1.5960	2.5419	2.0338	1.4835	1.1836	1.6584	1.6238

Panel B: CARs [0+;3] Regressed on Economic Variables

		Performance Variables		Control Variables				
	Intercept	d_time	d_region	MC	E/A	ROAE	PV/A	BBA-AAA
Model 1	0.0003	0.0123	-0.0036					
(Obs. 28)	(0.0289)	(1.3727)	(-0.3289)					
	R^2 0.0526		adj.R^2 0.0014					
Model 2	-0.0328	0.0127	-0.0300	0.0163	-0.0036	0.0005	-0.3265	-0.0067
(Obs. 28)	(-1.5173)	(1.3173)	(-2.3971)	(2.6434)	(-2.3376)	(0.5038)	(-1.2927)	(-0.0582)
	R^2 0.2775		adj.R^2 0.0246					

This table reports performance and control variables. Panel A illustrates the correlations among variables. The dummy variables for time of adoption (d_time) and region of headquarter (d_region) measure the market reactions for the different samples (event study). We use a set of five control variables. MC is a measure of the logarithm of market capitalization; E/A denotes equity/total assets; ROAE denotes the return on average equity; PV/A denotes project volume/total assets; and BBA-AAA denotes monthly yield changes on corporate bonds rated BAA and AAA. We calculate variance inflation factors (VIF) to control for multicollinearity. Panel B reports the results from the multivariate regression on CARs [0;+3] of EP adopters. We apply an OLS regression with heteroscedasticity-consistent standard errors. In model 1, we use an intercept and two performance variables; in model 2, we supplement with five control variables. The numbers in parentheses are t-values, and we report the number of observations (obs.), the R-square (R^2), and the adjusted R-square (adj. R^2) for each model. Data for the BBA-AAA variable come from Datastream; all other data come from Thomson One Banker.

In model 2, the factor loading for time does not change, but the region becomes statistically significant, and we observe significant factor loadings for *MC* and *E/A*. The positive factor loading (*MC*) could be explained by the greater public awareness of FIs with higher market capitalizations and therefore higher reputational pressure. The negative factor loading on *E/A* is plausible, because FIs with higher (financial) risk (i.e., lower *E/A* ratios) would have more to gain from additional risk management.

4.4.3 MLA League Table Analysis

The results reported in Panel A of Table 12 show that roughly three-quarters of the EPFIs were able to increase the amount of their global project debt over both the short and long term. In absolute values, we note mean and median increases for the short- (167.7%/45.1%) and long-term (417.3%/55.7%) analyses. While considering market development, the mean values remain positive, but the median values become negative in the short term (-24.7%), and even more strongly negative in the long term (-85.9%). We include median values in our examination because the mean values are likely to be driven by outliers.

In all cases below, the medians are lower than the means, and therefore represent a more conservative estimate of relative increases. Note that EPFIs underperformed the global market over both the short and long term. The same is true in developing countries (Panel B), although 63.0% (ST) and 78.4% (LT) of EFPIs were able to increase their project volume in this market.

With regard to the number of projects, we find that the EPFIs clearly outperformed the global market. Most EPFIs increased their number of projects (globally and in developing countries). And from solely a global perspective, EPFIs increased their relative number of projects by 6.8% (ST) and 4.7% (LT). The numbers reported in Panel B, however, show that EPFIs in developing countries lag the overall project finance market.

Furthermore, the numbers reveal that the adopters' global market share showed virtually no change in the short term. But in the long term, 52.4% of EPFIs experienced positive trends. The average global market share in the three years following EP adoption was 0.016 percentage points higher than in the same period prior to adoption, with a 3.7% median absolute increase. This seemingly small change becomes remarkable when it is assessed against overall market development. In recent years, more players have begun competing for market share, as indicated by a drop in the concentration ratio CR_{50}. Between 2003 and 2011, the concentration ratio in the global project finance MLA market de-

clined from 83.0% to 76.4%. In developing countries, it decreased from 86.8% to 82.7%, and most EPFIs clearly lost market share over the short term, but remained relatively stable over the longer period around EP adoption.

Table 12: EPFI Performance – MLA League Table Analysis

This table compares the volume of project debt, the number of projects, and the market share for EPFIs prior to and after EP adoption. Panel A includes all projects (e.g., globally), and Panel B includes only developing country projects. In the short-term analysis (ST), project volume is compared for the years prior to and after adoption. In the long-term analysis (LT), average project volume for the three years following adoption is compared to average project volume for the three years preceding adoption. The numbers in parentheses correspond to the equivalent value in USD or number of projects. The average (absolute) increase denotes the increase/decrease of project volume, number of projects, and market share; the average (relative) increase denotes the increase/decrease of project volume, number of projects, and market share adjusted for market growth. N denotes the number of observations.

Time Frame	EPFIs with an Increase	Average (absolute) Increase		Average (relative) Increase		Market Growth
		Mean	Median	Mean	Median	3/5 YGR
Project Volume						
Panel A: Global						
ST (N=46)	71.7%	167.7% (US$m 397.1)	45.1% (US$m 354.10)	97.9%	-24.7%	69.8%
LT (N=42)	73.8%	417.3% (U.S.$m 723.05)	55.7% (U.S.$m 611.61)	275.7%	-85.9%	141.6%
Panel B: Developing Countries						
ST (N=46)	63.0%	130.3% (U.S.$m 176.58)	21.0% (U.S.$m 140.12)	35.2%	-74.1%	95.1%
LT (N=37)	78.4%	669.6% (U.S.$m 404.48)	102.3% (U.S.$m 273.03)	464,9%	-102.4%	204.7%
Number of Projects						
Panel A: Global						
ST (N=46)	71.7%	71.0% (# 5.19)	56.2% (# 5.0)	21.6%	6.8%	49.4%
LT (N=42)	76.2%	167.0%(# 9.09)	100.0% (# 6.3)	71.7%	4.7%	95.3%
Panel B: Developing Countries						
ST (N=49)	58.7%	47.8% (# 1.07)	11.1% (# 1.0)	-7.1%	-43.8%	54.9%
LT (N=37)	78.4%	196.2%(# 3.23)	66.7% (# 1.7)	88.8%	-40.7%	107.4%
Market Share						
Panel A: Global						
ST (N=46)	50.0%	60.7% (-0.207)	-1.7% (0.005)	-	-	-
LT (N=42)	52.4%	156.5% (-0.179)	3.7% (0.016)	-	-	-
Panel B: Developing Countries						
ST (N=46)	45.7%	34.9% (-0.076)	-27.8% (-0.001)	-	-	-
LT (N=37)	45.9%	205.3% (-0.168)	-5.0% (0.016)	-	-	-

Distinguishing EPFIs by when they adopted the EP shows that early adopters performed better than later adopters. As Table 13 shows, EPFIs that adopted the EP before the 2006 revisions were able to increase their global market share by 11.7%, compared to a -16.4% decrease for late adopters. In developing countries, the difference is even larger: The market share of early adopters increased by 15.5%, while that of late adopters decreased by -56.3%. It is not clear, however, whether adopting the EP contributed to the poor performance of institutions that only recently became EPFIs. It is possible that newer members are banks with weaker social and environmental risk management, and, as a result, weaker performance. They may have sought the benefits of the EP without true compliance, and early adopters may be more committed to code they were instrumental in shaping. Adverse selection might also have led to decreased incentives for above-average performers to join the initiative.

Table 13: EPFI Performance – Market Share and Adoption Timing

This table compares EPFIs' global market share (Panel A) and their market share in developing countries (Panel B) before and after EP adoption. The short-term analysis compares the market share for the year preceding and after adoption. The long-term analysis compares average market share for the three years prior to and following adoption. The numbers in parentheses correspond to the difference (delta) between the means/medians before and after adoption. We develop two subsamples for EPFI performance: 1) those that adopted the EP before the 2006 revision, and 2) those that adopted it afterward. N denotes the number of observations.

Time Frame	Time of EP Adoption	EPFIs with an Increase	Average Increase			
			Mean		Median	
Market Share/Timing of Adoption						
Panel A: Global						
ST (N=45)	Before (N=28)	57.1%	97.2%	(-0.155)	11.7%	(0.080)
	After (N=18)	38.9%	0.1%	(-0.289)	-16.4%	(-0.185)
LT (N=38)	Before (N=28)	57.1%	139.3%	(-0.088)	12.9%	(0.139)
	After (N=10)	42.9%	190.8%	(-0.361)	-13.6%	(-0.081)
Panel B: Developing Countries						
ST (N=46)	Before (N=24)	66.7%	104.7%	(0.151)	15.5%	(0.350)
	After (N=22)	22.7%	-43.1%	(-0.322)	-56.3%	(-0.139)
LT (N=37)	Before (N=24)	62.5%	178.8%	(-0.000)	13.1%	(0.212)
	After (N=13)	15.4%	234.9%	(-0.475)	-46.8%	(-0.092)

To summarize, our analysis of changes in three key figures, especially market share, indicates that, globally, EPFIs tend to perform better than non-EP adopters. However, it is difficult to determine how much of this difference is attributable to EP adoption. For example, it is possible that institutions are successful partly because they have the appropriate environmental and social risk management procedures in place, and may adopt the EP merely for signaling purposes. In this case, we would not attribute their success to the EP. Neverthe-

less, our results allow for the conclusion that adopters outperform the global project finance market.

We observe a different situation in developing countries. Here, EPFIs clearly underperform in these markets, and thus tend to lose ground in exactly the regions where the EP are expected to have the strongest impact. But we again cannot assume this development is caused by the stricter EP guidelines. Instead, we note that many local banks entering the project finance market in developing countries and increasing their market share have not adopted the EP. One high-profile example is the State Bank of India, which has been a leader in the MLA League Tables for the last two years and operates solely in their home market. On the other hand, it is not necessarily true that all projects in which none of the MLAs is an EPFI are non-EP-compliant. It is possible that a local bank acting as the MLA designs the project according to the EP so that it becomes attractive to a wider range of potential lenders.

4.4.4 The Effects of the EP on the Project Finance Market

EP-Compliant Projects

Analyzing EPFIs as in the previous section does not allow for conclusions about what percent of project financings or of total project finance volume is EP-compliant. In other words, we cannot draw any conclusions about the EP's reach in the global project finance market. In the majority of projects, debt is provided by a club of banks, rather than by one bank alone. In cases where this club is comprised of EPFIs and non-EPFIs, some project volume is appropriated to non-EPFIs. Nevertheless, such a project must still be executed in adherence to the EP, assuming that the EPFIs honor their self-commitment. Thus, we see that sometimes a multitude of debt providers may be lending to supposedly sustainable projects, without being EP-compliant themselves. However, it is reasonable to assume that a project is EP-compliant as long as at least one EPFI is among its debt providers.

To better assess what percent of projects is EP-compliant, and to facilitate the analyses in the next two sections, we obtain data on projects with volumes of U.S. $10 million or more, and a financial close between January 1, 2003, and December 31, 2011. The data come from the Dealogic Projectware database. As the results in Table 14 show, the EP consistently gained in influence during the first four years of inception. In 2006, 68.1% of all projects were EP-compliant, which corresponds to 83.5% of total project volume.

Table 14: EP Projects in the Global Project Finance Market

	EP Projects				*Other Projects*		
Year	Volume [US$m] [a]		Number[a]	Avg. Volume [US$m]	Volume [US$m]	Number	Avg. Volume [US$m]
2003	53,539	(47.2%)	117 (33.5%)	457.6	59,864	232	258.0
2004	129,564	(75.0%)	249 (56.8%)	520.3	43,214	189	228.6
2005	147,571	(82.6%)	315 (64.5%)	468.5	30,995	173	179.2
2006	194,071	(83.5%)	397 (68.1%)	488.8	38,279	186	205.8
2007	227,390	(81.8%)	445 (67.1%)	511.0	50,582	218	232.0
2008	248,744	(77.6%)	456 (63.5%)	545.5	71,742	262	273.8
2009	206,835	(71.2%)	428 (60.1%)	483.3	83,609	284	294.4
2010	220,084	(61.9%)	499 (58.4%)	441.0	135,363	356	380.2
2011	280,126	(68.6%)	552 (56.8%)	507.5	128,198	420	305.2

[a] The percent of EP projects in total annual project volume and total number of projects are in parentheses.

Coinciding with the revision of the EP in 2006, however, this trend began to reverse. From 2007 onward, both the percent of EP projects in global project volume and the global number of projects – and accordingly the significance of the EP – declined steadily. In 2010, the number of EP and non-EP projects was almost equal. Furthermore, despite having remained relatively constant before, average EP project volume dropped markedly as well, undercutting the average volume of non-EP projects for the first time. The volume of EP-compliant projects rose again in 2011, but the percent of EP projects continues to decline.

To explore the reasons for the decline, we divide projects by location. As Panel A of Table 15 shows, the share of EP projects and thus the relevance of the EP in the high-income OECD countries has remained nearly constant since 2006. Approximately 83.4% of total project volume was attributed to EP-compliant projects over the last five years. In developing countries, where it exceeded 90% in 2005, the share of EP project volume has steadily decreased, reaching a low of 34.9% in 2010, before beginning to increase again during 2011.

As Panel B shows, the drivers behind this trend are projects in Asia and, to a somewhat lesser extent, the Middle East. While project finance has gained in importance in these regions, however, EPFIs have lost market share, a result that parallels the result from the MLA League Table analysis. Here we see that local banks are increasingly dominating project finance markets, especially in India and China. Very few of these institutions have officially adopted the EP (although, again, this does not necessarily mean that none of these projects are EP-compliant).

Table 15: Share of EP Projects in the PF Market - by Location

This table reports the percent of EP projects in the respective project finance markets. Each percentage is the quotient of EP project volume and total project volume in a given market and year.

Panel A: Project Host Country Development Status

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Developed Countries	48.2%	73.9%	77.6%	83.3%	81.4%	83.8%	85.7%	86.8%	89.4%
Developing Countries	45.7%	76.9%	90.1%	83.9%	82.2%	72.4%	61.8%	44.2%	53.1%

Panel B: Project Region

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Western Europe	53.8%	72.4%	83.9%	77.5%	86.3%	85.7%	86.4%	91.5%	91.9%
Eastern Europe	37.2%	87.2%	87.1%	64.3%	96.6%	88.7%	99.3%	95.3%	66.4%
North America	38.9%	87.1%	79.6%	89.2%	85.3%	85.3%	90.0%	95.5%	95.9%
South America	60.1%	63.6%	88.7%	77.3%	74.9%	94.7%	88.8%	92.8%	97.4%
Asia	30.4%	41.6%	51.0%	73.2%	52.9%	52.0%	37.6%	18.2%	36.6%
Middle East	59.2%	90.4%	96.5%	91.6%	93.9%	89.3%	91.3%	77.8%	69.8%
Oceania	60.9%	94.1%	87.4%	86.9%	87.9%	93.7%	96.7%	84.3%	91.8%
Africa	40.8%	51.8%	65.7%	95.0%	62.6%	60.9%	90.7%	90.6%	92.1%

Technology may play another part in the apparent drop in relevance of the EP in developing countries. Some of the aforementioned banks, in the course of extending their business globally, may only recently have begun reporting their project finance deals to databases such as Dealogic Projectware. Thus, it is possible that the high percentages of EP projects in earlier years may have been overstated.

Composition of Lending Syndicates in EP Projects

One of the advantages of adopting the EP is simplified communication between all players in the project finance market. EPFIs may establish particularly close working relationships – perhaps through the working groups of the EP Association – and be involved in lending syndicates that include no or only a few other institutions. An argument for this type of clustering behavior could be the sharing of project costs and the tasks of maintaining the quality of social and environmental assessments and action plans, as well as assistance in ensuring compliance with a project's timeline. EPFIs may even try to exclude non-adopters from syndicates, in an attempt to "force" adoption. In order to determine whether EPFIs do exhibit these types of behavior, we take a closer look at the composition of the lending syndicates in EP projects.

Figure 3 shows the number of EPFIs in syndicates of EP projects that closed from 2009 to 2011. The overall picture remained relatively constant over the three years. The majority of all EP projects involved one to three EPFIs as lenders, with twenty projects having forty-five or more EPFIs.

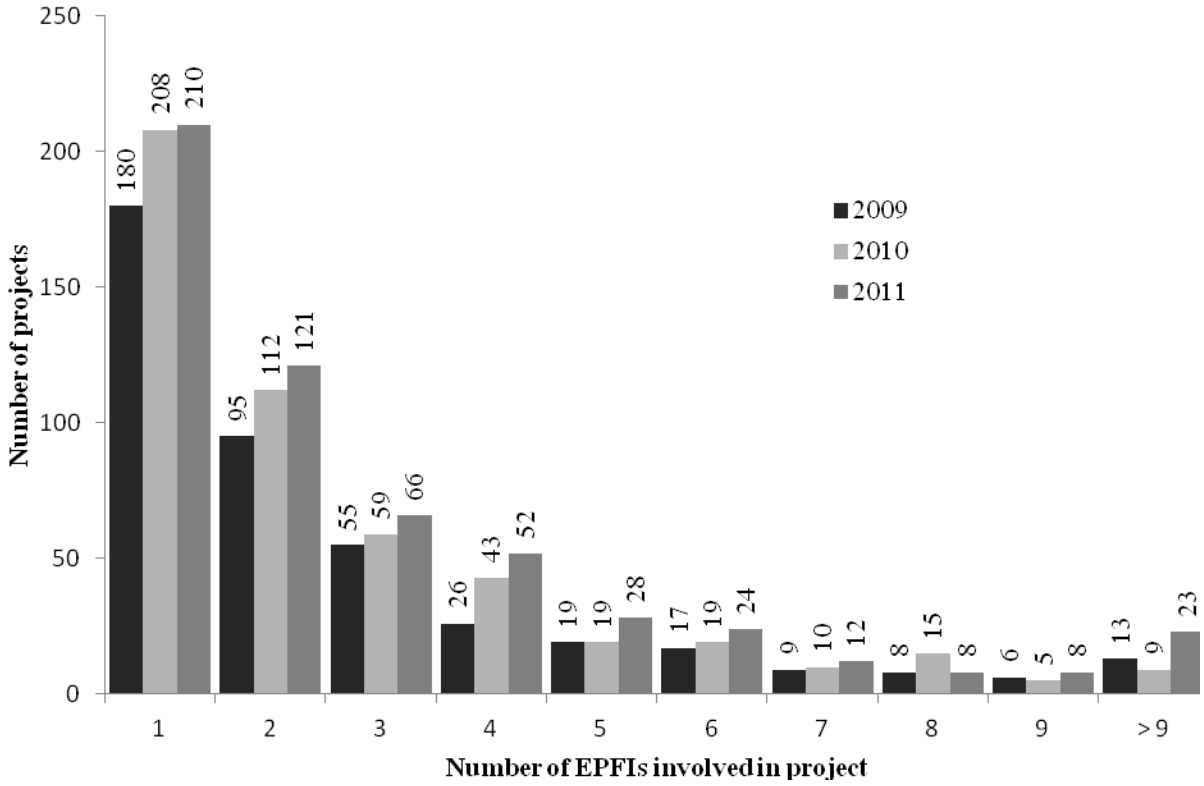

Figure 3: Number of EPFIs in Loan Syndicates of EP Projects (Source: Dealogic Projectware)

There is thus some indication that EPFIs work smoothly together. However, to assess whether this collaboration is outside the norm, and whether it can be viewed as clustering behavior or as excluding non-EP compliant firms from syndicates, we must examine the number of non-EPFIs as well. Table 16 gives an overview of the composition of lending syndicates in recent years. 31.4% of all EP projects were supported with debt from EPFIs only. The vast majority of these projects had only one lender, so we see no sign of clustering there. We note 154 projects that included two or three EPFIs only, with no other lenders. However, this is a normal practice, and thus would not indicate increased clustering among EPFIs. There are ten EP projects in which six to nine EPFIs are the only lenders, which is a remarkable occurrence. But they remain the exception.

Table 16: Composition of Lending Syndicates in EP Projects

This table reports the numbers of EFPIs and non-EFPIs in lending syndicates of EP projects that closed from 2009 to 2011.

EPFIs \ Non-EPFIs	0	1	2	3	4	5	6	7	8	9	> 9	
1	264	177	73	40	13	8	6	4	3	2	8	40.4%
2	107	94	44	34	12	12	6	4	8	2	5	22.2%
3	47	50	32	20	15	4	4	3	1	2	2	12.2%
4	26	29	22	20	9	10	0	3	0	0	2	8.2%
5	10	18	11	7	11	1	3	2	0	1	2	4.5%
6	5	13	11	7	4	5	5	4	2	0	4	4.1%
7	4	12	2	2	4	1	3	1	0	1	1	2.1%
8	0	7	5	4	7	4	0	1	2	0	1	2.1%
9	1	1	1	3	3	2	2	1	0	1	4	1.3%
> 9	0	4	4	7	10	2	2	2	3	3	8	3.0%
	31.4%	27.4%	13.9%	9.7%	5.9%	3.3%	2.1%	1.7%	1.3%	0.8%	2.5%	

Moreover, the distribution of projects in which both EPFIs and non-EPFIs are lenders does not reveal any abnormalities. The shaded grey diagonal line in Table 16 that indicates projects with an equal number of EPFIs and non-EPFIs covers 268 projects. And the number of projects at the lower left of the diagonal (436 projects) is not significantly larger than that at the upper right of the diagonal (311 projects). Of the forty-five projects involving more than nine EPFIs, eighteen also involve six or more non-adopters. These projects are very large, however, so it would not be unexpected to find a high number of leading project finance institutions.

In summary, we find no evidence that EPFIs tend to collaborate mostly with each other, or that they exclude non-adopters from the lending syndicates of EP projects.

4.5 Conclusion

Recent increases in project finance volume, combined with a growing public awareness of environmental and social issues, has raised the question of whether and how guidelines such as the Equator Principles can increase their impact on EPFIs in particular and the project finance industry in general. Our analysis depends on the temporal development of the impact. We contribute to the existing body of literature on the EP by, first, exploring whether their impact has changed over time, i.e., whether the capital markets reacted differently to early

EP adopters than to later adopters. Second, we analyze the performance of EPFIs in the project finance industry. Third, we identify trends among EP projects.

For this analysis, we used several different approaches, beginning with an event study methodology combined with a cross-sectional analysis. The sample in our event study was originally comprised of eighty-five financial institutions that announced EP adoption between 2003 and April 2012. Next, we conducted an MLA League Table Analysis, followed by a comparison of global project finance data. The data for the League Table Analysis and the comparison came from the Dealogic Projectware database for the 2000-2011 period.

We examined positive abnormal returns for financial institutions that announced EP adoption between 2004 and April 2012. When we examine FIs according to time of adoption, we find positive CARs over different event windows for early adopters. Thus, our results contradict those of earlier studies (e.g., Scholtens and Dam, 2007). We believe that conditional variance in stock returns explains this discrepancy. Our results also reveal that, despite increased awareness of environmental and social issues, the capital markets do not react more strongly now to EP adoption announcements. Thus, we examined no abnormal returns for the latest announcements. We expected capital market reactions to be stronger for later adopters than for earlier ones, due to the growth in consciousness of environmental and social issues. Following Wright and Rwabizambuga (2006), who argue that FIs in more competitive environments tend to be more careful of their reputations, we thus conclude that reputational risk is one of the main drivers of adopting a voluntary code of conduct such as the EP.

Using the League Table Analysis, we examined project volume, number of projects, and market share, and find that, from a global perspective, EPFIs tend to outperform non-adopters. This trend was especially pronounced for the number of projects and market share. When focusing on developing countries, we find the opposite: EPFIs clearly underperform non-adopters. We believe there are two main reasons for this difference.

First, successful FIs, who likely already have the appropriate environmental and social risk management procedures in place, will tend to adopt the EP more readily, but perhaps only for signaling or reputational purposes. Moreover, most successful financial institutions are headquartered in OECD countries. This is in line with the reputational risk management theory and recent interview-based results from, e.g., Conley and Williams (2011) and Macve and Chen (2010). On

the other hand, the underperformance may be the result of a high number of local banks entering the project finance markets in developing countries. This would increase the market share of non-adopters, not because they are more successful, but because they are dividing the market into smaller parts.

When analyzing projects instead of FIs, we observe a steady increase in volume and number of EP-compliant projects from 2003 to 2006. However, beginning in 2006, that share decreases rather dramatically. This trend is attributable to a strong decline in EP projects in developing countries, although the percent in developed countries (approximately 80%) has remained consistently high from 2006 to 2011. This supports our earlier results that using the EP as a (reputational) risk management tool may be even more effective in highly competitive environments such as OECD countries (Wright and Rwabizambuga, 2006). The most critical points in the League Table Analysis are also applicable here. The fact that local banks have become more involved in the project finance market, especially in other countries, and the fact that those banks may not be reporting to the primary project finance databases yet, could bias the results.

We find no evidence of EPFIs excluding non-adopters from lending syndicates. Most syndicates feature an equal distribution of EPFIs and non-adopters, which suggests that EP compliance by a specific bank is not a crucial requirement for collaborating in lending syndicates. This argument is somewhat weakened, however, when we consider that projects must technically be EP-compliant if even one of the banks is an EPFI.

Managerial implication is that it is beneficial for FIs to adopt voluntary codes of conduct as the EP. Besides, a positive impact on company's market value Marín et al., (2012) underlines our results by showing that CSR activities have a positive effect on competitiveness. The authors even argue that in particular a proactive strategy compared to an otherwise only active strategy strengthens the competitiveness of the company. This goes in line with our results that early adopters show significant positive abnormal returns and suggests an – at least active – engagement of FIs in voluntary codes of conducts or disclosures pertaining to environmental and social issues. Additionally, Heikkurinen (2010) supports our results as he finds that adopting an environmentally responsible identity can enhance the firm's strategic position. This is also supported by Melo and Mansouri (2011) who suggest companies should "*adopt the proposals of environmental non-governmental organizations and closely follow public opinion*" in order to influent profitability. Financial Institutions should be encouraged to foster and adopt responsible identities. In particular, taking into account the banking crisis, those strategies could be a key to success.

The role of the IFC offers governments and NGOs a unique opportunity to enhance the implementation of environmental and social issues in project finance performances standards. But Wright (2012) argues that governments are tempted to vote against a draft once they expect a negative impact on inflow of long-term capital. Our results encourage public policy to develop and foster standard settings pertaining to environmental and social issues in the financial sector. An increased market value and the outperformance of adopters provide arguments in favor of strengthening the efforts of both public policy and FIs to cooperate and expand the scope of performance standards not only in project finance, but also in e.g. financial advisory products.

Further research would be needed to determine the impact of the Equator Principles on the project finance market. And more reliable data is required – especially for developing countries – to control for potential biases caused by the lack of data. The next round of EP revisions may help overcome this issue.

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Appendix

Table 17: Financial Institutions that have Adopted the EP

Financial Institution	Date of Adoption	Early adopter	OECD	Financial Institution	Date of Adoption	Early adopter	OECD
ABN Amro Group[a]	06/04/2003	1	1	EFIC	03/03/2009	0	1
Absa Bank Limited[a]	10/22/2009	0	0	Eksport Kredit Fonden	05/14/2004	1	1
Access Bank	06/04/2009	0	0	Eksportfinans ASA	09/01/2010	0	1
Ahli United Bank[a]	05/02/2011	0	0	Ex-Im Bank	03/31/2011	0	1
ANZ	12/15/2006	0	1	Export Development Canada	10/26/2007	0	1
Arab African Inter. Bank	01/25/2009	0	0	FirstRand Limited[a,b]	07/13/2009	0	0
ASN Bank[a]	11/25/2009	0	1	FMO	10/19/2005	1	1
Aterios Capital	03/01/2012	0	0	Fortis[a]	02/17/2006	1	1
B. Bilbao Vizcaya Argentaria[a,b]	05/18/2004	1	1	HBOS/ Bank of Scotland	08/15/2006	0	1
Banco Bradesco[a,b]	09/08/2004	1	0	HSBC Holdings[a,b]	09/04/2003	1	1
Banco Comercial Portugues	01/02/2006	1	1	HVB Group	06/04/2003	1	1
B. de Galicia y Buenos Aires	03/19/2007	0	0	Industrial Bank[a]	10/31/2008	0	0
Banco de la República Oriental del Uruguay	01/03/2008	0	0	ING Groep[a,b]	06/23/2003	1	1
Banco do Brasil	03/03/2005	1	0	Intesa Sanpaolo	08/04/2006	0	1
Banco Espírito Santo[a,b]	08/16/2005	1	1	JPMorgan Chase[a,b]	04/25/2005	1	1
Banco Itáu BBA	08/12/2004	1	0	KBC Bank[a,b]	01/27/2004	1	1
Banco Mercantil del Norte[a]	03/12/2012	0	1	KfW	03/03/2008	0	1
Banco Sabadell[a]	09/28/2011	0	1	La Caixa	03/19/2007	0	1
Banco Santander[a,b]	04/30/2009	0	1	Lloyds Banking Group[a,b]	01/31/2008	0	1
Bancolombia[a]	12/11/2008	0	0	Manulife Financial	05/11/2005	1	1
Bank Muscat[a,b]	08/20/2007	0	0	MCC Bank	07/29/2003	1	1
Bank of America Corporation[a,b]	04/15/2004	1	1	Millenium PCB	01/02/2006	1	1
Bank of Montreal	09/15/2005	1	1	Mizuho Corporate Bank[a]	10/27/2003	1	1
Bank of Tokyo-Mitsubishi	12/22/2005	1	1	National Australia Bank[a,b]	10/25/2007	0	1
Barclays[a,b]	06/04/2003	1	1	Natixis[a]	12/30/2010	0	1
BMCE Bank[a]	05/10/2010	0	0	Nedbank[a]	11/10/2005	1	0
BMO Financial Group	09/15/2005	1	1	NIBC Bank[a]	11/09/2010	0	1
BNP Paribas[a,b]	10/24/2008	0	1	Nordea Bank	02/21/2007	0	1
CAIXA Economica Federal	03/19/2007	0	0	Rabobank Group	06/04/2003	1	1
Caja Navarra	01/09/2006	1	1	Royal Bank of Canada[a,b]	07/21/2003	1	1
Calyon	08/18/2003	1	1	Royal Bank of Scotland[a]	06/04/2003	1	1
CIBC[a,b]	12/03/2003	1	1	Scotiabank[a,b]	01/18/2005	1	1
CIBanco	03/07/2012	0	1	SEB	04/03/2007	0	1
CIFI	04/06/2007	0	0	Société Générale[a,b]	09/03/2007	0	1
Citigroup[a,b]	06/04/2003	1	1	St. Bank of South Africa[a,b]	02/02/2009	0	0
CORPBANCA	07/19/2007	0	1	Standard Chartered[a,b]	10/08/2003	1	1
Credit Suisse Group[a,b]	06/04/2003	1	0	Sumitomo Mitsui Banking Corp.[a,b]	02/23/2006	1	1
DekaBank	03/01/2011	0	1	TD Bank Financial Group	04/12/2007	0	1
Dexia[a,b]	09/18/2003	1	1	Unibanco[a,b]	06/01/2004	1	0
DnB NOR Bank[a,b]	05/29/2008	0	1	Wells Fargo Bank[a]	07/11/2005	1	1
Dresdner Bank	08/18/2003	1	1	WestLB	06/04/2003	1	1
E + Co.	10/30/2006	0	1	Westpac Banking Corp.[a,b]	06/04/2003	1	1
Ecobanc Transnational Inter.	01/01/2012	0	0				

[a/b] Financial institutions for which stock market data was available and that were included in the event study/cross-sectional analysis.

Declaration of Honor

I declare upon my word of honor that the doctoral thesis submitted herewith is my own work. All sources and aids used have been listed. All references or quotations in any form and their use have been clearly identified.

The dissertation has not been submitted for examination purposes to any institution before.

Ich erkläre hiermit ehrenwörtlich, dass ich die vorliegende Arbeit selbstständig angefertigt habe. Sämtliche aus fremden Quellen direkt und indirekt übernommene Gedanken sind als solche kenntlich gemacht.

Die Dissertation wurde bisher keiner anderen Prüfungsbehörde vorgelegt und noch nicht veröffentlicht.

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Julian Trillig

13. März 2013