Center for Energy and Value Issues

CEVI

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- **Call for Papers: 5th CEVI Conference, North Cyprus, 18-21 May 2017 (with ISINI session) – deadline: January 15!**
- **Leonie van Helvert reviews the determinants of firm value of European joint ventures in the energy business**
- **Nathalie Meutstege discusses the effect of the EU ETS on stock returns of oil and gas companies**

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Center for Energy and Value Issues
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Editorial Policy

The Energy and Value Letter brings together academics and practitioners worldwide to discuss timely valuation issues in the energy sector. It publishes news from the Centre for Energy and Value Issues (CEVI), its linked organizations and others (including calls for papers), columns on topical issues, practitioners' papers: short articles from institutions, firms, consultants, etcetera, as well as peer-reviewed academic papers: short articles on theoretical, qualitative or modeling issues, empirical results and the like. Specific topics will refer to energy economics and finance in a broad sense. The journal welcomes unsolicited contributions. Please e-mail to **w.westerman@rug.nl** (Wim Westerman), a copy of a news item, column or a completed paper. Include the affiliation, address, phone, and e-mail of each author with your contribution. A column or news item should not have more than 600 words and a paper should not exceed 5,000 words, albeit that occasionally larger pieces can be accepted.

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This edition of the Energy and Value Letter has two articles on related topics. Also, a Call for Papers for the upcoming CEVI conference is included. The latter is the main reason why this February 2017 issue is already published in January (so we are extending a tradition that started last year), thereby also allowing me to extend my wishes to all of you for the new year. May it be that we are as healthy and happy as can be and that private nor public storms do harms us. May it also be that we as CEVI can support both the exiting current energy world and its future sustainable design with our activities.

The Call for Papers in this EVL issue invites you to send in a paper to the 5th CEVI Conference, to be held in Guzelyurt (Northern Cyprus) from 18-20 May 2017. ISINI will organize one or two special sessions at this conference. We have been promised that the conference fee will be around 100 euros and that the functions will deliver great value for this small amount of money. Not just therefore and/or the proximity of the conference site to the sea, we encourage you to send in a paper to the organizing committee or (for the ISINI workshop) to w.westerman@rug.nl, before January 15, 2017.

The first article is written by Leonie van Helvert. She studied the European Union Emissions Trading Scheme (EU ETS) and the influence of oil prices on firm values in its different phases, as well as the value effects of equity ownership structures of joint ventures from different locations and different energy sources. She feels that the impact of oil prices on firm value changes in the different phases of the EU ETS. Also, argues that there is an inverted U-shaped relationship between equity ownership and firm value for European firms, with a sharper peak for renewable energy joint ventures.

The second article of this EVL issue is authored by Nathalie Meutstege. She is worried about the climate change problem and tries to find out if the EU ETS carbon exchange system helps to mitigate the problem. Although a negative relationship is expected between the EUA prices and the average stock return of oil and gas companies, surprisingly a positive relationship has been found. Perhaps there are just too many allowances on the market. This may give rise to changes in the system, but also provides countries such as China that deliberate on such a system something to think of.

As indicated before, CEVI is on the move. That is, we do not want to change the organisation as such, especially since we feel that the organisation may look small but it is unique and effective in the field. Rather, the board of the organisation opts for streamlining things and exploring the possibilities to broaden and deepen the CEVI activities. In the course of this, many promising initiatives are explored at the time and the board of our organisation will enter to the decision-making soon. Next, this will be reported upon in our journal. In the meantime, your comments and tips remain most welcome!

CALL for PAPERS

THE 6TH MULTINATIONAL ENERGY AND VALUE CONFERENCE

May 18-20, 2017, Guzelyurt, Northern Cyprus

Middle East Technical University, Northern Cyprus Campus

Center For Energy and Value Issues (CEVI), Amsterdam

Energy Markets Research and Application Center of Hacettepe University, Ankara, Turkey

http://www.centerforenergyandvalue.org/conferences.html

The objective of the conference is to bring together academics and practitioners from all over the world to focus on timely energy finance and investments, financial performance, energy markets and valuation issues in the energy sector. Papers dealing with developed as well as developing countries are welcome. *Specific topics* must refer to energy issues and include, but are not limited to:

Financial Regulation; *Financial Markets*; *Financial Risks*; *Asset Pricing*; *Value at Risk*; *Capital Structure*; *Sourcing Capital*; *Corporate (Re-) Structuring*; *Corporate Governance*; *Behavioural Finance*; *Financial Performance*; *Cost Control*; *Financial Accounting*; *Fiscal and Legal Issues*.

The first day of the conference includes practitioner presentations on topics such as; energy strategy, regulation, law and energy security. Senior business and government leaders from different countries share energy-related business opportunities in their markets.

Please submit your papers (completed or nearly completed) or participation interest via e-mail to: Dr. **Dr. Kazım Barış Atıcı (kba@hacettepe.edu.tr) or Dr. Yılmaz Yıldız (yilmazyildiz@hacettepe.edu.tr)**, by **15 January 2017.** Authors will be notified regarding the acceptance of their papers after reviewing. Final acceptance of full papers will be notified by **30 January 2017**.

The title page should include the affiliation, address, phone, and e-mail of each author together with the appropriate JEL classifications. Each participant agrees to serve as a discussant of a paper of his/her own area of interest, if needed.

Papers selected for this conference may be submitted for possible publication in a CEVI book, dedicated to this conference by *Springer Verlag*. All submitted papers will be subject to a blind peer review process. Further information regarding conference organisation and accommodation, travel arrangements, fees and activities will be published on the conference website in due course. For any inquiry regarding the submission process and registration at the Conference please contact Dr. Kazım Barış Atıcı by e-mail at: **kba@hacettepe.edu.tr**

Valuation determinants of European joint ventures in the energy industry

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Abstract
This paper investigates the determinants of firm value of joint ventures that are active in the energy business. The focus of the study lies with the European Union Emissions Trading Scheme (EU ETS) and the influence of oil prices in its different phases, as well as the equity ownership structures of joint ventures from different locations and with a focus on different energy sources. It is especially suggested that the impact of oil prices on firm value changes in the different phases of the EU ETS. Moreover, it is hypothesised that there is an inverted U-shaped relationship between equity ownership and firm value for European firms, having a sharper peak for renewable energy joint ventures.

1. Introduction

Joint ventures are a form of interfirm cooperation, where two or more partner firms work together to compete with firms outside their relationship (Hitt, Dacin, Levitas, Arregle, & Borza, 2000). The energy sector is one of the industries in which joint ventures are often formed (Meschi & Riccio, 2008). For the firms involved, working in joint ventures enables participation in a complex globalising market by building competitive advantages, through which value can be created (Chen & Chen, 2003; Mindruta, Moeen, & Agarwal, 2016). One example of an international joint venture with at least one European firm is the Malampaya project in the Philippines, the first Offshore Natural Gas project in the Philippines[1]. It is co-owned by Shell (Operator), Chevron and the Philippine government. Active participation of all partners is required to solve technological, logistical and financial issues[2].

Though there is a trend where the use of joint ventures as the Malampaya project has increased in popularity, only a small number of those joint ventures are considered a success. This happens because actual outcomes often do not live up to the expectations firms had beforehand (Hitt et al., 2000; Gomes, Barnes, & Mahmood, 2016). It is important to determine what factors truly cause a change in the value of the involved firms, so that firms can evaluate their strengths and possible pitfalls when entering into and managing joint ventures. This is especially important for the energy industry, where projects are often large, complicated and expensive. When using joint ventures, risks and expenses can be spread, while there is an increase in resources and capabilities (Dann, 2011).

[1] http://www.shell.com/about-us/major-projects/malampaya-phases-two-and-three.html
[2] http://malampaya.com/about/

Previous research has focused on either joint ventures in general, without focusing on a specific industry or sector (e.g. Chen & Chen, 2003), or with a focus on the automobile industry (e.g. Dyer & Nobeoka, 2000; Wilhelm, 2011). Previous research focusing on the energy industry relates to case studies and is especially project-based, where single joint ventures are researched (e.g. Raineri & Contreras, 2010). These case studies are difficult to generalise and not suited for theory testing (Karlsson, 2009). The increase in the use of joint ventures and their failure rate has made way for a growing concern amongst scholars (Gomes et al., 2016). However, to the best of the author's knowledge, there is no comprehensive research on the performance of joint ventures in the energy industry.

Therefore, this study will strive to answer the following research question: "*What are the determinants of firm value of joint ventures in the energy industry?*" It will do so by means of a literature study, where the proposed effects of several determinants on firm value will be established. The focus of these determinants lies with the European Union Emissions Trading Scheme and the influence of oil prices in its different phases, as well as the equity ownership structures of joint ventures from different locations and with a focus on different energy sources. With this research, the literature on industry-specific factors that relate to joint ventures will be enhanced with hypotheses on the European Union real-world.

For global energy firms it is imperative to identify and manage the right major capital investments, both for internal and external opportunities (Triantis, 2001). Still, most investments in the energy industry are made before firms have a clear understanding of the financial aspects and thus the value it might bring or cost (Mills, Kromer, Weiss, & Matthew, 2006). One way to increase firm value for the energy industry is through the use of joint ventures, which could help the planning and implementation of initiatives (Cora, 2009). The following subsections will therefore discuss the determinants of firm value of joint ventures in the energy industry. Here, the focus is on two different aspects related to external and internal determinants. First, different energy sources are discussed related to external influences by energy prices and government regulations. This is followed by an internal focus on the control of the joint venture based on different equity ownership types. Their combined effects are then taken into consideration after which performance measures are discussed.

2. Joint ventures

Joint ventures are a form of strategic alliances. In this paper, strategic alliances are defined as cooperative agreements between two or more firms, who work together to compete with firms outside their relationship by co-developing, sharing or exchanging technologies, products or services (Gulati, 1998; Hitt et al., 2000; Yang, Zheng, & Zhao, 2014). Within the realm of strategic alliances, joint ventures involve the creation of an independent but jointly owned equity firm outside of the partners' own firms (Gulati, 1995).

Dyer and Singh (1998) argued that joint ventures, rather than contractual alliances that do not involve the creation of an independent business, are the most competent when it comes to incentive alignment: knowledge transfer is promoted and higher value sharing can be achieved. However, though the firms are committed, joint ventures are a distinct organisation managed by multiple partners. By its very nature, tensions occur due to changes in partners' behaviour, their willingness to share information, and the omnipresent challenge of loyalty versus opportunism (Meschi & Riccio, 2008). Still, joint ventures signal partner commitment due to the level of capital invested, which enhances cooperation between firms and increases the odds of success (Beamish & Lupton, 2009).

As for the energy industry, the projects that are undertaken are often complicated. Their scale is grand, they are expensive and there are numerous risks involved. Therefore, the alliance structure of joint ventures is regularly applied to spread the risks and expenses related to a project (Dann, 2011). Moreover, the use of joint ventures has been gaining popularity due to decreasing energy sales prices and thereby an uncertainty regarding the recovery of commodity prices. Joint ventures can then provide risk benefits, while the partner firms maintain their corporate independence (Karev, 2015). For this paper the focus will therefore be on joint ventures rather than contractual alliances. As these face different concerns, it is important to separate them. This is especially the case when studying strategies for alliances, as otherwise no reliable propositions can be provided for their management (Beamish & Lupton, 2009).

3. Sources of Energy

Within the energy industry, a distinction can be made between different sources of energy. The basic distinction is between non-renewable energy and renewable energy. Non-renewable energy sources include hard coal, crude oil and natural gas: these are fossil mineral fuels whose quantities are finite and limited. Renewable energy (non-depleting) sources include solar, wind, water and biomass (Pach-Gurgul, 2014).

Due to global warming issues, it is important to reduce the scale of fossil fuel consumption. Substitutes for the traditional fossil fuels are essential and can be realised through an increase in the use of renewable energy sources. This has been solidified in the 2015 Paris Agreement, where the energy market needs to be redesigned to be more renewable (European Commission, 2015). Though this is the first truly global initiative, with 196 countries involved, the official signing of the agreement and thus its adherence starts in 2016 and 2017[3]. Before this, the largest Emissions Trading Scheme (ETS) was created by the European Union (EU), with the aim of managing the reduction of firms' carbon emissions (Ortas & Álvarez, 2016). The scheme is based on a cap-and-trade system, or allowance trading, where there is a limit on the total amount of pollution allowed (Charitou, 2015). The total amount allowed is divided into small pieces and allocated to different firms. A carbon market is created where firms can trade emission allowances if they are below their threshold, and where firms need to buy allowances or pay a fine if they cross their threshold (Jeffrey & Perkins, 2015). As the total amount of pollution allowed is decreased over time, the EU ETS scheme has resulted in a significant reduction of carbon dioxide emissions (Ortas & Álvarez, 2016). There are three phases in the EU ETS, which are shown in table 1.

Table 1. Phases of the European Union Emission Trading Scheme

Phase	Years	Actions	Penalty
1	2005-2007	'Learning by doing': setting prices, testing the system 100% of allowances given free of charge	€40 per tonne
2	2008-2012	Scope of the system widened: different emissions included Influence of the crisis created a drop in carbon prices 90% of allowances given free of charge	€100 per tonne
3	2013-2020	Scope of the system widened: different emissions included Harmonisation of rules 40% of allowances given via auction: share will rise yearly	€100 per tonne

Source: adapted from http://ec.europa.eu/clima/policies/ets/index_en.htm

[3] https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

Due to the EU ETS, there is a willingness to switch to energy sources that are less carbon-based. This occurs as it is more expensive to use polluting activities, which creates incentives for firms to apply processes that are environmentally-friendly (Ortas & Álvarez, 2016). The energy industry (e.g. oil refinement) is one of four main industries covered by the EU ETS, and thus is required to uphold the rules set by the EU ETS (Anger & Oberndorfer, 2008).

On the one hand, with new regulatory measures in place and a changing energy market, it is expected that the use of joint ventures will enhance value on a firm-level for the firms involved in the joint venture. It is important for the future as there is an inevitable reliance on renewable energy that is bound to occur. Government subsidization programmes exist that aim at compensating investors and to allocate investments to different renewable energy subsectors (Reboredo, 2015). However, investments in the renewable energy industry remain filled with risks as the technologies of some energy sources remain unproven at a large scale, raising concerns in terms of financial feasibility (Leblanc, 2008). Though the development of renewable energy systems is important, organisations face difficulties gathering funds if their risks are too high, slowing down the momentum of the renewable energy industry (Erzurumlu, Davies, & Joglekar, 2014).

One researched determinant for the development of the renewable energy industry is the oil price. In general, research has found the relationship between oil prices and stock prices to be negative (e.g. Kilian & Park, 2009). However, the renewable energy industry might benefit from an increase in oil prices as alternative energy sources become more interesting and viable (Managi & Okimoto, 2013). Kumar, Managi and Matsuda (2012) find that past movements in oil prices determine variation in renewable energy stocks, where renewable energy sources can serve as substitutes when oil prices are rising. Reboredo (2015) adds to this by arguing that incentives to promote the development of renewable energy are encouraged when oil prices are high as there is dependence between the returns of oil and renewable energy stocks.

The following hypothesis can then be formed, the outcome of which is expected to differ in each of the three phases of the EU ETS, as the influence of the oil price could change in the different phases. Moreover, changes occurred in 2008 due to the financial crisis, after which a surplus of carbon allowances occurred, which coincides with phase 2 of the EU ETS (Managi & Okimoto, 2013; Dirix, Peeters, & Sterckx, 2015; Inchauspe, Ripple, & Trück, 2015):

Hypothesis 1a: Oil prices are negatively related to the value of firms involved in non-renewable energy joint ventures.

Hypothesis 1b: Oil prices are positively related to renewable energy firms' stock returns, which in turn are positively related to the value of firms involved in renewable energy joint ventures.

4. Control

Though the rationale behind the formation of joint ventures differs between firms, there are several key aspects for the energy industry. First and foremost, specialist capabilities are required for the development and extraction of energy resources and assets (Dann, 2011). This makes it necessary for joint venture partners to either possess technological expertise or pair up with a partner that has it. In general it can be said that firms that link their partnerships, and thus joint ventures, to their strategies both in terms of assets and regions have a higher firm value (Ernst & Steinhubl, 1997). It is thus important to focus on the right partner for each joint venture as well as the right terms of the partnership and the right region.

One of the key determinants of joint venture performance is control, a subject that has received attention constantly in joint venture literature (Meschi & Riccio, 2008). There are multiple aspects related to the control of joint ventures, of which the focus in this study is related to strategic control as based on the research by Child (2001). Strategic control relates to management over a joint venture based on the proportion of equity ownership a firm has, which determines the firm's power over the strategic direction of the joint venture.

To determine the preferred equity ownership strategy of international joint ventures, previous research has investigated the relationship between different equity strategies and joint venture performance. Three general equity strategies are possible: majority equity ownership share, fifty-percent equity ownership share and minority equity ownership share, though most literature is focused on either a majority equity ownership share or fifty-percent equity ownership share. Previous research has found mixed results, where evidence on firm performance, measured in different ways, was found positive, negative or even insignificant for all different equity structures.

Regarding the majority equity ownership share, it is viewed as potentially advantageous in reducing managerial complexity as well as in reducing challenges related to coordination, thereby alleviating potential conflicts between the joint venture partners (Merchant, 2002). Related to this, a reduction in complexity reduces the time necessary to make decisions, a timely effort when joint decisions are needed (Zeira & Parker, 1995). Positive aspects for the majority equity ownership share are particularly evident when the partner that holds the majority possesses more advanced technology and skills (Calantone & Zhao, 2001). This partner will also have a higher incentive to invest in the joint venture. However, this could decrease the investment and cooperation incentives from the partner with a minority equity ownership share (Mantecon, Liu, & Gao, 2012). If the dominant partner exploits its powerful situation, the minority partner can get frustrated and conflicts can arise (Christoffersen, 2013).

On the other hand, a fifty-percent equity ownership share structure leads to higher goal congruence between the partners. There is less perceived uncertainty regarding the possible actions of the partner firm and thus opportunistic behaviour is curtailed while the partners' interests are harmonised (Luo, 2001). This occurs as there is more monitoring between the partners as well as exchange of information, thereby reducing the incentive to make value-destroying and self-interested decisions (Mantecon et al., 2012). Furthermore, as trust is important in the maintaining of a stable joint venture where both partners contribute valuable resources, this is most viable in a partnership without dominant partner (Christoffersen, 2013). However, coordinating activities has a high cost in a fifty-percent equity ownership share structure (Desai, Fritz, & Hines, 2004). Also, it is an inefficient organisational structure, because the joint decision making can lead to conflicts and slow decision making speeds due to permanent negotiation (Mantecon et al., 2012; Meschi & Riccio, 2008).

In a recent study, Li, Zhou and Zajac (2009) research a possible inverted U-shaped relationship between equity ownership structure and joint venture productivity. The authors argue that a focus on either control benefits or collaboration benefits alone suggests different linear patterns. Combining the two would provide an inverted U-shaped relationship where an increase in foreign equity ownership increases partner commitment, but an excessively dominant foreign ownership reduces commitment and knowledge transfer from the minority partner. Significant quantitative evidence for the inverted U-shaped relationship is found for international joint ventures based in China.

The preferred ownership structure appears to be dependent to some extent on the context. When relating the previous theory to the energy industry, projects undertaken with joint ventures are often complex and of a large scale (Dann, 2011). It is therefore important to coordinate the transfer of both resources and knowledge, which would be at their best in a fifty-percent equity ownership share that encourages the exchange of information. On the other hand, joint ventures in the energy industry are often created to spread risks and expenses as well as to create possible economies of scale (Karev, 2015). This would relate to a majority equity ownership share, where complexity and coordination costs are lowered while having the benefits of a partner when needed (Merchant, 2002). It is expected that joint ventures in the energy industry relate to the research by Li et al. (2009), where an increase in equity ownership share fosters risk spreading, while an excessive equity ownership share decreases the partner's willingness to share knowledge. This leads to the following hypothesis:

Hypothesis 2a: Equity ownership in joint ventures has an inverted U-shaped relationship with the firm value of firms involved in joint ventures in the energy industry.

Combining the subjects of renewable energy and control, it is expected that the inverted U-shaped relationship between equity ownership share and firm value changes for different energy sources. This could occur due to changing tensions based on dominating joint venture management and the circulation versus retention of knowledge (Meschi & Riccio, 2008). Whether firms are willing to cooperate and share their knowledge depends on the equity ownership share of the firm itself and its partner.

In the renewable energy industry, a knowledge base is required that exceeds the possibilities of a single firm in order to create scientific discoveries and equity is required for the financing of Research and Development (R&D) (Baldi, Peri, & Vandone, 2014; Yang et al., 2014). Due to the unique coordination challenges that joint ventures with a high R&D intensity face, as those in the renewable energy industry, it is important to sustain incentives to share tacit knowledge even with moral hazards present (Sampson, 2007). Zhang, Li, Hitt and Cui (2007) studied whether R&D intensity combined with a majority equity ownership share leads to increased performance, as this would lower moral hazards of local partners. However, the results were insignificant. This may lead to the expectation of increased benefits of fifty-percent equity ownership share for joint ventures that deal with renewable energy, as these provide high levels of cooperation while at the same time minimise moral hazards due to increased monitoring (Mantecon et al., 2012). It can be anticipated that the valuation effects are more prominent for renewable energy joint ventures, with a higher peak in terms of benefits around the fifty-percent equity ownership share, after which a sharper decline follows for increasing majority equity ownership share. The following hypothesis can then be formed:

Hypothesis 2b: The inverted U-shaped relationship between equity ownership and firm value is more prominent for firms involved in renewable energy joint ventures.

To determine the influence of the EU ETS, the focus of this study is on joint ventures that include at least one firm required to oblige the EU ETS rules. When faced with government regulations regarding environmental policies, firms might change their organisational structure (Chowdhury, 2008). Joint ventures are one way of cooperation between firms to collaborate on pollution diminishing innovations (Chiou & Hu, 2001). This would then be especially relevant in firms involved in renewable energy joint ventures. Due to the regulations present, finding solutions to incorporate renewable energy might be more important, which would lead to a higher peak for renewable energy. To incorporate the possible differences in the European firms and thus regional aspects of joint ventures as well as the influence of the EU ETS, the hypotheses regarding joint venture control will also be researched for the European dataset. These hypotheses are as follows:

Hypothesis 2c: For European firms, equity ownership in joint ventures has an inverted U-shaped relationship with the value of firms involved in joint ventures in the energy industry.

Hypothesis 2d: For European firms, the inverted U-shaped relationship between equity ownership and firm value is more prominent for firms involved in renewable energy joint ventures.

5. Measuring performance

There has been a growing interest within academic literature on the topic of joint venture performance as there is a high level of competition combined with a high failure rate (Gomes et al., 2016). In the energy industry, only 20 percent of oil companies are skilled in matching their objectives with their joint venture approaches (Ernst & Steinhubl, 1997).

One possible way to determine the performance of a joint venture is its survival. There are different theories arguing for either the liability of foreignness or the honeymoon effect. On the one hand, the liability of foreignness relates to the costs of doing business abroad, which are especially prominent during the first few years of the joint venture's existence (Meschi & Riccio, 2008). On the other hand, the honeymoon effect argues the opposite, where the termination of joint ventures has a low probability in the first year of its existence, as firms first need to commit themselves to the joint venture (Meschi, 2005; Shah, Zegveld, & Roodhart, 2008). Though these survival measures are sometimes used to determine the performance of joint ventures, this does not necessarily have to be the case. Successful joint ventures are good candidates for acquisitions, and if goals are met the joint venture might not be needed anymore altogether (Beamish & Lupton, 2009; Christoffersen, 2013). In both of these cases, termination of the joint venture constitutes good performance.

When a firm considers forming a joint venture, it is often wary of the impact of the joint venture on the valuation of the firm itself (Beamish & Lupton, 2009). There are subjective and objective measures to assess the performance of joint ventures, where subjective measures relate to goals obtained while objective measures relate to profit maximising figures (Park & Kim, 1997).

First, subjective measures reflect the goals of the partner firms and whether those goals are met. Therefore, they are argued to reflect the advantages of joint ventures as sought by the partner firms (Anderson, 1990). However, there is sensitivity to the results, where only the initial goals are taken into account and the outcome might be based on the personal view of employees (Christoffersen, 2013). For example, it is possible that the joint venture has not achieved its initial objectives due to premature termination, while the performance of the joint venture itself is satisfactory (Beamish & Lupton, 2009). On the other hand, objective measures relate to accounting measures, which have several advantages. Accounting measures have a higher reliability in their interpretation over survival measures, as their results are always related to performance, whereas for survival this depends on the context. It also has advantages over subjective measures, which have problems related to subjectivity due to same-source variance (Christoffersen, 2013). As there remains ambiguity related to the performance of joint ventures, it is important to use objective and empirical methods (Beamish & Lupton, 2009).

There are several accounting measures. First, the net present value for the partner firms that participate in a joint venture can be determined. However, though multiple measures exist none exactly reflects the net present value (Christoffersen, 2013). Another possibility is event-study methodology. Here, cumulative abnormal returns following the announcement of a joint venture are researched. However, using this method it is difficult to distinguish the effects of e.g. the joint venture ownership structure from other sources of value (Mantecon et al., 2012). The market-to-book ratio of equity can be based on Wang and Zhang (2015). It is computed by dividing the market value of equity by the book value of equity and the results are qualitatively equal to when Tobin's Q is used.

6. Concluding remarks

Though the use of joint ventures has increased in popularity, their high failure rate remains an important issue. The goal of this study is therefore to provide insights into the determinants of joint venture performance with a focus on energy source and regulations as well as equity ownership structure. A European focus is chosen and the variables as stated in table 2 below are deemed relevant for empirical testing.

Table 2. Variables and their suggested codes

Variable	Code
Firm value	Firm value
Stock returns	Stock returns
Oil price	Oil price
Percentage of equity ownership	Equity %
Interest rate level	Interest rate
Interest rate level five year average	Interest rate average
Culturally embedded opportunism	INDIV
Gross Domestic Product Per Capita	GDP PC
Number of partners	# Partners
Size	Size
Leverage	Leverage

It is suggested that oil prices are negatively related to the value of firms involved in non-renewable energy joint ventures. Also, it is hypothesised that oil prices are positively related to renewable energy firms' stock returns, which in turn are positively related to the value of firms involved in renewable energy joint ventures. For European firms, equity ownership in joint ventures will have an inverted U-shaped relationship with the firm value of joint ventures in the energy industry. Also, for European firms, the inverted U-shaped relationship between equity ownership and firm value is expected to be more prominent for firms involved in renewable energy joint ventures.

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The Effect of the EU ETS on the stock price of oil and gas companies

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Abstract
Climate change is an undeniable problem nowadays and therefore, regulations regarding greenhouse gasses are increasing worldwide. Since 2005, the EU pioneered with an emission trading scheme to reduce emissions. In this scheme, the EU ETS, nations receive emission allowances and are free to divide these allowances between the large domestic polluters. The emissions allowances are called European Union Allowances (EUA) and can be freely traded between companies, creating a carbon market. This study evaluates the impact of the EU ETS on the stock return of European gas and oil companies. It finds a positive relationship between the EUA prices and the average stock return of oil and gas companies. This result might be explained by potential over-allocation of allowances in that more allowances can be sold in the market than need to be bought.

Introduction

In 2015, The United Nation (UN) has agreed on new regulations regarding worldwide emissions of greenhouse gasses (GHG) during the United Nations Climate Change Conference (UNCCC). These new regulations are described in the Paris Agreement, which is the first universal and legally binding agreement on the emission of GHG to limit the climate change. While the Paris Agreement is not into force yet, it is interesting to study the effect of different regulations regarding emmision of GHG, as climate change possesses great danger to all of us (World Bank, 2015). Measuring the economic impacts of these regulations is of great importance for the policy-making process in the future (Bushnell, Chong and Mansur, 2009).

Currently, carbon pricing is the favored method by many economists and politicans for reducing CO_2 emissions to limit climate change. Two types of carbon pricing have been introduced in the past two decades, namely the implementation of a carbon tax on CO_2 emissions and the implementation of a CO_2 emission trading scheme. The latter requires companies to purchase permits in order to emit CO_2 emissions. In 2005, the European Union (EU) pioneered with the introduction of a CO_2 emissions trading scheme. By then, the European Union's Emissions Trading Scheme (EU ETS) was introduced, in which individual nations receive emission allowances and the indivual nations are free to divide these allowances between large domestic polluters. These emission allowances are called Euopean Union Allowances (EUA). These allowances can be freely traded between companies as soon as they have been divided, which creates a carbon market. In this carbon market, firms that succeed in reducing their emissions can sell their excess permits, while companies with prohibitively large costs of emission reduction can buy additional permits (Veld-Merkoulova and Viteva, 2016). The EU ETS was the world's first significant and by far the largest cap-and-trade system for CO_2 and covers a dozen industries and 28 European countries. The EU ETS has been rolled out in three phases, the first phase was from 2005 till 2007, the second phase from 2008 till 2013 and the third phase is from 2014 till 2020 (Bushnell et al., 2009).

Since January 2012, the number of carbon pricing instruments already implemented or scheduled for implementation has almost doubled, jumping from 20 to 38 (World Bank, 2015). These current carbon-pricing instruments differ in jurisdictions in both coverage and carbon price. In such an asymmetric world, countries might be concerned that their ambitious climate action may undermine the international competitiveness of some domestic sectors, which may lose market share and profit margins in comparison with competitors who do not face similar emission regulations and costs abroad. Given today's regulatory and competitive environment, it is important for companies to start looking at how these regulations will affect their operations and eventually affect their stock prices and stock return.

This study will provide empirical research on the effect of the EU ETS on the stock return of oil and gas companies, as these firms are highly carbon-intensive and relatively open to trade. Therefore, the research question in this study is "how does the EU ETS affect the stock return of oil and gas companies?"

1. Literature review

The relationship between the environmental regulation, specifically the EU ETS, and profit was studied by Bushnell, Chong & Mansur (2009). Although their data on allocations was insufficient to explicitly identify a "net holdings" effect, they did find evidence that allocations of EUAs played a role in the market's response to the CO_2prices. They concluded that in general, firms in industries that tended to be either carbon intensive or electricity intensive, but not involved in international trade, were hurt the most by the decline in permit prices. In industries that were known to be net short of permits, the cleanest firms saw the largest declines in share value (Bushnell et al, 2009). Demailly and Quirion (2008) studied the relationship between the EU ETS and the competitiveness of firms in the iron and steel industry. They conclude that for the iron and steel industry, although it's highly CO_2 intensive and relative open to international trade, losses of competitiveness were small. Furthermore, Oberndorfer (2009) emphasizes the importance of using oil and gas prices as explanatory variables because of their dual role as price drivers for both energy stocks and carbon allowances. He concludes that stock prices have been positively associated with carbon prices during Phase I. In this respect, the affected corporations are gaining value in the case of an increase in the EUA price and decrease in value when the EUA price falls. Veld-Merkoulova and Viteva (2016) provide a more general analysis of the economic and financial effects of carbon trading and regulations on the stock market prices and individual companies. They tested whether companies which emit less than what the market anticipates are associated with positive abnormal returns, and whether companies which emit more are associated with negative abnormal returns. Unfortunatly, Veld-Merkoulova and Viteva did not find statistical evidence in order to support their hypothesis.

As all of these studies used data which had been collected before 2012, which was in either the first or the second phase of the EU ETS, it is interesting to build upon those theories and studies using data collected after 2012. Especially after the Paris Agreement was established in 2015, which requires further restriction of CO_2 emissions in order to limit climate change. Therefore, this study will provide empirical research on the effect of the EU ETS on the stock value of oil and gas companies, as oil and gas companies are highly carbon-intensive and relatively open to trade.

2. Methodology

This study will cover data of a period of five years, starting from 01-06-2009 until 30-05-2014. This is the beginning of the second phase of the EU ETS and the period after the financial crisis of 2008 until the dramatic decline in oil prices in June 2014. Stock returns of the regulated firms are taken as the dependent variables and as an indicator of future profitablilty of these firms. As the EUA prices are a reflection of the carbon market and a great determinant of the effect of the EU ETS, this is used as the independent variable. This results in the following hypothesis developed:

H_0 = The stock return of oil and gas companies covered by the EU ETS will not be affected by the EUA price

H_1 = The stock return of oil and gas companies covered by the EU ETS will be affected by the EUA price

It is expected that there is a negative relation between the carbon permit price and the stock return of oil and gas companies. The higher the price of the EUA, the more companies need to pay in order to emit CO_2, which will directly affect their costs of their operations and therefore decrease their stock return. Generally, a high EUA price could be interpreted as an indicator of stringency of regulation shrinking future cash flows (Oberndorfer, 2009). A negative link between carbon prices and stock value would indicate that the carbon market is seen as a profit-decreasing regulation and as a source of uncertainty for the future of the affected firms. Decreasing profits may be explained by the cost of buying allowances, transaction costs, future abatement costs and decreasing market share by a lower demand for carbon intensive products (Venmans, 2015).

In order to find evidence to support or reject this hypothesis, data on the stock value of European oil and gas companies and the EUA prices are required. The European Environment Agency (EEA) provides the EUA prices of 2009-2014. Data regarding the stock return of European oil and gas companies is collected via DataStream, named as Oil & Gas Producers. The final sample consists of 127 European Oil & Gas Producers regulated by the EU ETS. Only companies that existed for the whole period are included. Moreover, oil prices and natural gas prices are included as explanatory variables as Oberndorfer (2009) stresses the importance of the inclusion of oil and gas prices and the exclusion of oil and gas prices as explanatory variables may cause severely biased estimates with respect to the effect of the EUA price change on stock returns. In this study, the Brent Crude Oil Price index is used to indicate the oil prices and is collected via DataStream. Lastly, natural gas prices are based on the Intercontinental exchange (ICE) and are also collected via DataStream. This results in the equation following below.

$$Y_{\text{stock return}} = \beta_0 + \beta_1 X_{\text{EUA price}} + \beta_2 X_{\text{oil price}} + \beta_3 X_{\text{natural gas price}} + \varepsilon$$

3. Results

Variables

The daily stock returns of 127 oil and gas companies regulated under the EU ETS have been manually computed, using data regarding the stock value of these companies collected from DataStream. Later, daily average stock returns of the 127 companies have been manually calculated and used for the regression analyses. An overview of all the descriptive statistics and the results of the normality tests of both the independent variables and the dependent variable are given in Table 1. Moreover, all the descriptive statistics and the normal Q-Q plots of the variables can be acquired via the author upon request.

Table 1 – Overview descriptive statistics

					Normality tests	
	Valid N	Minimum	Maximum	Mean	Skewness (z-value)	Kurtosis (z-value)
Stock return	1304	- 0.095	. 857	0.365	2.84	3.10
EUA price	1304	2.71	16.90	9.93	0.23	11.65
Oil price	1304	60.29	126.22	99.81	- 9.53	- 7.37
Natural gas price	1304	1.82	6.09	3.81	0.82	0.95

The mean of the average stock return variable is 0.365, with a standard deviation of 0.1792. The minimum average stock return in this time period was -0.0947 and the maximum 0.8571. No missing values and no outliers are determined for this variable. Using a threshold of the z-value range between -2.58 and 2.58 (cf. Rose, Spinks and Canhoto, 2015) the average stock return is not normal distributed according to the tests on skewness (z=2.83) and kurtosis (z=3.096). Yet, a plot does indicate that average stock return is normally distributed.

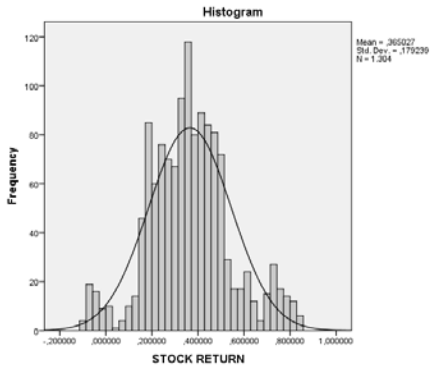

Figure 1 – Histogram stock return

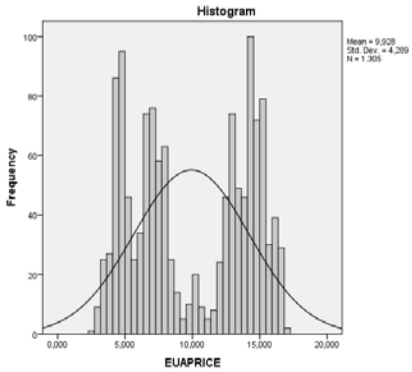

Figure 2 – Histogram EUA price

The average EUA price in this time period was €9.93 with a standard deviation of €4.28 and the price varied between €2.71 and €16.90. No missing values and no outliers could be detected. Although the skewness test indicates that the data is normally distributed (z-value=0.23), a plot and a kurtosis test (z-value=11.65) indicate that the EUA price is not normally distributed. The oil price varied between €60.29 and €126.22 and the average oil price was €99.80 with a standard deviation of €17.06. The oil price is not normally distributed based on the skewness test (z-value = -9.529) and the kurtosis test (z-value = -7.370).

Natural gas prices are based on the Intercontinental exchange (ICE) and cover the period from 1-6-2009 until 30-5-2014. The natural gas price varied between €1.82 and €6.09, at an average in this period of €3.81, with a standard deviation of €0.86. 15 outliers that affect the normal distribution of the variable have been replaced by the mean. Next, the natural gas price is normally distributed according to tests on skewness (z=0.82) and kurtosis (z=0.95) at a z-value threshold range between -2.58 and 2.58 (cf. Rose, Spinks and Canhoto, 2015).

Regression analyses

Five regression analyses are performed in this study. First, three simple regression are performed with all the explanatory variables individually, namely the EUA price, the oil price and the natural gas price on the stock return of oil and gas companies. Secondly, the EUA price and the oil price are regressed on the dependent variable. Lastly, all the explanatory variables, including the EUA price, the oil price and the natural gas price are regressed together on the stock return of oil and gas companies. An overview of the results of these five regressions can be found in Table 2 and all the individual results are available upon request.

Table 2 – Overview results regression analyses					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant (β_0)	. 421***	-. 346***	. 355***	-. 708***	-. 887***
Coefficient EUA price (β_1)	-. 006***			. 015***	. 014***
Coefficient oil price (β_2)		. 007***		0. 009***	. 010***
Coefficient gas price (β_3)			. 002		. 038***
Adjusted R^2	. 017	. 438	-. 001	. 522	. 550
F-test	23.941***	1016.322***	. 154***	790.566***	531.016***

Note: *, ** and *** show significance at 10%, 5% and 1% level, respectively.

To indicate if a model has significant explanatory power in predicting the dependent variable, an ANOVA test is performed. Based on the results provided in Table 2, the null hypothesis that ß = 0 can be rejected in all the models, as all the F-tests are significant at a 1% significance level (p=0.00). Therefore, all the models have significant explanatory power in predicting the stock return of the European oil and gas companies regulated under the EU ETS.

Given the results of the regressions and based on the adjusted R^2, provided in Table 2, model 5 is considered to be the best model (Adjusted R^2=0.550). The results of the regression analysis of model 5 indicate that 55.0% of the total variability in the stock returns is explained by the explanatory variables. In this last multiple regression analysis, the EUA price, the oil price and the natural gas price are included as explanatory variables. All the independent variables are statistically significant in explaining the dependent variable (p=0.00). Again, the coefficients of the EUA price and the oil price have positive, significant power in predicting the stock return of oil and gas companies, respectively (t=15.03, p=0.00) and (t=39.77, p=0.00). Although natural gas price did not have significant explanatory power in the simple regression, its coefficient is significant in the multiple regression analysis (t=9.126, p=0.00). Based on this analysis, the following equation can be established.

$$Y_{\text{stock return}} = -0.887 + 0.014\,_{\text{EUA-prices}} + 0.010_{\text{oilprice}} + 0.038_{\text{gas price}} + \varepsilon$$

Comparing the previous regressions, two interesting findings can be determined. Firstly, the third simple regression indicates that the natural gas price is not a significant explanatory variable in explaining the stock return, while the multiple regression analysis indicates that the natural gas price does have a positively significant power in explaining the stock return. Secondly, the first simple regression does indicate the expected negative relationship between the EUA price and the stock return, while the multiple regression analysis indicates a positive relation. A relation between the explanatory variables might explain this finding. The correlation matrix provided in Table 3 shows that there are indeed significant correlations between the independent variables. Using a threshold of $r \geq 0.7$, these correlations are not strong enough to cause insurmountable problems with multicollinearity.

Table 3 – Correlation matrix				
	Stock return	**EUA price**	**Oil price**	**Natural gas price**
Stock return	1	-. 134**	. 662**	. 011
EUA price	-. 134**	1	-. 565**	. 197**
Oil price	. 662**	-. 565**	1	-. 258**
Natural gas price	. 011	. 197**	-. 258**	1

Note: ** show correlation is significant at the 0.01 level (2-tailed).

However, the correlations between the explanatory variables might explain the different results of the regressions regarding the significance of the natural gas price. The interaction between the natural gas price and the EUA price might be explained by fuel switching. Generally, fuel switching takes place between coal and gas, and to some extent also oil, e.g. by converting rather inexpensively oil plants into burning gas plants or converting coal plants into burning oil or gas plants (Pettersson et al., 2013). Switching from coal to natural gas reduces CO_2 emissions and variations in the fuel prices should, therefore, be reflected in the variation of EUA prices (Delarue et al., 2010). Placing an adequate price on CO_2 emissions helps mobilize the financial investments required to support diverse actions, such as fuel switching from coal to natural gas, renewable energy deployment, the adoption of energy efficiency measures and the use of low-carbon technologies in industry (World Bank, 2015). These interactions between the explanatory variables may also explain the difference in the relationship between the EUA price in the first and last regression.

As model 5 is considered to be the best model, based on the adjusted R-square, further elaboration will focus on the positive relationship between the EUA price and the stock return of oil and gas companies.

4. Discussion

The previous findings indicate that stock returns are positively related to the EUA price, meaning that oil and gas companies covered by the EU ETS are gaining value in case of an increase in the EUA price and decrease in value when the EUA price falls. This positive relation contradicts the previous expectations. Therefore, the next section considers possible explanations.

Firstly, the positive relation between EUA price and stock return might be explained by the free allocation of emission allowances in the EU ETS. In the beginning of every phase in the EU ETS, individual nations receive allowances and are free to divide these allowances over the companies. These allowances can be seen as free allowances for the companies and windfall profits might occur. Windfall profits can occur when companies' free allowance permits exceed their actual needed CO_2 emission allowances. Over-allocated allowances can therefore be traded by the company and sold in the created carbon market, resulting in a higher net income, profit and stock return for the company. These results, however, call into the question free allowance allocation to corporations, as free allowances are seen as an instrument to support firms suffering from production cost increases generated by the EUA price rises (Hepburn et al., 2006). Unfortunately, windfall profits stemming from over-allocation are difficult to measure at a company level, because it is the difference between income from emission rights sales and expenses for abatement costs (Venmans, 2015). Moreover, the lack of reliable information about aggregate emissions is a critical contributor to the uncertainty about price levels and to the uncertainty about potential over-allocation. More transparency from these companies is needed to create a better picture of the impact of the EU ETS and to study the role of allocation of allowance on the effectiveness of the EU ETS.

Secondly, freely distributed carbon allowances create opportunity costs for the covered companies. For every extra unit of production, carbon allowances need to be handed into the regulator instead of being sold at the market (Venmans, 2015). However, these opportunity costs can be seen as marginal production costs and therefore, oil and gas companies might pass the opportunity costs through to the customer. In this case, the sales price would increase and customers pay for the additional marginal production costs. If the studied companies in this study indeed pass through these opportunity costs to the customer, this might explain why the stock return of the oil and gas companies is not negatively related to the EUA prices, but rather positively. Pass-through rates are considered to be lower when there is more competition outside Europe and when there is competition with firms not regulated under the EU ETS.

Moreover, the positive relation between the EUA prices and the stock return of the firms covered by the EU ETS might not be explained by the direct impact of the EU ETS on these companies, but by other firm specific advantages of oil and gas companies. These firms might for example have a strong R&D department, valuable know-how or patents that might increase in value when emission regulation becoming more important. Studies regarding the effect of know-how, the R&D department and patents can be become very valuable in the next few years.

However, the magnitude of the coefficient for the EUA price found in this study is only 0.014 and is relatively small, implying that for each euro the EUA price increases, the stock return of oil and gas companies increases with 1.4 cents, everything else held constant. Two things might explain the relatively small magnitude of this relationship between the EUA price and the stock return. The first is the relatively low EUA price over the studied time period. The current EUA price is too low to stimulate big oil and gas companies to invest in different techniques to reduce emission. Mulder (2015) states that if policymakers aim to improve the impact of the EU ETS on investment behaviour, they should first and foremost introduce measures that reduce CO_2 price uncertainty. Implementing a minimum and maximum EUA price is one example to reduce uncertainty and stimulate companies to reduce emissions. Secondly, other parallel instruments introduced in the past decades in order to reduce emissions, such as feed-in tariffs that stimulate the deployment of renewables, or substitutes for biomass co-firing, might explain the small impact of the EU ETS. Although the EU ETS and these parallel instruments do have the same goal, namely to reduce emissions, these parallel instruments directly and often adversely affects the performance of the EU ETS (Mulder, 2015). The reduction of emissions caused by the parallel instruments reduces the demand for EU ETS emission allowance and lowers the EUA price. Therefore, the impact of all parallel instruments across Europe could significantly lower the EUA price and hurt the dynamic efficiency of the EU ETS through this impact (Mulder, 2015).

5. Conclusion

In the last decade, the importance of climate change has increased dramatically. In 2005 the EU pioneered in placing an adequate price on CO_2 emissions in Europe, with the establishment of the European Union Emission Trading Scheme (EU ETS). The EU ETS was established in order to reduce CO_2 emissions, improve energy efficiency and increase the share in renewable energy. Individual nations and companies receive emission allowances and are free to divide these allowances between the large domestic polluters. These emission allowances are called Euopean Union Allowance (EUA) and can be freely traded, creating a carbon market.

This study is an empirical study measuring the economic effect of the EU ETS on European oil and gas companies, which are highly carbon-intensive and relatively open to trade. The economic effect is measured using the stock return of 127 European oil and gas companies covered by the EU ETS. It was expected that there would be a negative relationship between the EUA prices and the stock return due to the cost of buying allowances, transaction costs and decreasing market share by a lower demand for carbon intensive products. However, the results of this study show a positive relationship between the EUA prices and the stock return of these companies, with a relatively small magnitude, meaning that oil and gas companies covered by the EU ETS are gaining value in case of an increase in the EUA price and decrease in value when the EUA price falls.

This unexpected positive relationship might be explained by windfall profit, which indicates that the allocation of the divided allowances exceeds the allowance needed to cover the emission of the companies. When this is the case, companies can sell their allowances, creating revenue for the company and an increase in their stock returns. However, further research is needed to study the relation between windfall profits and the stock return. Further studies should take the allocation, and especially the potential over-allocation of allowance for some companies, into account. In that case, the effect of the EU ETS can be studied more intensively and with more depth. The small magnitude of the coefficient might be explained by the low emission price during that time period or by the parallel instruments used by individual countries, which often adversely affects the performance of the EU ETS. Further research on the effect of the EU ETS is important for future policy-making processes.

Although the results of this empirical study do not show a negative relationship between the EUA price and the stock return of oil and gas companies, fossil energy companies should not underestimate the effects of increasing regulations regarding CO_2 emissions worldwide. Further research on the economic effects of these regulations are becoming of greater importance, as climate change is an increasing and undeniable problem nowadays.

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