The Announcement Effect and Long-term Stock Performance Following Equity Carve-outs

"The study of US based equity carve-outs between 1999 until 2019"

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Abstract

The object of the thesis is twofold. First, it seeks to investigate the short-, medium- and long-term performance for parent firms and subsidiary firms following an equity carve-out transaction, for firms located in the United States in the period 1999-2019. The paper examines the stock price reaction around the announcement day of the equity carve-out for parents, and the initial public offering for subsidiaries. The reactions are measured using a market model and a market-adjusted model based on an event study approach using the abnormal returns and the cumulative abnormal returns (CAR) in the short-term. In the medium -and long-term a buy-and-hold abnormal return (BHAR) approach is adopted. Secondly, based on previous research, a characteristics analysis and an industry specific analysis several explanatory variables are used in a multivariate regression analysis to investigate the predictability of the short, -medium and long-term abnormal returns.

It concludes that when parent firms conduct an equity carve-out they experience positive CAR around the announcement day [-1;+1] using both the market model and the market-adjusted model. The findings are in line with the literature. The selected industries display different CAR, concluding that there is difference between the industries and the general data. Subsidiaries experience significant abnormal returns, also in line with the literature, but in contrast to the asymmetric information hypothesis. Further, subsidiaries display higher abnormal returns around the event day than parents. The medium -and long-term stock performance is examined using the market-adjusted model and the BHAR excluding the event date. The thesis finds insignificant positive medium-term BHAR for both parents and subsidiaries. Long-term it finds insignificant negative BHAR. It is concluded that parent firms display less volatility than subsidiaries and generate higher long-term risk-adjusted returns.

At last it conclude that several explanatory variables influence the BHAR over the different time horizons. The amount of Leverage respective to total assets is significant using the market model and market-adjusted model for parents around the event day. Relatedness is where parent firms conduct an ECO within the same industry and is significant as well, as is subsidiary size. A broad number of event day variables are found significant for the subsidiaries, such as Leverage, Crisis, Parent Size, Parent ROA and the sector High Technology. In the medium-term (90 day) parent firm BHAR are influenced by the operational variables Leverage and ROA, measured at the time of the announcement. Subsidiaries incur a significant beta variable, indicating that the parent firms' systematic risk is inherent for subsidiaries, and that it influences the medium-term BHAR (125 day) and the long-term (360 day) BHAR. It further concludes that the industries display different significant variables than the general data. In determining the long-term BHAR, leverage is significant on the 252-day horizon and ROA on the 360-day horizon for parents.

Table of Contents

CHAPTER 1 – Introduction to the paper 4

1.1 Background 4

1.2 Brief introduction 4

1.3 Equity Carve-Out vs other types of restructuring 6

1.4 Main research question 7

1.5 Delimitations 8

1.6 Structure of the thesis 9

1.7 Target group and contribution 10

CHAPTER 2 – Literature Review 11

2.1 Motivations and Reasons for Equity Carve-outs 11

2.2 Asymmetric information hypothesis 12

2.3 The divestiture gains hypothesis 12

2.4 Sources of short-term value creation 14

2.5 Long-term performance 16

2.6 Thesis Hypothesis 18

CHAPTER 3 – Methodology 19

3.1 Data and sample selection 19

3.2 Event study methodology 20

3.3 Models for estimating abnormal returns 21

3.4 Models for testing short-term abnormal returns 23

3.5 Models for testing long-term abnormal returns 24

3.6 Multivariate regression analysis 25

3.7 Criticism of CAR and BHAR 26

3.8 Validity and reliability 26

CHAPTER 4 – Characteristics & Drivers 28

4.1 General characteristics of the data sample 28

4.2 Industry specific drivers 29

4.3 Operational characteristics 37

4.4 Part conclusion 41

CHAPTER 5 - Empirical analysis: Univariate 43

5.1 Univariate performance analysis 43

5.2 Raw returns & Excess returns 43

5.3 Short-term performance 45

5.4 Medium -and long-term performance 48

5.5 Part conclusion 53
5.6 Correlation 53
5.7 Volatility 56
5.8 Risk compensation 58
CHAPTER 6 – Empirical analysis: Multivariate 60
6.1 Multicollinearity 61
6.2 Short-Term performance 62
6.3 Medium-term performance 66
6.4 Long-term performance 68
6.5 Part Conclusion 71
CHAPTER 7 – Discussion & Relevance of findings 73
CHAPTER 8 – Conclusion 76
8.1 Further research 79
9.0 Literature 80
10.0 Appendix 84

CHAPTER 1 – Introduction to the paper

The first chapter will be an introduction of the topic. It will provide general background information of the thesis, and the subject equity carve-outs. It will present the primary research questions, the delimitations and the structure.

1.1 Background

The topic of divestitures and equity carve-outs dates back to the 80's, which is why a short introduction to the history of equity carve-outs (ECO), spin-offs and conglomerates is essential to understand the fundamentals of ECOs and the motivation behind the transactions. By the 1980s conglomerates had become the main ownership structure for US based companies. The conglomerates were formed during the 60's and 70's based on the multidivisional corporate structure introduced by Dupont and General Motors in the 20's (Chandler, 1962). The Celler-Kefauver Act was introduced in1950 and made vertical acquisitions out of favor seen from a regulatory perspective. Corporations needed to look outside their original line of business in order to increase growth beyond organic growth. This led to a strategy among most firms in the 60's and 70's to grow by acquiring companies unrelated to their existing business, creating the "firm-as-portfolio" also known as the conglomerate structure. By the beginning of the 80's fewer than 25% of the Fortune 500 companies relied on a single defined industry (Gerald F. Davis et al. 1994). By the early 80's the split-up of conglomerates began, seen in line with current financial portfolio theory, that investors can and prefer to diversify their portfolio themselves. The disadvantages of conglomerates were highlighted and among others, private equity firms started to get traction in the market, dissolving conglomerates and splitting up the business units. Most of the transactions were unfriendly, and private equity firms at the time became known as corporate raiders. The corporate raiders relied heavily on debt financing, which due to the bond markets at the time, became easier accessible[1].

With corporate raiders threatening to take over conglomerates and split them up, the exchange-listed corporations had numerous opportunities to divest ineffective or undervalued business units or units not fit for their future strategy. The term divestiture gains, was introduced by Vikram, Nanda & M. P. Narayana (1999). The solutions were to either sell the business unit on the private market, to spin-off the business unit, to split-off the unit or to make an equity carve-out of the unit. Following the literature in the 90's the term 'conglomerate discount' was introduced as a measurement of the divestiture gains to the parent company. Going forward, divestiture gains will be looked upon, but the dataset contains both conglomerates carve-outs and carve-outs where the parent's business unit is related in terms of industry.

1.2 Brief introduction

An equity carve-out is a corporate restructuring tool defined as follows (K.Schipper and A. Smith 1986) *"An equity carve-out is the initial public offering of some of the stock of a wholly-owned subsidiary. A subsidiary equity offering resembles a primary offering of seasoned stock or convertible debt claims on an entire firm's assets in that cash is received from the public sale of equity securities".*

For the purpose of this thesis following shortened definition is used:

[1] Lewis, M. (1989). Liars Poker.

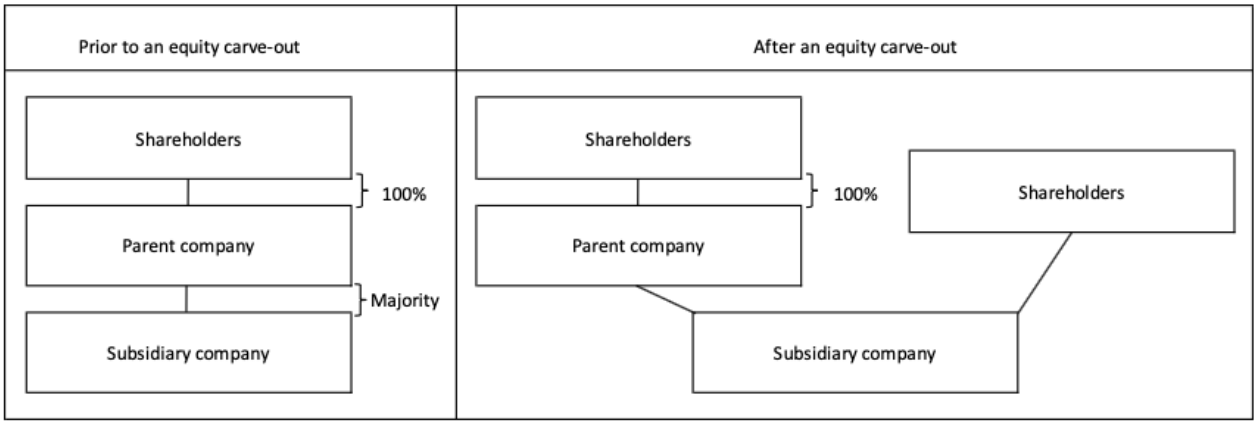
“An Equity Carve-out (ECO) is the initial public offering (IPO) by a majority owned private subsidiary of an exchange listed parent company” A list of abbreviations is displayed in appendix 0.

In order to elaborate the above definition, the different sub definitions are explained below. First, an ECO is the initial public offering of a subsidiary firm, therefore some practitioners refer to ECOs as sub-IPOs, there are five primary criteria’s that need to hold, these are:

- A privately held company is converted into a public company (totally or partially)
- The equity is offered to a broad range of public market investors
- It is possible, for the first time to buy shares in an offering from this company by public market investors
- The shares are afterwards traded in a secondary market, which allows for regular trading
- The transaction leads to a cash inflow either for the selling company, the selling shareholders or both[2]. Shipper and Smith (1986) also states that the shares offered in the IPO can be both a new issuance from the subsidiary or a sale of existing shares owned by the parent company.

Second, below is a simple figure showing the ownership structure before and after an equity carve-out. Prior to the carve out, several shareholders own the parent company which is publicly traded. The parent company owns the majority i.e. voting rights of minimum 50.01% in the subsidiary, which at the time of the IPO is a legal entity. This approach is slightly more relaxed compared to Vijh (1999), who requires fully owned subsidiaries i.e. 100% ownership. The majority approach is in line with recent research.

Table 1 – ECO transaction overview



Source: Authors creation

Third, in some carve-out cases a legal entity is formed during the IPO process in order to divest the business unit, in other carve-out the business is already a legal entity beforehand. The carved-out business must be a legal entity at the time of the IPO.

[2] Pojezny, N (2006). pp 8

Fourth, After the carve-out transaction the new shareholders own a part of the parent company, where the parent has decreased its position in the subsidiary company through the IPO. There is not a requirement to the ownership of the parent company after the ECO in the literature. In this study the average ownership of the parent company in the subsidiary after the IPO is 33.6%[3].

Fifth, to analyse the performance of the parent company after the ECO, the parent company must be public. This way the value of the parent company can be determined based on stock price development.

Sixth, the offering takes place to the public. As a difference to spin-offs existing shareholders do not receive direct equity in the divested company on a share-per-share basis. They primarily receive the proceeds and potential divestiture gains. Even though, some companies have issued pre-emptive rights to their existing shareholders, for them to gain directly of the ECO. Pre-emptive rights allow shareholders in this case, from the parent company to buy shares in the subsidiary before the public or non-parent shareholders are. This might also happen at a discount.

1.3 Equity Carve-Out vs other types of restructuring

Appendix 1 summarizes some of the most used financial and portfolio restructuring tools. The most common financial and portfolio restructuring tool is the spin-off. In a spin-off a parent company (in this example exchange listed) distributes shares in the subsidiary to existing shareholders of the parent company. The shares are often distributed as a special dividend from the parent company. Since no new shares are offered and the subsidiary shares a distributed as a special dividend there is no cash inflow to the parent or the shareholders, in contrast to an ECO. At last a spin-off most often contain full separation from the parent company, whereas an ECO most often entails that the parent maintain an ownership position in the subsidiary. Below is a table, that sum up the main differences in the two restructuring tools.

[3] Pojezny, N (2006). pp 9

Table 2 - Equity Carve-out vs Spin-Off transaction characteristics

	Equity Carve-Out	Spin-Off
Description	Initial public offering of a majority owned subsidiary	Parents distributing shares to excisting shareholders in a subsidiary
Degree of separation	Most often partial	Complete
Proceeds go to	Parent/and or subsidiary	No proceeds
Owner of subsidiary	New and/or existing investors	Existing investors
Ownership stake of parent after transaction	**50-99%**	0%
Trading post event	Yes	Yes

Source: Authors creation

Other financial and portfolio-based restructuring tools are also used. To mention some of them: A sell-off is a full divestiture of the subsidiary, where the cash inflow is fully received by the parent company or its shareholders. The subsidiary is most often not traded on a secondary market afterwards, as the acquisition is made of the whole asset/business unit.

A Tracking stock issue is a stock issue of a division, which follows performance on that given division. It is most often not listed separately from the parent but as a different share class. The new share class has different rights to return of the separated business unit. [4]

A Split-up is a when a parent transfers all its assets/business units into separate companies. The parent will most often seize to exist afterwards, and the shareholders will receive equal ownership in the new entities (Hurlbut M. H., Miles A. J, and Woolridge R. J, 2002).

1.4 Main research question

The current studies regarding equity carve-outs are based on data from the 80', 90's and 00's following the initial beginning of the divestiture type. More recent research has not been conducted since the number of ECO's are rather limited in recent years. But even though limited compared to earlier ECO's are still used and the volume tend to spike in certain periods, making a more recent study relevant. The data in the thesis includes 2 business cycles over 20 years. The thesis will look at US based subsidiary firms only, where parent firms can have all nationalities. More recent research has been conducted in Europe. Besides the relevance of a more recent study in the US there have been a limited focus on the industry relevance when looking at ECO's. The thesis thus

[4] The Balance. (2019). *Understanding a Tracking Stock. URL*

seeks to take a deeper look in the industries which displays the highest number of ECO's. Following this, two primary research questions are formed.

Primary research questions

1. *How does the stock of the parent firm react when an equity carve-out is announced and in the following 18 months of the announcement? How does the carved-out subsidiary stock react and perform at, and following the initial public offering?*

2. *What explanatory variables can be identified to have an impact on the short, medium- and long-term stock performance for both parent firms and subsidiaries? and does the significance of these differ between industries?*

The thesis further seeks to determine the characteristics of the parent and subsidiary firms in terms of operating performance and the risk associated with the given stocks. In order to provide a valid answer to above research questions the empirical analysis starts with the gathering of market data followed by a proxy for the market reaction in order to calculate the abnormal returns. The market reaction is often proxied by the stock price movement compared to the day prior. The analysis will be partly separated in order to answer the research questions as both the parent firms announcing the equity carve-out and the subsidiary that is carved out will be analysed. The event date for parents will be the announcement day of the ECO and for subsidiaries their first trading day. To measure the short-term effects to the parent and subsidiaries a short-term event study approach is used. Where parents' cumulative abnormal returns are calculated, their abnormal return and for subsidiaries just the abnormal returns, which is in line with Campbell, Lo & MacKinlay (1997). To measure longer horizon market reaction a Buy-and-Hold Abnormal Return (BHAR) based approach is used. Both short and long-term approaches will be tested using two abnormal return models, known as the market model (MM) and the Market-adjusted Model (MAM). Whereas the MM will not be used for subsidiaries as they have no prior stock price development to forecast of the relevant alpha and beta coefficients. A series of explanatory variables will be tested to answer the second research question. The variables will be found in previous research, and throughout the thesis. It will allow to conclude potential short, medium and long-term predictive variables.

1.5 Delimitations

As the literature within equity carve-outs is vast it is not possible to cover it all. The first delimitation is geographical, as the subsidiaries are all listed in the US. This mean that in contrast to other research on the topic, that the parent firms can be located throughout the world. The approach was adopted as the findings of the subsidiary firms are weighted higher in the thesis compared to the general academic research already published on the topic.

Not all relevant hypothesis that will be put forward within the literature will be tested. A select few found most relevant will be commented on, and the results will be put in perspective towards the most relevant hypothesis not directly covered. It is not the goal of the thesis to generate or find a new generic hypothesis, but rather to test the current against a newer data set, focused more on subsidiaries and industries.

The market model will not be used in order to determine subsidiaries abnormal returns, as the model requires backwards looking pricing data to estimate alpha and beta, the subsidiaries does not have

such data. Further, it will not be used in the full extend when conducting the multivariate regression analysis, as the alpha and beta coefficients that should be used best describe the short-term abnormal returns. Putting too much trust in the MM on long-term will lead to model errors, as the coefficients used to estimate the abnormal return will be based on outdated data. A solution to solve this is to use a lagged beta, though the approach is not used.

The industry analysis will be based on the parent firm industries, thus excluding the subsidiary industry analysis also in terms of the univariate and multivariate regression analysis. Some of the Industry specific analysis will be excluded such as correlation and Sharpe ratio due to page constraints and the relatively small output of information that will be generated by such analysis. Further, as an example the High Technology industry will not be analysed as an independent industry in the multivariate regression, since the sample size is deemed too small, causing potentially invalid results.

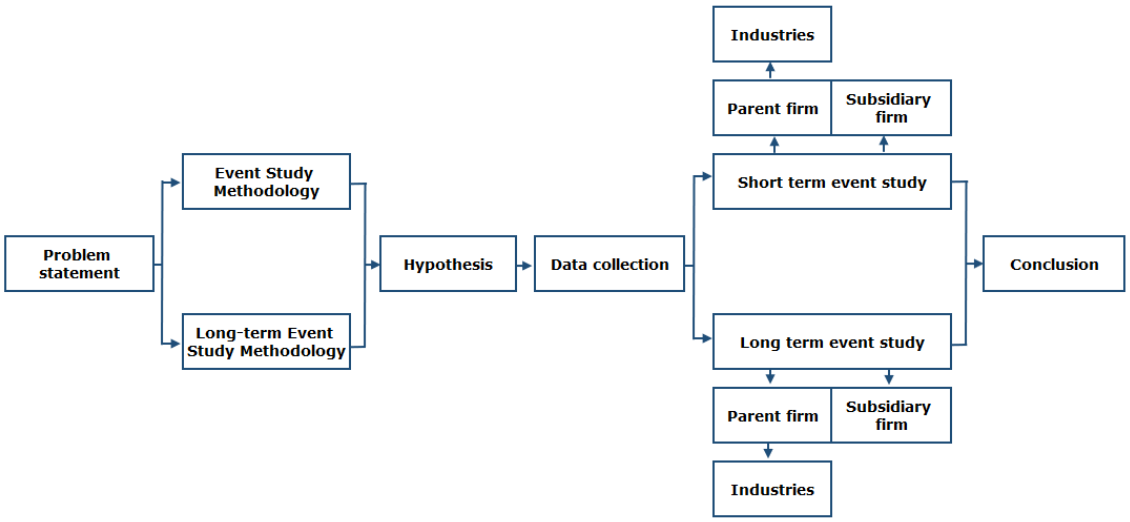
A Calender-Time-Portfolio approach introduced by Jaffe & Mandelker (1974) was excluded and the BHAR approach was adopted solely. The main reason was the criticism in the literature regarding the lack of explanatory power and the fact that the thesis will comment on the two market models, including a further comparison model would further complicate the presentation of the findings.

1.6 Structure of the thesis

In order to answer the research questions several analyses will be conducted, which will be divided into chapters. The structure of the thesis is based on 5 main chapters. **Chapter 1** have already been gone through as the introduction to the thesis. **Chapter 2** seeks to give clear interpretation of the different definitions, concepts and wording used throughout the thesis. Having established a common ground for the concept of ECO's. The third chapter consists of the methodology. **Chapter 3** is an extension of chapter 2 and looks at event study methodology including models for determining ST event studies, as well as medium-term (MT) and long-term (LT) event studies. In order to answer the two research questions regarding the short-term (ST) stock market reaction at announcement day two return approaches are used and described in chapter 3. The first is the cumulative abnormal return model known as CAR. The model centers around the event day with a [-1;+1] day interval cumulating the abnormal return. The second approach is the abnormal return approach at the event day, which is non-cumulative. In order to calculate the abnormal returns, it is for both return approaches essential to introduce the two used abnormal return models, in this case the Market Model (MM) and the Market-adjusted Model (MAM). The MM estimates the abnormal return using the [-220:-20] day alpha and beta coefficients. Whereas the MAM uses the realized market returns. For the MT and LT test horizon a buy-and-hold abnormal return (BHAR) approach is adapted, which is an accumulating return approach excluding the event day. Having established the methodology chapter 3 also introduces a literature review, in order to determine which explanatory variables which might be relevant to test for and to cover the hypothesis currently existing in the academic literature on the topic. **Chapter 4** will provide deep dive analysis of the data set, providing descriptive statistics, operational characteristics and industry specific characteristics and statistics. **Chapter 5 & 6** is the empirical data analysis and consists of 3 parts. The first part is the univariate analysis, which seeks to answer the first research question. The second part is a relative analysis conducted based on risk/return parameters. The third part is chapter 6, the multivariate regression analysis, which combines above chapters and test relevant explanatory variables, based on short, medium and long-time horizons for both parent firms, parent industries and subsidiaries. The third part will mainly answer the second research question. **Chapter 7** will include a discussion of relevance and **chapter**

8 will conclude on the findings. A visual display of above-mentioned switch between Event Study and Long-run even based studies can be seen below.

Figure 1 - structure of the thesis



*Authors Creation

1.7 Target group and contribution

The primary target group for the thesis is students, researchers and interested investment professionals, seeking current knowledge within the field of equity carve-outs. It is assumed that the thesis is written to peers, that have a basic understanding of the financial markets and theories. The thesis will therefore restrain from deeply explaining financial terms and models such as the CAPM, the efficient market hypothesis and so on. The thesis seeks to give an updated view on the American ECO market using data going through two major economic cycles spanning over 20 years. Further an industry specific approach is used, which differs from prior research. For the interested investor, the thesis seeks to provide empirical basis for investment strategies around ECO announcement, subsidiary IPOs and LT holdings in firms that have ECO's on their corporate action list.

CHAPTER 2 – Literature Review

The second chapter will cover the most relevant literature on the topic of equity carve-outs. It will list the findings of previous literature relevant to answer the research questions and elaborate on the hypothesis put forward. It will further list the hypothesis put forward in the thesis.

2.1 Motivations and Reasons for Equity Carve-outs

Numerous academic studies exist in the field of equity carve-outs and the associated stock price effects. The topic has generated interest among academics since 1980. Most of the studies are event based and focuses on short-term (ST) and long-term (LT) stock price reactions of the parent company around the announcement day of an ECO or subsidiary initial public offering (IPO). The findings in the literature are consistent stating that parent firms experience abnormal announcement day returns. It is observed from table 3 that the cumulative abnormal return (CAR) is in the interval of 1.23%-2.75%, with an average of 1.93%. Further, competing companies tend to incur negative announcement day returns, on both parent and subsidiary level. Table 3 list the main studies conducted (Not pre emptied), their estimation period (for alpha and beta using the MM) and findings regarding value creating in terms of abnormal returns.

Table 3 - ECO announcement day performance in literature

Author	Estimation period	Time period	Sample	Event window	CAR%
Shipper and Smith (1986)	[-280;-161]	1965-1983	76	[-4;0]	1.83%
Klein, Rosenfeld and Beranck (1991)	[-150;--50]	1966-1983	52	[-4;0]	2.75%
Slovin, Sushk and Ferraro (1995)	[-240;-121]	1980-1991	32	[0;+1]	1.23%
Michaely and Shaw (1995)	[-109; -10]	1981-1988	28	[-2;0]	1.20%
Hand and Skantz (1998)	[-450;-251]	1981-1995	265	[-1;+1]	2.29%
Allen and McConnel (1998)	[-450;-250]	1978-1993	188	[-1;+1]	2.00%
Chemmanur and Paeglis (2000)	[-245;-45]	1984-1985, 1991-1998	19	[-1;+1]	1.96%
Haushalter and Mikkelson (2001)	[-215;-15]	1994-1996	31	[-1;+1]	2.18%
Vijh (2002	-	1980-1997	336	[-1;+1]	1.94%
Vijh (2002	[-500;-250]	1980-1997	336	[-1;+1]	1.93%
Hulbert, Miles and Wooldridge (2002)	-	1981-1994	185	[-1;+1]	1.92%
Average					1.93%

Source: Authors Creation of Pojezny, N (2006).

Schipper and Smith (1986) studied 76 equity carve-outs of fully owned subsidiaries and found that on average the parents stock increase with 1.83% at announcement day. This finding is in contrast with their findings that a seasoned equity offering or debt offering leads to an average loss of 3%.

Two main hypotheses have in the years been proposed and studied in order to explain the stock price reaction of the parent at the announcement date of an ECO, the divestiture gains hypothesis

and the asymmetric information hypothesis. The fundamentals of the divestiture gains hypothesis were discovered by Schipper and Smith (1986).

2.2 Asymmetric information hypothesis

The asymmetric information model was first introduced by Myer and Maljuf (1984), whereas Nanda (1991) extended the model into a hypothesis. The initial study was conducted around seasoned equity offerings (SEO), where the main conjecture was that following a SEO the firm must have asymmetric information about the company's value. The management or board must think that the firm is overvalued otherwise they would not offer new shares. Nanda (1991) explores asymmetric information as a hypothesis to why parent firms have positive ECO announcement day returns. The concept of asymmetric information relies on one market participant exploiting having more information than another. In this case the market participant with all the information about the current parent firm and the subsidiary is the parent firm. The market participant lacking information is the financial markets, as participants in the market do not have proprietary/insider information in the subsidiary.

When deploying Nanda (1991)'s findings, which states that management can either issue equity in a subsidiary (ECO) or as a SEO in the parent firm in order to raise capital the management will act depending on their view on valuation in the parent and subsidiary. The framework touches upon how to consider ECOs, Nanda (1991) argues that managers or boards will issue equity in the subsidiary if they think it is overvalued instead of issuing equity in the parent firm. With this Nanda (1991) predicts that a divested position in an assumed overvalued subsidiary will lead to positive stock returns on the announcement day of the ECO. While the subsidiary will suffer a loss with negative returns in the first trading days, as it is presumed overvalued. The asymmetric information hypothesis assumes that 1) The parent firms stock will react positively to the announcement of an ECO, 2) The subsidiary must be overvalued and thus encounter negative announcement returns, 3) it does not assume anything on operating performance, thus it can be assumed that overvaluation is a sign of management expectations to lower than expected future performance.

Vijh (2002) tests a version of Nanda's (1991) asymmetric information hypothesis based on 336 ECOs in the US from 1980-1997. Vijh (2002) finds that returns increase, as the ratio of subsidiary relative to non-subsidiary assets increases in the parent firms balance. It is found that when the pre-ECO subsidiary assets exceed the pre-ECO non-subsidiary assets the average excess returns are 4.9% and only 1.2% the other way around. This contradicts Nanda (1991) as a majority of the subsidiary asset mass should be overvalued and not perform better than the undervalued non-subsidiary assets. The market reaction on announcement date is also higher when the parent carve-out a non-related business, than when it carve-out a related business, indicating a divestiture gain.

2.3 The divestiture gains hypothesis

Schipper and Smith (1986) conclude on 4 explanations of the announcement date gains 1) Due to the separation of parent and subsidiary management can focus on core business and the likelihood of foregoing positive NPV project decreases. 2) Analyst coverage increases, and exchange regulation is set in making more information available and demanded by the analyst. 3) A potential takeover might increase the market value of the subsidiary. 4) Incentive oriented market value-based contracts for subsidiary managers might increase firm and shareholder value, by optimized operations. The divestiture gains hypothesis holds several sub hypotheses, all predicting that the subsidiary and the parent in some way will both be more competitive businesses diversified. The

following sub hypothesis should be seen as a whole, contributing each of them to the divestiture gains hypothesis.

2.3.1 Fundraising hypothesis

The purpose of raising capital can be many depending on firm specific situations. The proceeds from the carve-outs can either be used as a cash inflow to the parent, the subsidiary or both, depending on which type of carve-out transaction it is. Allen and McConnell, (1998) studies a managerial discretion hypothesis, where the management only engages in ECO transactions if they have capital constraints. They find that parents with capital constraints are more prone than non-constrained companies to engage in ECO transactions of subsidiaries in order to generate cash-flow for the parent. Financing in this case becomes the main driver for engaging in ECO transactions.

Allen and McConnell (1998) states that in accordance with Jensen (1986), managers value control over assets higher than an effective organization. This leads to managers being reluctant to carve-out subsidiaries unless they a have capital constraints. This is mentioned as the "managerial discretion hypothesis". Consistent with this hypothesis they find that subsidiaries tend to have lower operating performance and higher debt ratios than parents. They find support for the divestiture hypothesis as well, as abnormal returns following an ECO is higher when the proceeds are used to pay down debt rather the retained.

Vijh (2002) agrees with Allen and McConnell, (1998), that fundraising is the main motive for ECOs and can explain some of the divestiture gains. But also introduces two new hypotheses in order to further explain the motive. There are two main transaction types, a primary placement and a secondary placement. In a primary placement new shares are offered directly in the subsidiary, making it cash-flow neutral for the parent. The parent's ownership of the subsidiary will in this case get diluted due to the offering. The proceeds are accrued to the subsidiary enabling it to finance new activities, projects or change its capital structure. In a secondary placement the parent firm will sell their shares as part of the listing, whereas there will be no shares issued by the subsidiary. The transaction is cash-flow positive for the parent firm, where the full proceeds are accrued to it, whereas it is neutral for the subsidiary (Wagner, 2004; Vijh 1999 and 2002). An ECO can also contain a mix of the two above mentioned offerings. The financing strategy hypothesis puts focus on the use of the proceeds.

2.3.1.1 The Investment strategy hypothesis

The Investment strategy hypothesis is when proceeds, through a primary placement accrues to the subsidiary and the main purpose is to finance investment opportunities. It is further discussed by Schipper and Smith (1986), Allen (1998), Powers (2003), and Frank and Harden (2001). Their empirical findings show that parent firms carve-out their subsidiaries because they have higher growth and tend to be more profitable than the parents. Their conclude that when the transaction is primary, and the proceeds goes to the subsidiary it is to finance future growth opportunities. Further evidence is collected by Vijh (2002) and Schipper and Smith (1986), regarding equity carve-outs in high growth industries.

2.3.1.2 Contracting efficiency hypothesis

Schipper and Smith (1986) introduces the first hypothesis of contractual type to have an influence on the positive announcement period return for the parent company. Even though they provide no evidence of their hypothesis, they conject that an equity carve-out results in a set of more efficient and simpler contracts between the firm and the managers. The main pillar in the hypothesis is that, the compensation packages to subsidiary managers can be based on stock price development and with stock compensation. Having more efficient contracts on parent and subsidiary level will likely influence the operating performance in a positive manner.

The hypothesis further predict that parent firms will react positively to carve-out announcements, parents rivals will reach negative to carve-out announcements and subsidiary rivals will react negative to carve-out announcements (Schipper and Smith 1986). though, the hypothesis cannot be accepted, since Nanda's (1991) signaling model rejected the rivals to have a negative stock price reaction upon announcement date.

2.3.1.3 The Incentive alignment hypothesis

The Incentive alignment hypothesis is a specific case of the above-mentioned contracting efficiency hypothesis. It is set around the subsidiary managers, where it argues that improvements in performance and stock price development is due to the incentives offered to these managers. The ECO allows the subsidiary to offer stock-options, warrants and other incentive-based stock dependent instruments, that would not have been possible to offer if the subsidiary were privately held (Aron 1991 and Allen 1998). High growth companies tend to offer their executives a higher proportion of stock-based incentive plans (Gaver 1995). A characteristic of ECO's, is that the subsidiaries experiences significantly high growth, compared to their parents. A public subsidiary might attract more qualified executives due to their potential incentive schemes. Powers (2003) acknowledges that some parents carve-out their subsidiary with the motive of creating a more effective organization.

2.3.1.4 Corporate focus hypothesis

Comment and Jarrell (1995) implied that the managerial skills needed in order to manage a firm vary from each business unit if the units do not contain the same core elements. With this they argue that it is not self-explanatory that the management for the core business is as good as managing the non-core business. Intuitively it makes sense, that management cannot be experts in all the matters of a given firm, if the firm's business varies cross sectional. Thus the diversification of a non-core business unit in this paper an equity carve-out, can be used to test if carve-outs of non-core or core assets perform best over time, but also the market reaction on announcement day (Boone, et al. 2003).

2.4 Sources of short-term value creation

The previous review of the literature indicates that ECO's create value on the announcement day for the parent firm. The following section sums up the most notable sources of value creation at announcement day. The sources of value creation are a derivative of the previous stated hypotheses. The sources of value creation differ depending on which of the two main hypothesis that are used to explain the value creation. In the context of an ECO Hennings (1995) states that

there are 4 enterprise value enhancements: 1) Increase of cash flows 2) Reduction of cost of capital 3) Disclosure of hidden reserves and 4) Reduction of information asymmetries.

2.4.1 Cash Flows

The proceeds can flow to the subsidiary or the parent depending on the transaction structure as mentioned under the fundraising hypothesis. In a private placement the subsidiary gets the proceeds enabling them to pursue further and current growth opportunities. In such a case the book value of equity will increase in the subsidiary. When making such a transaction the proceeds must be applicable to positive NPV projects that were not redeemable as a part of the parent company due to capital constraints.

In a secondary transaction where the parent firm offer a portion of their shares in the offering the cash flow will affect the parents balance sheet directly. No proceeds will go to the subsidiary. The main motivations for such transaction seen from the parent firm's perspective is capital structure optimization. Related actions might be taken upon the transaction such as debt repayment, dividend payment, investments in non-subsidiary related business units. It should in general be seen as a redistribution of capital and change in capital allocation from one business unit to another.

2.4.2 Reduction of capital cost

Cost of capital is influenced by a variety of elements ranging from economic macroeconomic factors, company specific factors and fundamental factors. An ECO might be conducted to influence the fundamental factors such as risk and preference of capital provider. Further company specific factors such as capital structure policy, dividend policy and investment policy influence the cost of capital.

The fundamental factor such as risk, is looked upon as company specific risk. Initiating an ECO might reduce risk in the parent firm. As mentioned earlier subsidiaries tend to cater high growth opportunities, which entails all thing being equal higher risk. A high-risk subsidiary affects the total risk of the company using any risk weighting scheme. Divesting such risk, or some of that risk can lead to lower total risk, leading to lower capital cost, as debt will become cheaper as will equity[5]. Further, the risk of financial misallocation i.e. dis-optimal capital distribution is lowered in an ECO[6].

Risk can also be seen in perspective of equity analysis and fundamental valuation of stocks using a discounted cash flow model. Having lower company specific or unsystematic risk will lead to a decrease in the Weighted Average Cost of Capital (WACC). The smaller discounting factor itself should lead to a higher valuation but, since some of the growth is subtracted from the parent firm due to the ECO it should be, in accordance to the efficient market hypothesis an Miller-Modigliani a zero sum transaction, but according to the information asymmetry hypothesis it might not always be the case.

2.4.3 Disclosure of hidden value

Going through the prospectus process as part of the IPO all assets, liabilities and equity must be disclosed an allocated specifically to the subsidiary. The parent has in most cases not listed all the subsidiary's income statement, balance sheet and cash flow items separately, thus shedding light

[5] Efinancemanagement.com (2020). *Factors Affecting Cost of Capital*. URL
[6] Hornung, K., Wullenkord, A. (2001), pp 60

on new information in both companies' seen from an analyst point of view. Following the process hidden reserves, defined as shares of equity capital not currently listed on the balance sheet of the parent, is disclosed more clearly. The new classification of balance sheet items and hidden reserves increases the information available for analyst. Further, all new value uncovered will be priced into the current stock price of the parent. Disclosing hidden value also leads to more transparency on management performance between different business units. Making investor judgement easier.

2.4.4 Information asymmetries

The Information asymmetry hypothesis has two primary sub hypotheses. One regarding the management decision and motivation for an ECO and the other concerning more transparency and less information asymmetries as a value incubator. Since Vijh (2001) shows findings contradicting the first hypothesis elaborated in section 3.1.

The second variant of the hypothesis is mentioned by Langenbach (2001), who argues that an ECO mitigates some of the information asymmetries between the subsidiary, the parent firm and the actors in the financial markets. A higher level of transparency, quality and quantity of subsidiary information allows for analyst to better cover the subsidiary and offer more precise evaluation. A higher level of quality and quantity regarding information and the information requirements in the IPO process makes the subsidiary and arguable the parent firm more transparent and investable for a variety of investors. As demand might increase for the stocks, supply in this case stays the same, indicating higher equilibrium prices[7].

2.5 Long-term performance

Another part of the literature relevant for this thesis is the LT stock price and operating performance of both the parent and the subsidiary, where a variety of the mentioned ST hypotheses are applicable for the long horizon to. But, in order to capture the total value created by the carve-outs, it is not sufficient to look only at announcement date abnormal returns. Allowing for a LT perspective will also allow to test the ST hypothesis further. An overview of the past literature looking into LT stock performance of parent and subsidiary is shown in table 4.

[7] Mathesius, J. (2003), pp 65

Table 4 – Long-term stock market effects from the literature

Author	Time period	Sample	Object	Event window	Abnormal Return
Vijh (1999): BHAR adjusted by market index	1981-1995	628	Parent	[0;+12]	-5.8%
				[0;+36]	-4.3%
			Subsidiary	[0;+12]	1.3%
				[0;+36]	-2.9%
Vijh (1999): BHAR adjusted by size & Book to market	1981-1995	628	Parent	[0;+12]	-0.6%
				[0;+36]	-0.7%
			Subsidiary	[0;+12]	5.2%
				[0;+36]	8.0%
Vijh (1999): CARs adjusted by size and industry	1981-1995	628	Parent	[0;+36]	-12.6%
			Subsidiary	[0;+36]	-5.7%
Vijh (1999): CAR adjusted by size & Book to market	1981-1995	628	Parent	[0;+36]	-3.0%
			Subsidiary	[0;+36]	5.0%
Anslinger, Bonini, and Patsalos-Fox (2000)	1988-1996	46	Parent	[0;+24]	5.2%
		67	Subsidiary	[0;+24]	12.8%
Annema, Fallon, and Goedhart (2001)	1990-2000	200	Parent	[0;+24]	-21.5%
			Subsidiary	[0;+24]	-10.0%
Powers (2001)	1981-1998	181	Parent	[0;+12]	-7.7%
			Subsidiary	[0;+12]	-8.0%
Gleason, Madura, and Pennathru (2006)	1981-2001	91	Parent	[0;+12]	-23.2%
				[0;+18]	-25.7%
		112	Subsidiary	[0;+12]	-16.2%
				[0;+18]	-24.4%
Average			Parent		-9.1%
			Subsidiary		-3.2%

Source: authors interpretation of Pojezny, N (2006).

A quick look into the past literature of table 4, indicates that the LT abnormal returns for subsidiaries seems higher than for parent firms. Vijh (1999) examines a period from 1981-1995 using 628 carve-out transactions. He examines the carve-outs LT performance based on a 12- and 36-month interval. The approaches and benchmark vary and are based on 3 main approaches. The first is based on BHAR adjusted by the market index. With this approach it is found that the parent firm underperform in both 12 and 36 months. The subsidiary outperforms the relevant market index with 1.3% in the first 12 month and underperform over a 36-month period. Vijh (1999) further uses a BHAR adjusted by size and book-to-market value (B/M). Using this approach parents underperform the market slightly, whereas subsidiaries outperform the market with 5.2% in 12 months, and 8% in 36 months. Further a CAR approach is used adjusted by size and industry and at last by size and B/M. The findings of the study are in contrast with Loughran and Ritter (1995) studies on IPOs and SEOs. They find that IPOs in generally have a raw return on 3.4% during the first three years after the IPO, and 4.7% for SEOs. The ECOs studied generate a raw return on 14.3%, substantially above the return for the peer IPO and SEO transactions. This contradicts the findings of Prezas et al. (2000) who finds that carve-outs do not experience significantly higher BHAR than matched IPOs.

Anslinger, Bonini and Patsalos-Fox (2000) explores the performance of 46 parents and 67 subsidiaries from 1991 to 1995. Using a buy-and-hold abnormal returns approach they find that subsidiaries and parents over a 24-month period both outperform their relevant index with respectively 12.8% and 5.2% . Subsidiaries again, seem to be the best performing of the two. In contrast, Madura and Nixon (2002) explores 88 ECOs from 1988 to 1993, also using a BHAR approach. The study examines 4 time periods, 6, 12, 24 and 36-month, finding that the parent firms mean cumulative return is -39.6%, suggesting that the transactions are LT value destroying for parent firms.

Power (2001) reports that based on a BHAR approach parent firms and subsidiaries underperform with respectively -7.7% and -8%, based on 181 ECOs from 1981 to 1998 and a 12-month period.

Power (2003) documents positive BHAR for the first 12-36 month but negative for year 4 to 5. He further reports that operating performance, measured as ROA peaks at issue, whereas it is declining statistically significantly afterwards, for the parent firm. Subsidiaries tend to outperform their matching group in terms of operating ROA performance the first year of listing. He further argues that the performance is declining relative to the portion of shares sold in the subsidiary. Further, he finds that the same relationship is with the LT stock performance, concluding that the more shares the parent sell in the ECO, the poorer the operating and stock performance will be LT.

2.6 Thesis Hypothesis

Though many of the above-mentioned hypothesis centers around characteristics the thesis seeks to test the hypotheses in order to fully answer the two main research questions. The hypotheses are based on the findings of the previous literature on the topic.

Related literature hypothesis:
The asymmetric information hypothesis
"Parent firms will at announcement date incur average abnormal returns, whereas subsidiaries will incur average abnormal losses"

The divestiture gains hypothesis
"The parent firms will see better operating performance leading up to the ECO which will influence their abnormal returns positively in the period after, where subsidiaries will incur better operational performance following the ECO"

"Operating characteristics such as debt/asset levels, ROA, and sales influences the short, medium and long-term related to abnormal returns"

"Subsidiary ECOs conducted during a crisis tend to outperform related to short-term and underperform in the long-term"

"ECO subsidiaries within the same industry as parents underperform related to abnormal returns short, medium and long-term"

Model error hypothesis
"Industry abnormal returns are influenced differently from the explanatory variables in both the short, medium and long run"

CHAPTER 3 – Methodology

The third chapter introduces how the data is gathered and the broad characteristics of the data. It will further go into dept with the methodology used throughout the thesis. It will mention event study methodology, models for determining abnormal returns both short -and long-term. It will touch upon the multivariate regression analysis assumption and the validity and reliability.

The thesis will take a deductive scientific approach, starting with former theory and research on the topic, then form a hypothesis/research questions, then it conducts the relevant quantitative analysis and thus conclude on the research questions.

3.1 Data and sample selection

Throughout the thesis raw data subtracted from two primary financial database providers have been used, the Thomson One database and a Bloomberg terminal. The data from the Thomson one database consists of relevant transactional information, including relevant equity carve-out information with parent names, subsidiary names, dates, macro industry and ownership. A double check and filling out missing data points to the Thomson One data was done using the SEC.gov database, which contains all corporate action information from the US. Bloomberg was used to subtract relevant stock prices used in the return calculations for both the parent firms, subsidiary firms and their matched market returns. Further, the operational characteristics data was subtracted from Bloomberg as well.

All tables displayed from this point are the authors creation based on Bloomberg and Thomson One data unless otherwise stated.

The sample from Thomson One contains ECO's in the US over a 20-year period from 1999 to 2019. A 20-year period is used in order to spot cyclicality and trends during up and down turns in the economy. When searching the Thomson One database the definition of an Equity Carve Out is in line with the theoretical definition which *is "Equity carve-outs are transactions where publicly traded parent companies "carve-out" a part of their subsidiaries' outstanding shares through an initial public offering (IPO)"* (Ghosh et al,. 2012).

A partial sale of a subsidiary shares to the public is required, along with maintained controlling interest in the subsidiary from the parent. Initially screening for Spin-off (Equity Carve-out) to include subsidiary IPOs listed 10.041 results in Thomson One's database. Limiting the IPO date to be between 01/01/1999 and 01/01/2019 limited the search to 604. Further limiting the search to only contain public ultimate parent companies was tried, inflicting an issue. Several of the ECO's had ultimate parent companies which were of private status, whereas the immediate parent was public. A manual extraction of public ultimate parents[8] and immediate parent[9] was conducted, including 320 ECO's in the search. Further excluding all Private Equity backed IPO's entailed a final number of 117 ECO's used in the thesis. ECO's with market cap under USD 75 was deselected due to potential trading volume liquidity issues and lack of maturity of the spun off company, potentially inflating the

[8] An Ultimate parent is the final beneficiary which is often a private holding company
[9] An Immediate parent is the company that actually carve-out the subsidiary.

volatility research in the analysis. Further parents that are listed fund managers and private equity funds are deselected, as they do not qualify.

The data was double checked with the SEC.Gov database for IPO filings and on the investor relations pages on each company. The Thomson One data was incomplete regarding % of subsidiary spun off and parent ownership before and after the IPO, to gain this data the S1/A filings was searched and manually transcribed. Further, announcement date and equity ownership before and after was double check. Below number of ECO's are consistent with previous studies conducted on the topic.

The panel below presents the distribution of the ECO's across the sample period of 20 years.

Issue Date	#	#%
1999	18	15%
2000	13	11%
2001	8	7%
2002	3	3%
2004	2	2%
2005	2	2%
2006	6	5%
2007	1	1%
2008	1	1%
2009	2	2%
2010	1	1%
2011	3	3%
2012	10	9%
2013	18	15%
2014	13	11%
2015	8	7%
2016	3	3%
2017	1	1%
2018	4	3%
Total	117	

The panel below presents the distribution of the ECO's across the different sectors.

	Subsidiary Sector	Parent Sector
Consumer Products	5	4
Consumer Staples	3	3
Energy and Power	30	28
Financials	18	27
Healthcare	3	5
High Technology	18	12
Industrials	10	6
Materials	6	8
Media and Entertainme	5	7
Real Estate	8	2
Retail	4	7
Telecommunications	7	8
Total	117	117

Finally, some further complications incurred towards some of the firms, limiting the empirical analysis to 112 firms. The data is displayed in appendix 1 & 2.

3.2 Event study methodology

The academic interest in event studies related to stock market behavior have been a hot topic within financial economics since Farma et al. (1969) introduced their well renowned event studies. Later followed several event studies on the back of the approach used by Fama et. al. The most well

established within both academics and practitioners are the Fama & French (1992) 3 factor model for predicting stock market returns, based on 3 factors they found statistically significant to prior stock return development. Event study methodology contribute to a deeper understanding of the stock market effects from specific corporate actions and firm characteristics.

The methodology is used in order to test economic models but also as in this paper to measure the impact on stock prices based on specific events or determinants like factors or other explanatory variables. The efficient market hypothesis states that in an efficient market everything is priced into the security. Though it is not possible to generate abnormal returns without increasing the associated risk as stated in the CAPM equation. Jensen's Alpha was introduced by Michael Jensen in 1968, slightly before his contribution to the above-mentioned study by Fama et. al. (1969). Jensen's alpha is an addition to the Capital Asset Pricing Model (CAPM), that includes an abnormal return parameter, which is elaborated further in section 3.3 (Models for estimating abnormal returns). The main point of interest within even studies is to test if a set of explanatory variables have a statistical significance on the performance of stock prices in a given data set. The tests conducted will test the hypothesis, that the abnormal returns equal zero. In a broader perspective event studies are a way to test for market inefficiencies.

3.3 Models for estimating abnormal returns

To gauge the market reaction at the announcement date for parent firms the excess returns will be calculated both short-term (ST) and long-term (LT). The ST will be based on an event window of [-1;+1] days for the parent firms. For the subsidiaries, a ST performance will be based on an event window of [0;0] days, containing only the event day. The MT/LT horizon will be the same for both parent and subsidiary at respectively 30 days, 90 days, 125 days, 252 days and 360 days.

When testing for both ST, MT & LT post-event performance a variety of return models can be appropriate. The most common is the market model (MM), which is highly preferred by researchers when testing for ST abnormal returns. Brown and Warner (1980) states that the MM is powerful and even though more complex return models are present it yields similar results. Previous studies within equity carve-out literature prefer to use the MM for ST horizons as it does not overcomplicate the input requirements and again, yields similar results.

Another model used frequently in the literature is the more simplistic market-adjusted model (MAM), which simply subtract the realized return of the given stock with the matched market return of that same stock. Both models are elaborated further on below.

When estimating the expected return, there is two primary models - The MM and the Capital Asset Pricing Model (CAPM). Both seek to yield the expected return based on a number of input parameters. The models are specified below. With following defined parameters:

$R_{it} = raw\ return\ for\ security\ (i)\ at\ time\ (t)$

$r_f = Risk\ free\ rate$*(t-bill is used)*

$\beta_i = observed\ beta\ for\ security\ (i)$

$R_{mt} = Market\ return\ at\ time\ (t)$

$e_{it} = residual\ return\ (error\ term)\ for\ security\ (i)\ at\ time\ (t)$

$a_i = observed\ alpha\ (intercept)\ for\ security\ (i)$

$AR_{it} = abnormal\ return\ for\ security\ (i)\ at\ time\ (t)$

Capital asset pricing model (CAPM)

$$R_{it} = r_f + \beta_i(R_{mt} - r_f) + e_{it} \quad (1)$$

The market model (MM)

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \quad (2)$$

where the error term e_{it} in the MM is the abnormal return also known as the residual return.

As the thesis seek to calculate the abnormal return in order to test for significance in performance and significant explanatory variables the MM approach is used. The model adjusts for alpha, whereas alpha is only captured in the error term of CAPM. The MM is often preferred over CAPM as the latter imposes a restriction not incurred by the MM. CAPM's intercept is the risk-free rate, causing the error term, in which the abnormal return is isolated in, increases the variance of the error term and thus resulting in worse model. Increased variance imposes weaker test statistics as the standard deviation of the error term is used to construct the test statistics. Using such model will yield more noise. The MM has alpha as its intercept which is calculated as the intercept using the return data from the 200 days before the event date- i.e. [-220, -20]. Beta is calculated on the same basis using a linear OLS regression approach. Bartholdy et al. (2007, p. 228) states that a standard estimation period is between 200-250 observations before the event date. The calculation of the MM abnormal return can be done in two ways, thus resulting in two different models. The MM and the MAM. The MM abnormal return is calculated using the above stated estimation period to define the two coefficients, alpha and beta and plotting the estimated coefficients into equation 2. Rearranging equation 2 and assuming the model displays no error term the abnormal return is stated in equation 3 (Dasilas, A. Leventis, S., 2018).

$$AR_{it} = R_{it} - \left(\hat{a} + \hat{\beta}_i R_{mt}\right) \quad (3)$$

As above require an estimation period to determine the abnormal return (AR) it cannot be used for IPO firms, in this case subsidiaries. Further it is not suitable for LT performance measures, as it will result in the estimation period being too far ago, i.e. more than the recommended -250 days by Bartholdy et al. (2007, p. 228). A solution is to include the coefficients in the following period, thus using a lagged alpha and beta approach. The approach will overlap with the event date, thus inducing a model issue. Using the MM and assuming the model parameters beta = 1 and alpha = 0 yields the

market-adjusted model for abnormal returns. The model is applicable for each firm and can be specified as stated in equation 4.

$$AR_{it} = R_{it} - R_{mt} \quad (4)$$

The MAM for calculating the abnormal return does thus not take historical performance into account, making it suitable for LT event studies and for testing IPO's LT performance.

An issue with above models was raised by Scholes & Williams (1977), who in broad terms highlighted, that thinly traded securities (with low volume) might produce wrong beta estimates, as the price movements are not captured correctly. A solution for this is to use a lagged beta approach. This will not be adapted in the thesis, as small (market cap) firms are excluded thus assuming decent volumes and correct price movement capturing by the Bloomberg database.

3.4 Models for testing short-term abnormal returns

When calculating ST, stock performance it is most common, within the literature, to use the cumulative abnormal returns (CAR) and the abnormal returns (AR). The single period AR can be calculated using the previous mentioned MM and the MAM for abnormal returns. Whereas using CAR is based on the accumulation of the single period AR. Fama (1998) states that abnormal returns can simply be summed, thus indicating that it is calculated as in equation 6.

$$CAR_{it} = \sum_{t=1}^{T}(R_{it} - E[R_{it}]) = \sum_{t=1}^{T}(AR_{it}) \quad (6)$$

Showing that CAR_{it} is the cumulative abnormal return over a given time period (t). CAR is most often used in event studies in order to determine the return effects of ST shocks to the stock, such as M&A activities, corporate actions and in this matter ECO's.

Besides using CAR, a simple AR calculation based on both the MM and the MAM will be used. It should be noted that the approach has flaws, such as not accounting for lag effects in market reactions and potential significant post announcement day losses. But it is essential in order to compare the parent and subsidiary firms. For the subsidiary firms, the MM parameters cannot be calculated, due to their lack of historic return figures prior to the IPO (event date). Making it impossible to estimate the required alpha and beta coefficients.

As the thesis contains two samples of firms, the parent portfolio and the subsidiary portfolio an equally weighted portfolio assumption is used calculating the total abnormal return for each portfolio. The cumulative average abnormal return (CAAR) is referred to as CAR using the portfolio approach, which applies when using the simple AR too, it is known as the average abnormal return (AAR) for portfolios. The daily returns are aggregated both using the AR and CAR in order to receive the AAR or CAAR. Going forward it should be noted that the thesis uses this approach but still refers to the CAAR and AAR as CAR and AR. Equation 7 displays the AAR and CAAR

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad and \quad CAAR_{it} = \frac{1}{N}\sum_{n=1}^{N} CAR_{it} \quad (7)$$

3.5 Models for testing long-term abnormal returns

When calculating LT stock performance, it is within the literature most common, to use BHAR. As noted by a variety of researchers like Agrawal et al (1992), Barber & Lyon (1997), Mitchell & Stafford (2000) and many others BHAR is suggested as the most efficient approach. The model seems to cause less distortion and less bias in the predictors due to its more simplistic approach according to Barber & Lyon (1997) and Kothari & Warner (2008). It can be described as follows by Micthell & Stafford 2000; page 296 *"average multiyear return from a strategy of investing in all firms that complete an event and selling at the end of a pre-specified holding period versus a comparable strategy using otherwise similar non-event firms*". As part of the event study approach both BHAR and CAR uses the matched market (S&P 500) returns at the event date, thus ignoring actual dates when conducting the portfolio returns as all are taken at event date. Equation 8 displays BHAR.

$$BHAR_{it} = \prod_{t=0}^{T}[1 + R_{it}] - \prod_{t=0}^{T}[1 + R_{mt}] = \prod_{t=0}^{T}(1 + AR_{it}) - 1 \quad (8)$$

where BHAR is the buy-and-hold abnormal return of a security (i) at time (t). R_{it} is the arithmetic return of a given security or portfolio (i) at time (t). And R_{mt} is the arithmetic return of a market security or portfolio i at time t. AR_{it} is the abnormal return of a given security or portfolio (i) at time (t). BHAR can as well as CAR be calculated using an arithmetic mean portfolio approach thus obtaining an average buy-and-hold abnormal return. Throughout the thesis this will be referred to as the portfolio ABHAR or simply BHAR.

$$ABHAR_t = \frac{1}{N}\sum_{i=1}^{N} ABHAR_{i:(t,T)} \quad (9)$$

As mentioned earlier when calculating the abnormal return for both BHAR, CAR and AR the respective firms must be matched with a benchmark. Academics uses two primary approaches, known as the Reference Portfolio Benchmark and the Single Firm Benchmark. The reference portfolio benchmark used in the thesis is based on choosing a relevant market proxy in order to reflect the true abnormal returns. According the Barber & Lyon (1997) a number of issues arises using such approach. They recommend using the single firm benchmark approach. The later mentioned approach centers around finding a single firm for each of the firms within the sample that matches in correspondence with industry, market size, B/M together with a variety of other restrictions. They indicate that the issue with the first mentioned approach is that the abnormal return in LT is very sensitive to the benchmark, whereas it must mirror each firm as exact as possible. The reference portfolio used in the thesis is based on the S&P 500, as the index cover the largest 500 companies in the US. The main reason for choosing the reference portfolio benchmark is that parent firms and subsidiaries show unique features in the data, changing over time in terms of size e.g. it is not consistent with a single firm benchmark approach, as it's characteristics change over time.

Statistical tests

In order to test the statistical significance of the above-mentioned abnormal return models, the test statistics are computed using student's t-distribution. Further the degrees of freedom will vary around the number of data points. The null hypothesis is in this case either $H_o: BHAR_{it} = 0$ or $H_o: CAR_{it} = 0$ and $H_o: AR_{it} = 0$ which is tested for n firms within both subsidiary and parent firms. The test statistics follow the below listed t-distribution as stated in Barber & Lyon (1997).

$$t_{CAR_{it}} = \frac{CAR_{it}}{\sigma CAR_{it}/\sqrt{n}} \text{ (10)}$$

$$t_{BHAR_{it}} = \frac{BHAR_{it}}{\sigma BHAR_{it}/\sqrt{n}} \text{(11)}$$

$BHAR_{it}$ is the arithmetic average of the sample and $\sigma_{BHAR\ it}$ is the standard deviation of the abnormal returns based on a cross sectional sample of the n firms included in the analysis.

For the univariate analysis, a one sample t-test is conducted whereas, it will be based on a multivariate regression analysis for testing explanatory variables.

To sum up the event period for CAR , is for the parent firms [-1;+1] day around the event day 0. For subsidiaries and AR, the event day is [0], indicating that it is not cumulative around the event day.

The estimation window is only calculated to parent firms as it requires historical price data to calculate the alpha and beta coefficients. It is based on an estimation window of [-220:-20] days before the event day.

3.6 Multivariate regression analysis

Fama French (1993) used a 3-factor multivariate regression model in order to assess the LT effects on the stock prices by applying three factors. The factors tested was a market factor$[RM_t - RF_t]$, a size factor $[SMB]$ and a book-to-market factor $[HML]$. They modelled the excess returns of the portfolio by subtracting the risk-free rate at date (t) with the portfolio return at date (t): $R_t - RF_t$. By applying the MAM they expressed the following multi factor regression model:

$$R_t - RF_t = a + \beta_1 [RM_t - RF_t] + \beta_2 SMB_t + \beta_3 HML_t + e_t \text{ (5)}$$

The beta values and the error terms are estimated as part of the regression. Whereas instead of using the risk-free rate the above-mentioned market-adjusted return model will be used. This will be elaborated further in the section prior to the multivariate regression analysis. The above approach will be used to test relevant factors in the thesis. General factors known within the literature and operating factors will be tested, both on the total dataset but also on specific industries. This is done in order to test the factors influence within the different industries.

The main purpose of applying the factor approach in this case the multivariate regression is to explain the short, medium and long run stock performance of the parent and subsidiary firms. When conducting the regression an Ordinary Least Square (OLS) approach is used. In order to ensure the validity of the model a number of underlying assumptions have to by met (Brooks, 2008). The six assumptions will be briefly covered, they are all a reference to Brooks (2008).

1) The linearity assumption

   All the variables must be of linear character. If the variables display too extreme numbers a solution to mitigate the issue is to use the natural logarithm (LN) of the variable.

2) Mean of the error terms to be zero

   The average of the error terms are assumed to be zero, if there is a constant included in the model

3) Variance of the error terms to be constant

   If the variance of the error terms are not constant, thus not satisfying the assumption of heteroskedasticity. This can be tested using a White's test, where if heteroskedasticity is found it can lead to biased results.

4) Error terms are uncorrelated

   The error terms should not display autocorrelation as they are assumed random.

5) Error terms are normally distributed

   As the error terms are assumed random, they should follow a normal distribution in accordance to the central limit theorem.

6) Non correlation among the explanatory variables

   There is assumed no multicollinearity among the explanatory variables. A way to test for this is by using a Variance Inflation Factor (VIF) test and exclude variables with multicollinearity amongst them.

The thesis will take a similar approach as above using a multifactor regression model, where the definition of the variables will be introduced in section 6 - the multivariate regression analysis.

3.7 Criticism of CAR and BHAR

Using CAR and BHAR the primary criticism revolves around the potential difference from the used market return and the actual excess return compared to a completely mirrored firm, without the given event. As it is close to impossible in practice to find 100% matching companies and that indexes like the S&P 500 is often used reflect some of the critique (Fama, 1998). If an equally matched firm was found another issue arises. Kothari & Warner (2007) states that corporate actions are most likely the function of a set of factors leading up to the event. If a comparable firm displaying similar prior development of the given set of variables it is not fully comparable. Further when a single index is used the cross-sectional market correlation is not captured as when cross-sectional market indexes are used. Though the approaches have critique Barber & Lyon (1997) states that for increasing sample sizes the biases are mitigated.

3.8 Validity and reliability

The data input used in the thesis is considered valid. Even though it might require additional research and data gathering. The data gathered is all publicly available information if the public have access to the Thomson One database and Bloomberg Terminal. The thesis collects data from only acknowledged databases in order to ensure high validity. Previous literature thus references data collection from similar and the same databases. The data is essential in answering the research questions and thus display a degree of high relevance analysing the topic at hand.

As the validity issue centers around the quality of the data collected reliability centers around the extend of which the analysis and the techniques used can be replicated by peers. The thesis seeks to use data from recognized databases used previously in the literature. The approach is further fully explained in the previous methodology section, making it replicable. The size of the data set is considered decent and thus able to generate reliable results. The data is though not completely comparable with all previous research as methodology varies, thus making comparison harder. The thesis findings are both valid and reliable taking above mentioned into account.

CHAPTER 4 – Characteristics & Drivers

The fourth chapter will highlight the characteristics of the data set, going into dept with an industry specific analysis to spot differences and equals compared to the general data. Further, it analyses the operational performance measures such as revenue, ebitda, leverage levels and ROA. The analysis is the base in the multivariate analysis, as the explanatory variables are found.

4.1 General characteristics of the data sample

The average number of ECO's in the 20-year period is at 6.2, with substantial outliers. 7 of the years account for 75% of the observations, which leads to the relevance of looking further into the economic or sector specific market drivers in those years. The years around the dot.com bubble ranging from 1999-2002[10] makes up 36% of the total observations, whereas the period post the financial crisis from 2012-2015 makes up for 42% of the observations. Looking at the general IPO market in the US during the same period, the period around the dot.com bubble, ECOs accounted for 29% of the IPO's. During 2012-2015 ECO's accounted for 22% of the total IPOs. The average of ECO's as part of total IPO's is 4%, the ECO activity to general IPO activity is above average in following years: 2001, 2009, 2012, 2013 and in 2014. The biggest outlier being 2001 and 2013, with ECO's counting for respectively 10% & 14%.

Table 5 - Number of ECO's and IPO's based on year

Issue Date	#	#%	General IPO's	#%	ECO as % of total IPO
1999	18	15%	486	14%	4%
2000	13	11%	406	12%	3%
2001	8	7%	84	2%	10%
2002	3	3%	70	2%	4%
2004	2	2%	71	2%	3%
2005	2	2%	226	7%	1%
2006	6	5%	206	6%	3%
2007	1	1%	199	6%	1%
2008	1	1%	213	6%	0%
2009	2	2%	31	1%	6%
2010	1	1%	63	2%	2%
2011	3	3%	154	5%	2%
2012	10	9%	125	4%	8%
2013	18	15%	128	4%	14%
2014	13	11%	222	7%	6%
2015	8	7%	275	8%	3%
2016	3	3%	170	5%	2%
2017	1	1%	105	3%	1%
2018	4	3%	160	5%	3%
Total	117		3,394		

The industry distribution for both the subsidiaries and parent firms is shown in table 6. A small number of industries make up for most observations. Of the 12 industries listed 3 industries make up for 56% of the subsidiary industry distribution. The same industries make up for 57% of the parent firms. Energy & Power, Financials, and High Technology are the industries accounting for the majority of ECO's. In order to understand the drivers and identify potential ST and LT performance variables these industries are analysed further.

[10] Wollscheid, C. (2012). Rise and Burst of the Dotcom Bubble.

Table 6 - Industry distribution

	Subsidiary Sector	Parent Sector
Consumer Products	5	4
Consumer Staples	3	3
Energy and Power	30	28
Financials	18	27
Healthcare	3	5
High Technology	18	12
Industrials	10	6
Materials	6	8
Media and Entertainme	5	7
Real Estate	8	2
Retail	4	7
Telecommunications	7	8
Total	117	117

The average equity offering of the ECO's in the data are 33.6%, where most of the subsidiaries are wholly owned pre carve-out, with parent firms owns 96.8% on average. The average ownership after the transaction is 62.8%. The industry specific traits are especially shown in Consumer Staples and financials where the average ownership after the ECO in the subsidiary is 40.7% & 49% respectively. Substantially under the average. The equity offered shows the same distinctions in these two industries, with an average offering of 59.3% & 42.6% respectively. The ownership owned after the issuance can be an indicator of whether the parent firm seek to divest the carved-out subsidiary or seek to maintain their majority interest within the subsidiary. The parent firm's motivation is highly relevant in order to fully understand the sentiment behind the transaction.

Table 7 - Offering details in percentage

	Average % Ownership after	Average % ownership before	Equity Offered %
Consumer Products	73.2	99.9	26.8
Consumer Staples	40.7	100.0	59.3
Energy and Power	64.8	100.0	34.1
Financials	49.0	92.8	42.6
Healthcare	73.0	100.0	27.0
High Technology	75.4	97.1	21.7
Industrials	60.9	86.6	26.8
Materials	74.3	100.0	25.7
Media and Entertainment	58.4	97.1	38.7
Real Estate	64.1	100.0	35.9
Retail	68.4	98.1	30.3
Telecommunications	68.4	96.2	27.8
Total Average	**62.8**	**96.8**	**33.6**

The offering size of the ECO's ranges between US$m 75 - US$m 10.620, with a mean (median) of US$m 706 (327).

4.2 Industry specific drivers

In order to fully understand the drivers and market trends within each industry the three above mentioned industries are split up and analysed one by one. Relevant general market observations will be elaborated as well.

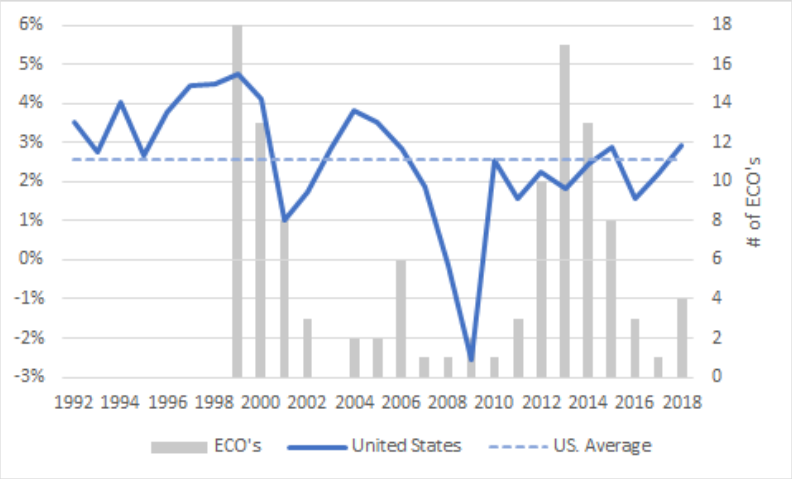
Stock performance is driven by mainly three broad elements, they are either driven by operational development, future growth expectations or margin expansion/contraction. The operational

development seem crucial to analyse further. In order to identify potential explanatory variables for the stock performance an analysis of several macroeconomic drivers in the general economy and the selected industries is conducted. The variables are intended to shed light into the industry specific drivers that influence the operational performance.

An economic cycle is defined as the fluctuations in the general economic activity as expansions and contractions. It is often measured as a country's gross domestic product in percentage development relevant to the previous periods output. As seen in table 8 the average yearly GDP growth for the US going back to 1992 is 2.6%. Leading up to the first peak of the dataset in ECO's in 99-01 the GDP growth was at 4.75%, indicating an expansion in the economy, thus the first economic cycle. The period is well known as the dot.com bubble, the internet was on its way forward, which led to an increasing number of technology start-ups. These start-ups IPO'ed just 1-3 years after their launch, most of them with no earnings. During late 00, start 01, several factors contributed to the bubble burst following an economy wide contraction of the economy[11]. As GDP growth contracted to a low in 2001 at 1% the number of new ECO's stumbled from respectively 18 and 13 the previous years to 8 in 2001 followed by 3 in 2002 and 0 in 2003.

GDP% picked up again from 2001 until 2007, the economy expanded again indicating higher than average GDP growth, the number of ECO's picked up slowly as well. When the financial crisis hit in 2008 GDP growth turned negative -1.6%, ECO activity was more or less non-existing in the following years. GDP% went further down in 2009 before it reached average numbers from 2010.

Table 8 - GDP% development vs. ECO activity



Notably the ECO activity did not follow in the years up to the financial crisis as it did up to the dot.com bubble. The activity boomed afterwards from 2012-2015. ECO activity follow the economic cycles, thus in recent years the activity in general have been low.

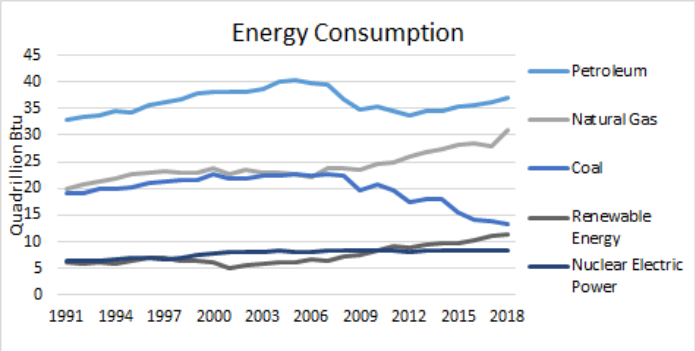
Source: Authors creation of data world bank and Thomson One data (2020)

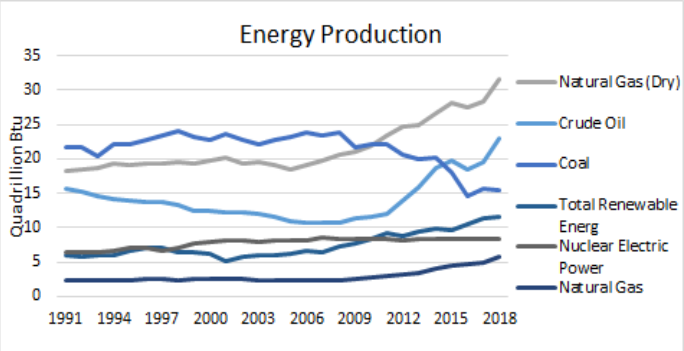
[11] Wollscheid, C. (2012). Rise and Burst of the Dotcom Bubble.

4.2.1 Energy & Power

Energy & Power make up 22% of the data set seen from the parent firm's perspective and 25% from the subsidiary. The US have a 330 million big population and lists as 10th in the highest energy consuming country per capita in 2019, making it the most energy consuming country just after China[12]. According to the latest data from the U.S Energy Information Administration the primary energy production was in total 95,721804 Quadrillion Btu[13], whereas the consumption was at 101,193004 Quadrillion Btu leading to a mismatch of 5,471,288 Qua. Btu. As seen in table 9, the sources of consumption and production does not match entirely, as energy consumption from Petroleum based products was 36 Qua. Btu in 2018, crude oil energy production accounted for only 23 Qua. Btu. Indicating that the US are net importing crude oil in order to keep up their energy consumption. It should be noted that the US have export bans and tariffs in place within crude oil.

Table 9 - Energy consumption and production in the US[14]





Starting with the energy consumption, coal have decreased 39% in the period from 1999 until 2018, whereas the total consumption has increased with 5%. Renewable energy has increased with 75% in the period, though starting on a low basis accounting for 7% of the total consumption in 1999. Whereas Natural Gas have increase with 36% from a higher basis of 24%.

The development in Natural gas consumption have been followed by an increase in the production of 63%. Crude oil production has increased with 83% but does still not match the consumption from petroleum.

[12] Worldpopulationreview.com (2020). Energy Consumption by country 2020. URL
[13] British Thermal Units
[14] Eia.gov (2020). Annual Energy Review. URL and authors creation

Table 10 - Number of ECO's in years

Issue Date	#
1999	1
2001	3
2004	1
2006	2
2011	1
2012	4
2013	5
2014	7
2015	2
2016	1
Total	27

The number of ECO's in the Energy and Power industry peaked from 2012-2014 with 16 ECO's. Table 9 displays that the development in Natural Gas consumption and production seem to pick up growth in this period. The incentive alignment hypothesis states that the subsidiary's most often incur, or operate in high growth industries, which is why they are divested from the stable parent firm. The growth must incur several years before an eventual ECO, for the diversification decision to be made etc. Taking the CAGR from 2010 to 2015 of the output in order to compare the growth development (growth is consumption growth in US energy industry) seemed justifiable. The general CAGR for the industry, was in the period from 1999-2016 at 2.6%. The CAGR in the years with most ECO's from 2010-2015 was at 5.2%, substantially higher than the average growth. It seems that in the periods with an increasing activity around ECO's the industry saw higher than average growth rates.

Firms in the industry with focus on Natural gas and Crude oil can be divided into groups with several different characteristics in accordance to their partaking in the total value chain from production to consumption. The sub sectors can be defined as Upstream, Midstream, Downstream and Service providers. Upstream activities center around extracting oil and natural gas from the ground, Midstream centers around the movement of the extracted product towards a refinery or end consumer if used for energy. Downstream is the refineries, which turns the raw product into either fuel, heating oils, plastics etc.

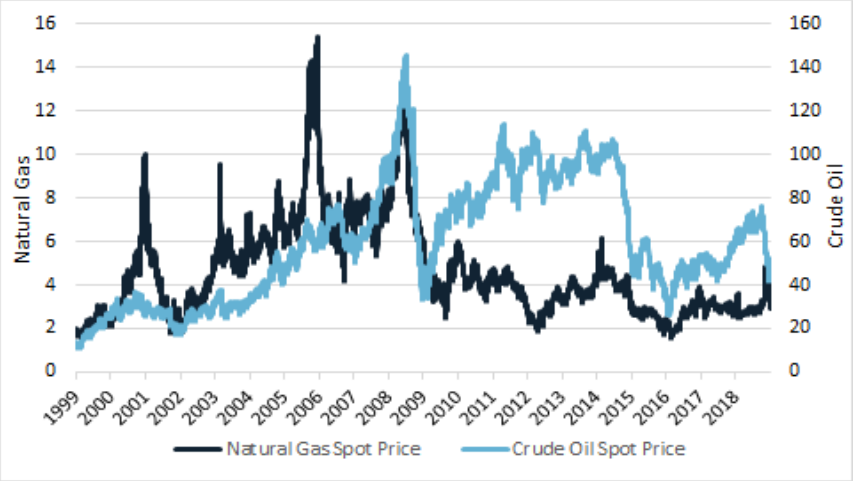
Reasons for an Equity Carve-out in the Energy & Power industry falls into line with the broad divestiture gains hypothesis and its sub hypothesis, but in order to fully grasp this the operational analysis is essential. Choosing an ECO instead of a spin-off or other divestiture measure indicates that the corporations within the industry still seek exposure towards to carved-out areas. A few reasons for divesting a subsidiary within the energy & power industry is: Cash flow generation for the parent firm or the subsidiary (Cash flow Hypothesis) in order to invest in more promising parts of the value chain, reduce exposure towards areas where the parent firm or the subsidiary do not have the desired competitive advantages. In the history of the industry, it has been known for asset sales and not equity carve-outs[15].

The supply and demand locally in the US have been covered briefly whereas, the price development in general might tell more about the current state of the industry, such as profitability, investments etc. As many Energy companies have high fixed cost and capex. they are very dependent on price development in order to be profitable. As seen in table 11, the Natural gas spot price and WTI Crude oil (US based) price seem highly volatile during the period. Where Natural gas price hid lows at around US$ 2/MMBtu[16] in 2002, 2012 and 2016 and highs in 2006, 2008 and 2009. Crude oil saw

[15] Accenture.com (2012). Five Accelerators for Oil and Gas Carve-outs and Divestitures. URL
[16] Million British Thermal Units

its lows in 2009, 2016 and 2018, whereas it has remained at a higher basis level from 2010-2018 than Natural Gas.

Table 11 - Natural Gas & WTI Crude Oil spot price development



Source: Bloomberg, *Authors Creation*

Price development will be used as a variable that might explain the post announcement day abnormal returns in the Energy and Power industry.

4.2.2 Financials

Financials make up 23% of the data set seen from the parent firm's perspective and 16% seen from the subsidiary. There are 3 major subsectors within financials, Diversified financials, Banks and Insurance[17]. As diversified financials cover a broad range of services also offered by banks and insurance companies, focus will be put on determining drivers within the latter. Since the data only contains 1 insurance company, the drivers of these will not be elaborated as such. The number of ECO's in accordance to year can be seen in table 12 below. Most ECO's are concentrated from 2012-2015.

Table 12 - Number of ECO's in years

Issue Date	#
1999	1
2002	1
2004	1
2006	2
2008	1
2009	1
2010	1
2011	1
2012	3
2013	6
2014	4
2015	2
2016	1
2017	1
2018	1
Total	27

The banking industry typically rely on 3 types of revenue, Net Interest Income (NII), Net Fee Income (NFI) & Net Trading Income (NTI).

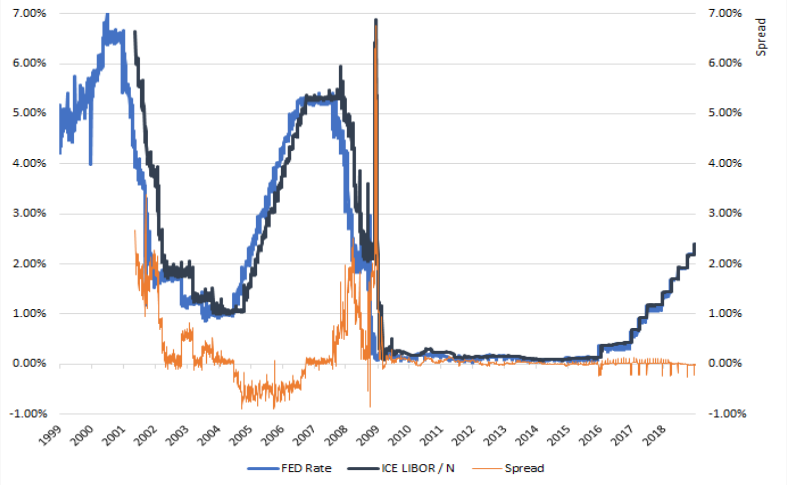
NII is generated by the lending business, to private citizens and corporations. NII is derived by subtracting the banks interest income with the interest cost, also referred to as funding cost. Interest income is generated by the bank's lending activity (volume) and is highly dependent on the margins on the given lending activity. It can also be viewed as the spread between lending rates and deposit rates. The interest cost is the cost incurred by the bank in order to facilitate the given lending activity, often primarily consisting of deposits. Seen from a balance sheet perspective the assets (loans) generate returns, in order to finance making these loans the bank funds itself using client deposits (Liabilities). The interest rate that the banks offers to the depositors is the FED rate and

[17] Bloomberg.com (2020) Sector performance. URL

thus a determining factor of the funding cost. Further, the deposits are most often placed in ST notes, that in a high interest rate environment will yield a higher spread in favor of the banks.

Table 13 shows that the years following a financial crisis such as in the dot.com bubble FED substantially lowers their interest rates in order to stimulate the economy. By this, lowering the deposit rate for what banks can place their own deposit at, thus banks lower their deposit rates as well, which results in lower funding cost. Though funding cost is lower the same accounts for the banks volume, in this case loan activity[18]. As seen in table 13 the spread between the FED deposit rate and ST notes in this case replicated by ICE Libor Overnight decreases as rates decreases. The bank's prime loan rate is displayed in appendix 7, indicating the same as below.

Table 13 - Fed Interest rate development vs Ice Libor overnight[19]



Source: Authors Creation of Bloomberg data

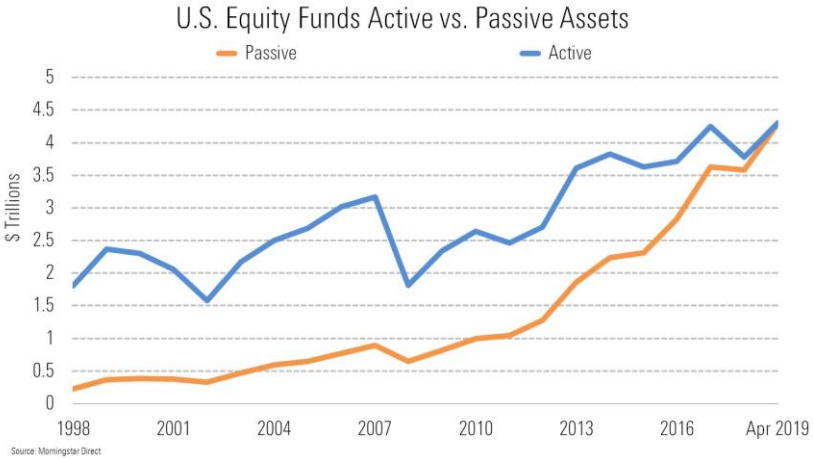
The spread becomes zero after the financial crisis, indicating that bank margins on loan activity is very low, it further indicates low margins followed by the dot.com bubble. Thus, a crisis variable is relevant to look at when testing the abnormal returns within the financial industry. Further the development of the FED rate development indicates the current economic situation within the financial industry. It will be tested as a proxy for the economic state within the industry in section 6.

Net Fee Income consist primarily of two drivers but depends a lot on the services offered by the individual banks. There can be transaction-based fees for corporate finance services such as M&A, money transfer fees, account fees, cash management fees, lending and guarantee fees, capital market fees and investment fees. Fees associated with investment funds offered by the banks will most often make up most of the income. The two main drivers of the fees is the assets under management (AUM) in the funds and the fees associated with the management of the assets[20]. Fees have been pressured due to high competition and increased focus on low cost-based funds like Exchange Traded Funds (ETF's). AUM is highly important for the banks, and in general highly correlated with the development on the financial markets.

[18] Fred.stlouisfed.org (2020). Loans and Leases in Bank Credit, All Commercial Banks.
[19] London Interbank Offering overnight (What are banks willing to loan for to a AAA credit rating overnight)
[20] Authors knowledge from in depth analysis of Danske Bank

As seen in Table 14, the general AUM have increased in the last two economic cycles, with downturns during the respective two crises. Most banks offer active managed funds, where investment managers pick stocks, follow a specific trading strategy or just follow the market. Active asset management of course comes with a higher cost base for the costumer, which can easily be 2-5% annually of AUM. Active funds have seen net outflow in recent years, whereas passive funds have seen substantial inflow since 2008. The annual cost base for such funds is in comparison between 0.2%-1%[21].

Table 14 - Active vs passive investment funds



Source: Morningstar (2019). A Look at the Road to Asset Parity Between Passive and Active U.S. Funds. URL

As established the AUM in active funds is an income driver for most banks, which is why it will be tested as a potential explanatory variable regarding the post carve-out performance.

Net Trading Income is not always displayed separately, thus it will only be covered briefly. Net Trading Income is income from Fixed Income and FX trading and primarily consist of spreads from selling and buying in the OTC market.

4.2.3 High Technology

The number of ECO's within High Technology (HT), centers around the dot.com bubble years from 1999-2001, as mentioned in table 8, GDP growth spiked during these years, and the number of ECO's in the dataset is dominant. Notable in the distribution of ECO's within subsidiaries and parents, the total amounts to 18 subsidiaries and only 12 parents within the sector. Further, the subsidiaries are dominant in the dot.com bubble years, indicating that non-technology business carve-out their technology business. This indicates that parent firms carved-out their technology departments or in- house technology start-ups in order to utilize the stock rally in technology stocks, which can be related to the asymmetric information hypothesis.

Leading up to the dot.com bubble was a technological revolution where technology companies spiked up everywhere. The fraction of internet companies as % of the total IPO's spiked to 57.4% in 1999 where the fraction of High Technology companies was 54% of the IPO's in this data set. In

[21] Morningstar (2019). A Look at the Road to Asset Parity Between Passive and Active U.S. Funds.

comparison the fractions had been respectively 4.9% and 21.5% in 1997 & 1998. Another characteristic of the time was the age of the companies that got listed, in 1999 the median age for an IPO'ed company was 4 years, compared to 9 years in 1997 (Ljungqvist & Wilhelm, 2003).

A potential explanatory variable that will be tested in section 6, is relatedness. In this case a dummy variable determining if the parent and subsidiary is within the same industry. As displayed in table 15, this is most often not the case within the HT industry and could be the same for the other industries

Table 15 - Number of ECO's within HT

Issue Date	Subsidiary #	Parent #
1999	6	3
2000	4	3
2001	3	1
2005	1	1
2007	1	1
2015	2	3
2018	1	0
Total	18	12

4.2.4 Other Industries & industry index development

Materials, Media & Entertainment, Retail and Telecom are the most dominant industries among the other industries varying with 7-8 ECO's based on parent industry. In materials 4 of the 8 ECO's was conducted during the dot.com bubble, where the subsidiary industries varied. In Media & Entertainment all but two ECO's was conducted during the dot.com bubble. Retail numbers are spread out, not indicating any trends. Telecom has 6/8 under the dot.com bubble.

The performance of the mentioned industries stock index' can be seen in table 16. The stock index development is used as a proxy for general industry developments, as stock prices assumable capture profitability, risk and future growth opportunities. Notable is Energy and Power, hitting all-time highs in 2014 where the number of ECO's also hit all-time highs. Technology hit lows after the dot.com bubble, where previous highs was set. Financials saw its toughest periods following the financial crisis in 08, from which highs it has not yet reached again. An in dept correlation analysis will be conducted later. The indexes used are the respective exchange traded funds, that invest in what is known as the market portfolio within each index.

Table 16 - Stock indexes development

IYF US Equity (iShares US Financials ETF)
IYE US Equity (iShares U.S. Energy ETF)
IYW US Equity (iShares US Technology ETF)
IYJ US Equity (iShares U.S. Industrials ETF)
IYM US Equity (iShares U.S. Basic Materials ETF)
PMR US Equity (Invesco Dynamic Retail ETF)
PBS US Equity (Invesco Dynamic Media ETF)
VOX US Equity (Vanguard Communication Services ETF)

Source: Bloomberg retrieved 21.01.2020

It should be noted not all ETF's were traded back in 99, which is why the data starts in 01. Further, the ETF's will be used as market proxy in chapter 5 & 6 for the industry specific analysis.

The determining factors for the performance might be influenced by the macroeconomic environment. When testing in the industry specific multivariate analysis the variables from this analysis will be used to test if they influence the abnormal returns obtained from parents and subsidiaries. They are used as a proxy for the macro environment.

4.3 Operational characteristics

Operational characteristics will be analysed for both the subsidiaries and the parent firms. The subsidiaries operational characteristics will be the data at the IPO and 1 year after the issue date. It will be used as variables in the post-performance regression analysis. The parent firm's characteristics will be based on the announcement date, 1 year before and 3 years before in order to analyse the development leading up to the ECO. Following determinants will be used: The size of the company based on the reported revenue in GAAP terms quarterly. The operational performance is determined by EBITDA and the EBITDA margin. In order to display the profitability relative to asset size the performance measure "return on asset" (ROA) is used. The state of the balance sheet will be characterized by a net debt to asset value, in order to determine financial stability.

<u>General operational characteristics</u>

The descriptive signatures of the data set are displayed in table 17. Revenue at announcement date (parents) has a mean of US$8.535m, substantially higher than the median of US$1.008m, indicating substantial outliers within the size of the companies. As displayed in figure 2 outliers in terms of revenue are few but high in monetary terms for both parent and subsidiaries. Going forward the median will be highlighted.

Table 17 - Operational characteristics

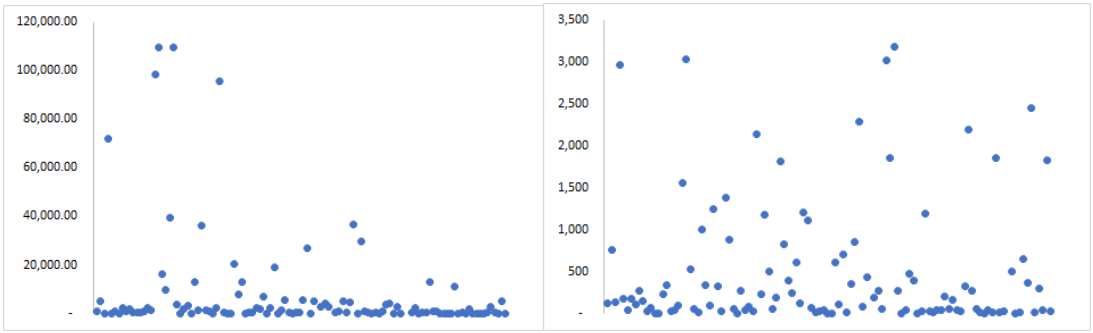
Parent	Revenue (Quarterly US$m)	EBITDA (Quarterly US$m)	EBITDA margin%	Debt/Assets %	ROA %
At Announcement *(mean)*	8,535	1,004	11.8%	28.7%	3.4%
Median	1,008	178	17.7%	27.1%	3.4%
(-) 1 year *(mean)*	7,676	579	7.5%	30.6%	3.0%
Median	1,216	127	10.4%	29.5%	3.3%
(-) 3 year *(mean)*	7,904	1,115	14.1%	30.2%	1.2%
Median	1,072	110	10.2%	29.2%	3.0%
Subsidiary					
At IPO *(mean)*	501	37	7.4%	27.8%	3.7%
Median	166	22	13.0%	21.7%	3.1%
+ 1 year of IPO *(mean)*	574	48	8.3%	26.1%	2.0%
Median	186	21	11.3%	21.7%	2.8%

The median revenue at announcement date show a decreasing trend over the 1-year period, whereas it remains stable at a 3-year period. EBITDA increases with 62% leading up to the announcement date, which indicates increased operational focus on profitability among parent firms, as topline does not grow accordingly. The margin expansion can be caused by industry and company specific traits. Debt to asset ratio decreases indicating that parent firms deleverages their balance sheet leading up to an ECO. It also indicates that increased debt and balance sheet issues are not among the more general motivations for ECO's, even though a more general capital structure strategy on debt reduction is still a potential motivation. ROA increases from 3% 3 year before the ECO to 3.4% at announcement, indicating a trend of better operational performance.

Subsidiaries median revenue of US$166m increases on average with 12% the following year (table 17). EBITDA is roughly the same, though indicating a decrease in operational effectiveness. It should be mentioned that higher growth companies short-term tend to sacrifice financial gains in order to capture market shares and build up their business. Further scale advantages are most often limited. Debt to assets remains the same 1 year after the IPO whereas the return on assets declines with -0.3%-points. Compared to the parent's lack of top line growth leading up to the IPO, the subsidiaries top line growth of 12% is remarkable, indicating that subsidiaries operate in high growth business areas. Following this, subsidiaries are slightly less levered and tends to generate less ROA. Parent firm's median revenue is 6.5x bigger than the subsidiaries, which put the revenue grow findings a bit in perspective, as the growth basis is lower.

Outliers are few but larger in terms of revenue in the parent firm data, whereas the subsidiary data have a more diverse revenue distribution among the firms but still with a few outliers. This might affect the data validity as it could be more homogeneous in terms of size.

Figure 2 - Data outliers based on revenue (Parent at announcement date & Subsidiary at IPO date)



To determine whether the operational characteristics depend on parent firm or subsidiary a linear OLS regression is conducted for each. The analysis is solely conducted based on the announcement date (parent) and trade date (Subsidiary). The following table displays the relevant beta coefficients and p-values. The test is comparative, the determining variable is firm size, ebitda, debt, ROA and the explanatory variable is a dummy variable taking the value 1 if parent and 0 if subsidiary. It is conducted in order to determine if the two data samples operational characteristics are significantly different from each other.

Table 18

Variable (x)	Beta coefficient	P-value
Size	8,034	0.0001
EBITDA	958.6	0.0001
Debt	4.328	0.1829
ROA	0.973	0.4907

As observed in the table, the coefficient is positive for all four characteristics and especially the coefficient for Size and EBITDA seem high. E.g. the Size coefficient of 8,034 tells that parents on average have US$8,034m higher revenue than subsidiaries. As mentioned earlier this number is influenced by outliers. Nonetheless the difference is significant on a 1% significance level. The p-value is used to determine whether the explanatory variable (in this case parent/subsidiary) has a significant effect on the characteristic. On a 1% significance level the null hypothesis $H_0: \beta = 0$ can be rejected for Size and EBITDA. It can with 99% certainty be said that parent firms have a significant effect on the value of these two characteristics. Debt and ROA with p-values of 0.18 and 0.49 does not return a difference with statistical significance, thus it cannot be concluded that these two factors are dependent on whether the firm is a parent or subsidiary[22].

4.3.1 Industry specific operational characteristics

Energy & Power

Table 19 displays the operational characteristics for the Energy & Power industry. The quarterly median revenues for the parent firms increases with an average of 28% in the 3 years leading up to the ECO, with most of the increase happening from year 1 to announcement. EBITDA increases with 24%, whereas the median EBITDA increases with 62% on average every year for 3 years. The big drop in the operating performance in the year before the ECO should be noted, as this bad performance could be the basis of the decision. Debt ratio remains stable, indicating that on average

[22] Bennigsen, F. Ravensholt, F. Lundquist, J. (2019)

the parent firms do not engage in ECO's in order to deleverage their balance sheets. ROA increases from 4.3% to 5.4% indicating either a smaller asset base to generate returns or higher returns, as the EBITDA margin remains stable.

Subsidiary revenue increases with 100% 1 year after the IPO, whereas EBITDA increases 58% on average, caused by the revenue development, as margins decrease. Debt to asset ratio is increasing slightly from 26.5% to 31%. The increase in leverage of 21.5% is signaling that the subsidiaries are using an increased amount of debt to finance their activities. ROA at 7% after the first-year public is 31% higher than the ROA generated by the parent firms indicating higher profitability, relative to assets. It could also be that the subsidiaries are service companies, thus not owning heavy assets. The revenue increase is signaling that subsidiaries on average incur higher growth than parents, but it should be kept in mind that the base is 35x lower than the parents.

Table 19 - Operational characteristics of the Energy & Power Industry

Parent	Revenue (Quarterly US$m)	EBITDA (Quarterly US$m)	EBITDA margin%	Debt/Assets %	ROA %
At Announcement *(mean)*	20,182.35	2,085.20	10.3%	26.9%	6.1%
Median	2,138.00	328.89	15.4%	26.2%	5.4%
(-) 1 year *(mean)*	6,408.41	483.11	7.5%	28.6%	2.3%
Median	1,619.29	121.63	7.5%	28.0%	1.7%
(-) 3 year *(mean)*	14,307.54	2,237.35	15.6%	29.6%	3.7%
Median	1,667.39	263.50	15.8%	27.6%	4.3%
Subsidiary					
At IPO *(mean)*	343.41	59.70	17.4%	31.1%	9.9%
Median	61.92	28.15	45.5%	31.8%	8.5%
+ 1 year of IPO *(mean)*	381.85	47.23	12.4%	29.3%	11.3%
Median	123.80	44.58	36.0%	26.5%	7.1%

In financials, both parents and subsidiaries are relatively larger in terms of median size at the announcement and IPO date. As financial companies most often do not report EBITDA their Net income have been used as a replacement. This will all things being equal make compromise the validity if comparing EBITDA and net income.

Table 20 - Operational characteristics of the Energy & Power Industry

Parent	Revenue (Quarterly US$m)	EBITDA (Quarterly US$m)	EBITDA margin%	Debt/Assets %	ROA %
At Announcement *(mean)*	8,355	866	10.4%	26.2%	1.5%
Median	1,701	187	11.0%	24.7%	0.7%
(-) 1 year *(mean)*	8,943	607	6.8%	27.5%	2.2%
Median	1,887	134	7.1%	26.4%	1.6%
(-) 3 year *(mean)*	10,990	1,157	10.5%	26.1%	-1.4%
Median	1,577	161	10.2%	25.8%	0.8%
Subsidiary					
At IPO *(mean)*	765	70	9.1%	30.1%	3.4%
Median	294	55	18.7%	20.7%	1.0%
+ 1 year of IPO *(mean)*	875	73	8.4%	29.2%	0.9%
Median	272	44	16.2%	20.9%	1.1%

Debt to asset is below the median of the total sample size with 2.4%-points, indicating lower leverage at announcement date. The lower leverage can be associated with the capital requirements restrictions many firms within the financial sector incur. The interesting element is the development within the debt to asset following up to the ECO, where the leverage decrease from 26.4% 1 year before to 24.7% at the announcement. The same trend was seen within the Energy & Power industry

as well as the general sample size. Where the general median starts at 29.5% the year before and ends at 27.1% at the announcement date, indicating increased balance sheet focus.

ROA is lower than the general dataset indicating that financial firms operate in low margin business relative to assets. ROA for parent firms is 0.7% whereas it is 3.4% for the general dataset. At IPO for subsidiaries have 1% ROA compared to 3.1% for the general data set.

High Technology is the smallest industry of 12 ECO's from parent and 18 for subsidiary. The size median of parent firms at announcement date is approximately the same as the peer sample. EBITDA does not differ substantially either. Parent firms tend to grow substantially in terms of revenue and EBITDA. Revenue growth is 20% from a basis 3 years prior to the announcement. EBITDA in comparison increases 3x, substantially more than the peer group. In the same period leverage increases from 10% to 16%, whereas ROA increases from 4.4% to 5.6%. Leverage is in general lower in this industry compared to the peer data, whereas ROA is substantially higher. Above indicates that the parents operate in higher growth and higher margin businesses than the general group.

The subsidiaries are substantially lower in terms of revenue than the peer group, using the median they are 3 times smaller in terms of revenue. EBITDA margins are poor at 2.5% compared to the median of 13% at the IPO date of peers. Parent firms are 20x larger than the subsidiaries, which is only seen in the HT industry, the average is at 8x. 1 year after the IPO, EBITDA margin have increased substantially to 14% at the same levels as the peer group. Revenue increases with 30%, substantially more than parents in the same industry but also from a lower base. ROA decreases after the first year from 7.5% at IPO to 3.2% 1-year after.

Table 21 - Operational characteristics of the High Technology industry

Parent	Revenue (Quarterly US$m)	EBITDA (Quarterly US$m)	EBITDA margin%	Debt/Assets %	ROA %
At Announcement *(mean)*	2,241.01	429.30	19.2%	20.3%	2.4%
Median	923.28	156.93	17.0%	16.2%	5.6%
(-) 1 year *(mean)*	1,913.80	286.32	15.0%	19.6%	3.0%
Median	775.33	131.54	17.0%	19.2%	7.0%
(-) 3 year *(mean)*	1,630.43	160.14	9.8%	12.6%	3.8%
Median	765.25	38.70	5.1%	10.1%	4.4%
Subsidiary					
At IPO *(mean)*	249.92	16.88	6.8%	21.1%	3.8%
Median	44.40	1.10	2.5%	18.1%	7.5%
+ 1 year of IPO *(mean)*	443.78	40.03	9.0%	22.9%	-3.8%
Median	64.64	9.27	14.3%	23.4%	3.2%

4.4 Part conclusion

To sum up it can be concluded parent firms in general display decrease in size but not EBITDA in the years leading up to an ECO. Parents are in terms of median revenue 6x larger than subsidiary firms, significant at a 1% level, the same is coherent regarding EBITDA where parents are 8x larger than subsidiaries. Further, findings not reported above indicates that subsidiaries display significant growth in revenue (10% level) of an average 12%/year whereas parent firm's revenue decline is insignificant. Parent firms have significantly different size and ebitda than subsidiaries. Their debt to assets and ROA though is insignificant. Energy & Power display above median size, and EBITDA for parent firms at around 2x the general median. Their subsidiaries display lower than median

revenue and higher EBITDA, indicating good margins and more immature carve-outs, profitability is highest within the industry as well. Financials display above median size and EBITDA for both parent and subsidiaries. The operational performance in ROA is substantially lower than average. High Technology also varies from the general sample. It can be concluded that there is difference between the different industries in terms of their operational performance.

CHAPTER 5 - Empirical analysis: Univariate

The fifth chapter is the first part of the empirical analysis. It seeks to answer the first research question by testing the CAR, AR and BHAR for significance using the market model and the market-adjusted model, on all time horizons. It will further look at specific characteristics of the data like correlation, volatility and the Sharpe ratio.

5.1 Univariate performance analysis

Three univariate time series analyses will provide a graphical and statistical overview of the raw returns, the abnormal returns (AR), the cumulative abnormal returns (CAR) and the buy-and-hold abnormal returns (BHAR). The analyses will include both the MM and the MAM. As mentioned in the delimitation the MAM will be used in order to calculate BHAR and CAR for subsidiaries, as it is not possible to estimate the alpha and beta for the subsidiaries [-220: -20] before the event (IPO). The MM will still be used in order to calculate ST CAR and MT BHAR for parent firms, but for comparison between parent and subsidiaries the MAM is used. The industry specific analysis will contain only the parent firms, due to the cross-sectional characteristics of the subsidiaries and the general focus of the thesis, as mentioned in the delimitation.

5.2 Raw returns & Excess returns

The raw returns are calculated based on the price difference between day t and t+x also known as the percentage change. The raw return for day 125 is calculated as follows below:

$$Raw\ Return = \frac{Closing\ price\ at\ day\ 125\ of\ trading}{Closing\ price\ at\ event\ day} - 1$$

In order to derive the t-statistics a one sample t-test is conducted with the assumptions mentioned in section 3. Table 22 below shows that the raw returns at announcement day for parents are significantly different from 0 on a 1% significance level. The parent return is on average 3.73% on the announcement day, whereas the subsidiary underpricing is on average 20.49%. The mean return for the parent firms increases with around 3x from the announcement day to the last day included in the data, the 360th day. In comparison the subsidiaries only slightly increase taking their underpricing into account during the same period. Subsidiary returns increase from the underpricing at 20.49% to a high from 39.81% after 252 days and then decreases to a raw return of 21.29% after 360 days. This indicates more volatility in the subsidiary firms, than the parents, which is relevant to look further into later in the analysis.

Table 22 - Raw Returns

Parents	Mean R%	t-statistics	*Subsidiary*	Mean R%	t-statistics
Day 0	3.73***	6.32	Day 0	20.49***	5.37
5 days	4.44***	4.87	5 days	21.99***	4.99
30 days	6.70***	4.69	30 days	26.72***	4.43
90 days	10.30***	2.53	90 days	33.80***	3.77
125 days	10.88***	2.15	125 days	31.63***	3.43
252 days	10.49***	2.50	252 days	39.81***	2.10
360 days	12.07***	2.07	360 days	21.29***	2.36

Parents (ex day 0)	Mean R	t-statistics	*Subsidiary (ex day 0)*	Mean R	t-statistics
Day 1	-0.26	-0.82	Day 1	1.66***	2.68
5 days	0.43	0.78	5 days	0.74	0.73
30 days	3.10**	2.39	30 days	4.00**	1.70
90 days	6.03*	1.63	90 days	8.40**	1.99
125 days	6.44*	1.41	125 days	9.56**	1.74
252 days	6.07*	1.55	252 days	13.39*	1.42
360 days	8.03*	1.40	360 days	4.64	0.77

It should be noted that the stars represent the significance level of the given variable. This is done throughout time horizons in the regression output tables: *** indicates significance on 1% level, **on a 5% level, *on a 10% level

Excluding the event day parent firms show short, medium and LT significant returns. After 30 days, the return is 3%, whereas it increases to 8% in the period. Compared to subsidiary firms the results show more variation. After 30 days it shows significant 4% returns, whereas it increases to 13% after 252 days, decreasing to 4.65% after 360 days, a notable LT drop in returns.

To better understand the short, medium and long-term performance of the subsidiary and parent firms the excess returns are relevant to look at. It is calculated in such way that it considers the different points in time that the event occurs and matches the individual stock returns with the market return at that time (as the MAM). It is calculated by taking the raw return for each stock and subtracting the raw return of the market. This is done for all the firms in each of the two portfolios, whereas the excess returns are equally weighted to reflect the total portfolio excess return.

Table 23 - Raw holding-based market-adjusted returns

Parents	Mean R%	t-statistics	*Subsidiary*	Mean R%	t-statistics
Day 0	3.79***	6.43	Day 0	20.45***	5.34
5 days	4.08***	5.26	5 days	21.88***	4.49
30 days	5.24***	4.12	30 days	25.02***	4.29
90 days	5.75**	1.59	90 days	30.05***	3.48
125 days	5.13*	1.09	125 days	39.70***	2.24
252 days	0.19	0.06	252 days	29.62**	1.80
360 days	-0.87	-0.18	360 days	11.07	1.27

Parents (ex day 0)	Mean R%	t-statistics	*Subsidiary (ex day 0)*	Mean R%	t-statistics
Day 1	-0.48*	-1.51	Day 1	1.60***	2.60
5 days	-5.60	-0.11	5 days	0.54	0.55
30 days	1.89**	1.66	30 days	3.05*	1.38
90 days	1.41	0.42	90 days	5.62*	1.42
125 days	0.93	0.22	125 days	4.91	0.98
252 days	-3.86	-1.19	252 days	4.82	0.56
360 days	-4.54	-1.02	360 days	-5.91	-1.16

The holding based abnormal returns is for parents significant the first 30 days on a 1% level, with an announcement date AR of 3.79%. The LT 360-day AR is slightly negative though insignificant. The parent returns excluding the event date is significant with a negative AR at day 1 and a positive at day 30 at respectively a 10% and 5% level. The LT AR is negative with -4.5%, but still insignificant. Subsidiary returns are all significant on minimum a 5% level in the whole period including underpricing except on 360 days. Excluding underpricing, clearly indicates that underpricing is skewing the results and thus provides non usable measures for the LT abnormal returns. The second trading day (day 1) is still significant with 1.6% on a 1% level. The LT performance excluding underpricing is insignificant but negative with -5.9%, in contrast to the returns including underpricing.

5.3 Short-term performance

When testing ST abnormal returns CAR is most often used compared to BHAR, but they yield very little deviations. BHAR is primarily used for LT abnormal returns among other academics, whereas CAR is used for short time horizons. CAR is calculated using the MM and the MAM. The underpricing is only calculated for the subsidiaries using the MAM, as no previous return data is available prior to their IPO. The ST abnormal return will be displayed as the abnormal return at day [-1;1]. The subsidiaries ST performance will not be elaborated further, as the MAM is equal to the excess return-based approach displayed and commented on in table 23 above.

The MM is calculated based on the alpha and beta coefficients for each firm based on the returns from [-220;-20] days before the event. Afterwards the MM return is calculated for each firm and then the arithmetic average is taken to display it like a portfolio based on equation 3. Table 24 displays the findings for the parent firms by applying the two models and the AR and the CAR. Starting with the MAM, the event day AR is 3.42%, with a t-statistics at 5.98 indicating that it is statistically significant at a 1% level. The [-1]-day AR is on average -0.21% but not significant, the same applies for the +1 day return at -0.105%. CAR display a [-1;1] period return at 3.09%, significant at a 1% level. The return is compounded and not an arithmetic average. It should be noted that the difference between the AR at day 0 and the table 23 displayed day 0 AR using the MAM differs slightly due to the exclusion of two parent firms, as they did not have data for day -1.

Table 24 - Abnormal Return market-adjusted model & market model

Market adjusted model		*N=112*	Market Model		*N=108*
Days	AR	t-statistics	Days	AR	t-statistics
[-1]	-0.210%	-0.70	[-1]	-0.310%	-0.94
[0]	3.42%***	5.98	[0]	3.57%***	5.89
[+1]	-0.105%	-0.37	[+1]	-0.150%	-0.50
	CAR	t-statistics		CAR	t-statistics
[-1]	-0.217%	-0.70	[-1]	-0.310%	-0.94
[0]	3.20%***	4.79	[0]	3.26%***	4.50
[+1]	3.09%***	4.32	[+1]	3.089%***	4.12

The MM coefficient alpha is estimated to be an average of $\alpha = 0.001051$ and beta is estimated to be on average $\beta = 0.011491$. The positive alpha indicates that the portfolio of parent firms leading up to an ECO transaction generate abnormal returns of 0.151% during a 200-day period. Using a one sample t-test to determine if alpha is significant yields a t-statistics to be at 4.93, concluding

significance at a 1% level. According to the efficient market hypothesis this should not be the case. It speaks to the model error of using the market index as benchmark, spoken of among academics. The portfolio of parent firms is most likely to have different characteristics than the general market, this is in terms of size, industry, profitability and so on. This leads to the industry specific analysis, where the market index will be industry specific, which in theory should match the parent firms better. The better match would lead to less model error and according the to the efficient market hypothesis insignificant LT alpha. Applying the MM to the general group yields a significant abnormal return on day 0 at 3.57%, whereas the -1 and +1 AR are both insignificant. AR is slightly larger using the MM than the adjusted model, but otherwise the results are coherent with each other. The CAR is also significant using the [-1;1] time period at 3.09%.

5.3.1 Industry specific ST abnormal returns

The industry specific ST AR and CAR will be calculated using the same approach as the general data. The Energy & Power industry adjust for the market using an industry specific ETF, as the market proxy. This will generate different abnormal returns using both the MAM and the MM. The comparison of the industry specific and the general ST AR will be biased as, different market proxies are used, thus they are not completely comparable.

The Energy & Power industry ST analysis using the MAM and the MM included respectively 25 and 23 firms. The MM included 2 firms less as there were not enough [-220:-20] data for two of the firms within the sample. This might introduce some model error, as these two firms have the potential to make a difference. As displayed in table 25, the AR using the MAM was 2.78% at the announcement day for the parent firms, significant at a 1% level. In contrast the MM yielded a 2.07% AR. As the MM takes historic alpha and beta between the firms and the market into account, this number should be contributed with most importance of the two. Looking at day 1, firms experience a significant loss in AR on -0.78% (10% significant) for the MAM and -0.98% (5% significant) using the MM. The loss can be an indicator of an overreaction by the market at the announcement date, followed by a correction when the ECO have been looked more thoroughly through. Cautiously comparing the AR for the Energy & Power industry to the general sample, highlights that the general data AR is 0.64%p higher using the MAM and 1.5%p higher using MM. As the two tests does not have equal data points, in this case firms, it is not possible to conduct an equal means test to test for significance in the differences.

Table 25 - Abnormal Return market-adjusted model & market model

Market adjusted model		*N=24*	Market Model		*N=23*
Days	AR	t-statistics	Days	AR	t-statistics
[-1]	-0.132%	-0.21	[-1]	-0.031%	-0.07
[0]	2.78%***	3.29	[0]	2.069%***	3.13
[+1]	-0.78%*	-1.60	[+1]	-0.98%**	-1.84
	CAR	t-statistics		CAR	t-statistics
[-1]	-0.185%	-0.29	[-1]	-0.031%	-0.07
[0]	2.07%***	2.55	[0]	2.05%**	2.34
[+1]	1.278%	1.23	[+1]	1.066%	0.99

The period CAR [-1:1] is not significant with a t-statistic of 1.23 and a CAR of 1.87%, meaning that the post announcement day significant negative return is causing a non-significant CAR for parents

within the industry using the MAM. The same applies for the MM, where CAR is at 1.07%, but insignificant, due to the significant negative AR incurred in the 1st day after the announcement.

The MM alpha coefficient is estimated to be on an equally weighted average at $\alpha = 0.00067 \approx 0.067\%$ alpha is lower than the general portfolio, which is also reflected in the MM AR and CAR. Using a one sample t-test to determine if alpha is significant indicates a p-value of 3.33 showing that alpha is significant at a 1% level. The average beta calculated in the general portfolio was surprisingly low, but also a result of a model issue matching the correct market with the portfolio components. The average beta in the energy & power industry is estimated to be $\beta = 0.92459$ based on the same regression analysis approach as above. The beta is substantially higher than the general group and shows that the industry specific companies have higher systematic risk also known as market risk. Thus, the MM results for this sector is more dependent on the market returns than the MM is for the general portfolio.

The Financials MAM included 22 firms in the calculations of CAR and AR, whereas the MM included 21 firms. 1 firm did not have sufficient historical stock price data. The event day returns are for both models significant at a 1% level generating an AR of respectively 2.18% and 2.05%. The two models are relatively close to each other and comparing the AR to the Energy & Power industry they are more aligned than with the general market. +1 day are both slightly negative and insignificant.

Table 26 - Abnormal Return market-adjusted model & market model

Market adjusted model		*N=22*
Days	AR	t-statistics
[-1]	0.509%	0.85
[0]	2.18%***	2.98
[+1]	-0.196%	-0.62
	CAR	t-statistics
[-1]	0.509%	0.85
[0]	2.66%***	3.47
[+1]	2.45%***	3.10

Market Model		*N=21*
Days	AR	t-statistics
[-1]	0.652%	1.11
[0]	2.05%***	2.59
[+1]	-0.211%	-0.66
	CAR	t-statistics
[-1]	0.652%	1.11
[0]	2.67%***	3.20
[+1]	2.45%***	2.77

Looking at CAR, it is significant in the holding period [-1;1] for both models at a 1% level. The models yield approximately the same returns of 2.45% CAR in the period. The period CAR is under the general portfolio CAR with 0.64%p for the MM.

The MMs alpha coefficient is on average at $\alpha = 0.00022 \approx 0.022\%$ Using a one sample t-test to determine if alpha is significant indicates a p-value of 0.9 showing that alpha is insignificant. The beta coefficient is at $\beta = 0.86928$ substantially higher than the beta in the general portfolio, indicating higher systematic risk and covariance with the industry specific market.

For High Technology firms a sector specific analysis would not yield satisfying results as the data after adjusting for the availability of historical [-220;20] days before the event day figures the sample size was simply too small to give a valid result. It will be commented on in in section 5.5.3.

5.3.2 Part Conclusion

To conclude on the ST abnormal returns the MAM and the MM yields similar results of AR at respectively 3.42% and 3.57% both significant at a 1% level. The CAR is also significant concluding that there are significant CAR at the announcement date of an equity carve-out in the general portfolio. The two industries displayed different results than the general group, indicating that there is difference in market reaction between the industries, but it also indicates that a better benchmark generates lower AR and CAR.

5.4 Medium -and long-term performance

When testing for the all period abnormal returns, BHAR is calculated between [0; 360] days. BHAR is calculated using the compounded difference between the single firms in the data sample and the market matched returns over the same period. This section seek to further display the data before conducting the multivariate regression analysis testing various factors, a short display of the data graphically will be made and BHAR will be tested using Student's t-test. The models will be gone through independently in order to better compare parents and subsidiaries.

5.5.1 The market-adjusted model

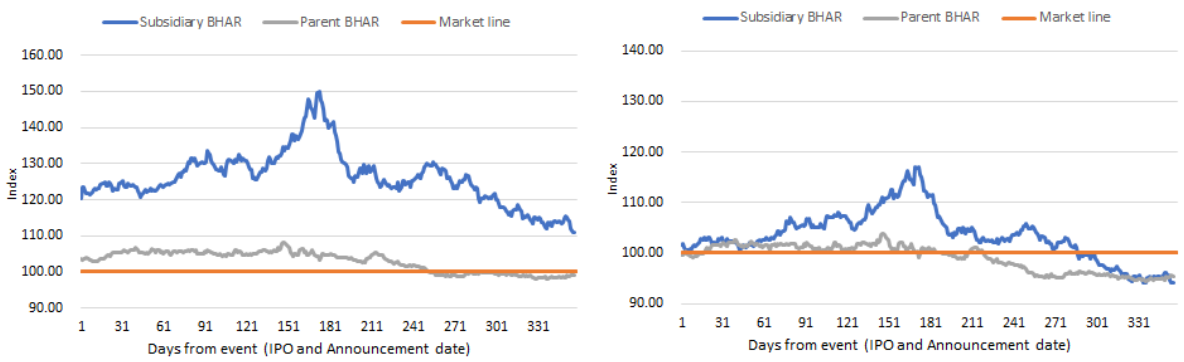
The return of each portfolio firm is indexed as seen in equation 12 below whereas the portfolio raw return is based on a mean arithmetic approach, following the same approach as the CAR.

$$Index_{value_n} = 100 * (1 + r_t) * (1 + r_{t_{+1}}) *.....* (1 + r_{t_{+n}}) \quad (12)$$

The compounded index values for the portfolio is then based on an arithmetic average for each day of the individual firms and used as a proxy to the portfolio index. Another approach is to take the arithmetic average of the single firms returns and the calculating an index based on the average returns.

As depicted in figure 3 the indexed BHAR for the subsidiaries starts in index 120 indicating an average underpricing of 20%. In contrast parent firms CAR yields an average of 3.7%. Subsidiary BHAR peeks 180 days after the IPO in index 150, whereas it decreases towards index 110 after 18 months (down-27% from peak). The typical lock-up period for when it is allowed to sell existing shares for inside shareholders like parent firms is 180 days. As a consequence of the expired lock up period the free float of shares will most often increase in this period of time, increasing the supply of the stock. Looking at it purely as a supply demand question it will put a downwards pressure on the stock price, as demand assumedly does not increase. It indicates that existing shareholders in this case most often parent firms, sell some portion of shares after the lock-up period. As a reference parent firms on average surges from index 105 to 98 in the same period (-27% vs. -7%).

Figure 3 - BHAR indexed with and without underpricing



As IPO underpricing can be caused by a variety of factors it is an outlier in terms of return. As depicted in figure 3 to the right side, adjusting for both IPO underpricing and announcement date returns the indexed BHAR develops poorly on the LT for both parents and subsidiaries. The development still has the same trajectories as before just from a lower event date level. Adjusting for underpricing and announcement date returns the average 18-month BHAR for subsidiaries and parents are respectively -6% and -4.5%.

Where parents seem to underperform the market slightly LT both adjusting for announcement day returns and when not, the subsidiaries seem to outperform the market when not adjusting for underpricing. This finding is common and not just an ECO characteristic Shefrin, H. (2002). To better understand the statistical aspects a t-test have been conducted on the BHAR performance over the period of 18 months. The following hypothesis will be tested throughout the thesis $H_o : \beta = 0$ whereas the beta coefficient in this case is represented as the BHAR.

Starting with the parent firms the 1-month BHAR of 5.24% is significant on a 1% level. Indicating that the announcement of an ECO have a positive MT stock price effect yielding abnormal returns. The standard error is low at 1.27 at announcement date and 3.62 after 1 month compared with the LT standard error of 4.7. Risk/return measure will be elaborated further on later. At a longer time-horizon +3 month there is no statistical evidence for abnormal returns. With the 6-month average BHAR at 5.13% turning to a 12-month BHAR of 0.19% towards a negative LT BHAR of -0.87%, though insignificant.

Table 27 - Panel A of parent firm BHAR

Parent firms	Announcement day	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	3.79***	5.24***	5.75	5.13	0.19	-0.87
t-statistic	6.43	4.12	1.59	1.09	0.06	-0.18
Standard error	1.27	3.62	4.69	4.69	3.39	4.73
No. of observations	114	114	114	114	114	114

As depicted in table 28 the BHAR based underpricing return at 20.45% for the subsidiaries is statistically significant on a 1% level. The same accounts for 1 month, 3 months and 6 months BHAR. The peak happens after 6 months at 39.7%, whereas it ends with a positive BHAR of 11.07%, though insignificant. The subsidiary is thus generating significant BHAR, which in theory would impact the parent firm positively, as they on average own 63% of the subsidiary after the carve-out transaction. Put in other words, the parent firm's asset value increases.

Table 28 - Panel B of Subsidiary firm BHAR

Subsidiary firms	Announcement day	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	20.45***	25.02***	30.05***	39.70**	29.62*	11.07
t-statistic	5.34	4.24	3.48	2.24	1.80	1.27
Standard error	5.89	8.63	17.70	17.70	16.45	8.73
No. of observations	114	114	114	114	114	114

Table 29 below shows the subsidiary stock BHAR excluding underpricing. The BHAR standard error indicates lower volatility in the stocks the day after the IPO. The standard error increases in the first 6 month whereas it decreases and stabilizes on the LT. BHAR is insignificant except from day 1. Even though insignificant BHAR of 11.66% after 6 months can be mentioned, as well as the large switch towards a negative BHAR of -5.9% after 18 months.

Table 29 - Subsidiary firm and parent firm BHAR no IPO underpricing return

Subsidiary firms	Day 1	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	1.60***	3.05	5.62	11.66	4.82	- 5.91
t-statistic	2.61	1.38	1.42	1.29	0.56	- 1.16
Standard error	2.21	3.94	9.04	9.04	8.61	5.11
No. of observations	114	114	114	114	114	114

Parent firms	Day 1	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR % -	0.48	1.89*	1.41	1.03 -	3.86 -	4.54
t-statistic -	1.51	1.65	0.42	0.30 -	1.19 -	1.02
Standard error	1.15	3.35	3.38	3.38	3.25	4.47
No. of observations	114	114	114	114	114	114

Adjusting for the event date 0 return both parents and subsidiaries show insignificant underperformance of the market. Parent firms underperform the market with an average of -4.5%, and subsidiaries with -5.9%. Parent firms display 1 month 10% significance on 1.89% BHAR, whereas it decreases towards the LT using the MAM.

To sum up, the MAM does not result in LT significant BHAR for parents or subsidiaries.

5.4.2 The market model

The coefficients obtained using the MM are assumed stationary when using them to forecast the BHAR. The coefficient used for determining the LT BHAR is the same used in the CAR calculations. The changing input variable is the market return. There will be used 108 firms, as the MM coefficients is only based on these.

Table 30 displays the MM BHAR over a period of 360 days. The announcement day is excluded. The first day after the announcement is insignificant with a negative BHAR of -0.39%, whereas it on LT follow a downwards trajectory leading to a 360-day BHAR of -6.17%. Indicating that on average the parent firms underperform the market with 6.17%, but still insignificant. On a 252-day basis the underperformance is significant at a 10% level, they apply for 125 days. The 252-day negative return of -7.8% is substantially lower than the MAM BHAR of -3.86% (insignificant).

Table 30 - Market model for parents long-term price performance

Market Model	1 day	30 days	90 days	125 days	252 days	360 days
BHAR %	-0.39%	0.72%	-2.70%	-5.60%*	-7.80%*	-6.17%
t-statistics	-1.27	0.46	-0.94	-1.56	-1.42	-0.69
std error %	*0.31%*	*1.55%*	*2.86%*	*3.59%*	*5.50%*	*8.95%*
N	*108*	*108*	*108*	*108*	*108*	*108*
tails	*1*	*1*	*1*	*1*	*1*	*1*

The MM BHAR should be put in perspective that the alpha and beta used as the input is fixed from the estimation window. This means that to estimate the 360 BHAR a [-220;-20] day alpha and beta is used. This will lead to model errors, which is why above should not be interpreted, but, is included in order to get an indication of the given approach. It yields differences to the MAM based BHAR, which for LT event studies are commonly used.

5.4.3 Industry performance

As reasons, motivations and characteristics varies among the industries it is found relevant to test the hypothesis, if different industries yield different abnormal returns. The same approach will be used as with the general data of all tree industries, but the display of the results will be comprised. Overlapping data is expected as the industry specific ECO's is a part of the general data analysed above. If outliers are found within the industry specific analysis it might shed light on industries that are influencing the data in a skewed way. Each industry is matched against the relevant industry ETF, meaning that the BHAR is calculated excess of the relevant industry specific ETF and not S&P 500.

Energy & Power

BHAR is significant at a 1% level at announcement day with 2.78%, lower than the average for the total group of 3.8%. The 1-month BHAR are similar but significant at a 5% level compared to a 1% level for the total group. Where the two differentiates is after 3 months. The industry displays a significant (10%) BHAR at 10.1% and 14.1% after 18 months. The industry shows significant LT BHAR, which is unique compared to the total group. The group displays negative LT BHAR, thus underperforming the market in the long run, whereas the performance displayed within the Energy and Power industry is remarkable. The LT abnormal return performance can potentially be explained by several factors like operating performance after the ECO but also leading up to the ECO. Table 12 displays that operating performance of parents in the industry indicates that ROA improves leading up to an ECO, Debt/Asset levels decreases and size increases. Generally a positive development in the factors mimicking the operating performance leading up to the ECO for parents and afterwards for the subsidiaries, which indicates that the ECO is not conducted due to pressured operational performance within the parent firm, nor due to poor performing subsidiaries. It could indicate that the divestment is conducted in order to focus on core business areas. This will be elaborated further in the multivariate analysis.

Table 31 - Panel D Energy & Power

Energy & Power	Announcement day	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	2.78***	5.53**	10.14*	7.28	7.14	14.11*
t-statistic	3.25	2.25	1.91	1.46	1.41	1.69
Standard error	2.46	5.31	4.97	4.97	5.08	8.34
No. of observations	26	26	26	26	26	26
Energy & Power	Day 1	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	-0.78*	3.04	6.60	4.70	5.60	13.51*
t-statistic	-1.60	1.26	1.25	0.91	0.97	1.61
Standard error	0.50	2.41	5.26	5.16	5.75	8.39
No. of observations	26	26	26	26	26	26

Excluding the announcement day return indicates a negative 1st day return. BHAR display no significance in the following MT. But turns significant after 18 months at 10%. The findings are in steep contrast towards the general data, since the BHAR is significant and positive at 13.51%.

Financials

The industry displays below average announcement day BHAR of 2.94%, significant at 1%. Only the first day BHAR is significant which tells that it cannot be concluded that the parent firms generate LT abnormal returns. Even though insignificant the financial industry general negative BHAR from month 3 to month 18, which is notable compared to the total group, only displaying negative BHAR over an 18-month period. As displayed in table 13, Debt/Asset increases for the parent firms looking at a 3-year period leading up to the ECO transaction. In the same period their Net Income margin and ROA indicates improvement, indicating that the operating improvement is financed by the increased debt. Increased debt levels could be a trigger for diversification within the financial sector. Looking at the subsidiaries 1-year post IPO performance the debt/asset ratio increases substantially from 18%-23%, whereas ROA is almost halved. Indicating that the carved-out companies have operational issues, at least after the carve-out. Excluding the announcement date returns Financials display significant and negative medium and LT BHAR at a 5% level from 3 months to 12 months of respectively -5,5%, -7.2% and -8.4%. It should be noted that the difference between the table 32 listed 1-day BHAR and the day 1 AR in section 5.4.1 is due to a higher number of firms included in the below data. Several firms did not display event day -1 data, and where thus excluded in that part of the analysis.

Table 32 - Panel E Financials

Financials	Announcement day	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	2.94***	2.55	-2.67	-4.37	-5.91	-3.53
t-statistic	3.87	1.65	-0.84	-1.25	-1.16	-0.51
Standard error	1.55	3.17	3.49	3.49	5.08	6.91
No. of observations	27	27	27	27	27	27
Financials	Day 1	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	-0.32	-0.36	-5.51**	-7.20**	-8.40**	-5.95
t-statistic	-0.71	0.27	-1.90	-2.19	-1.65	-0.85
Standard error	0.45	1.35	2.91	3.29	5.09	6.96
No. of observations	27	27	27	27	27	27

For the high technology industry all BHAR are insignificant, though negative after 3 months. The sample size of 12 observations might prove an issue when testing for significance and will in this case not be commented on further.

Table 33 - Panel F High Technology

High Technology	Announcement day	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	3.62	3.54	-4.05	4.80	-1.06	-6.66
t-statistic	1.59	1.13	-0.42	0.38	-0.07	-0.22
Standard error	3.13	9.75	12.65	12.65	15.38	30.93
No. of observations	12	12	12	12	12	12
High Technology	Day 1	1 Month	3 Months	6 Months	12 Months	18 Months
BHAR %	-1.48	3.54	-4.05	4.80	-1.06	-6.66
t-statistic	-0.96	-0.10	-0.73	0.08	-0.50	-0.32
Standard error	1.55	2.09	10.07	12.80	15.36	30.07
No. of observations	12	12	12	12	12	12

5.5 Part conclusion

It can be concluded that excluding the announcement day return both parents and subsidiaries display negative BHAR LT, even though it is insignificant. Further, the industry specific analysis displays different results, indicating that the different industries display different BHAR.

5.6 Correlation

In order to better grasp the relationship between the parent firms, subsidiaries and the market, the correlation between them is calculated based on BHAR. The return development is matched and comparable for the two portfolios. The comparable market will follow the earlier mentioned assumption and be the accumulated index respectively for the subsidiary matched market returns and the parent matched market returns. The correlation analysis will be based on a LT time horizon of 360 days, a MT of 150 days and a ST of 90 days. The underpricing and announcement day effects are excluded as it is significant return outliers. The correlation equations is used:

$$Corr[X_1, X_2] = \frac{Covariance[X_1, X_2]}{Std[X_1] * Std[X_2]} \quad (10)$$

[23]

Where X_1 is the first variable and X_2 is the second variable.

The trend correlation gives an indication of how strong the trend is within dataset between the 3 variables. Thus, indicating if the ST variation is captured by the LT trend.

Table 34 - Correlation matrix (LT - 260 days)

Correlation matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.31	1.00	
Market	0.48	0.70	1.00

According to table 34, the correlation between parents, subsidiaries and the market is weak and semi weak displaying a correlation coefficient at respectively 0.31 and 0.48. It tells that 31% of the movement in parent share prices correlates with the movements in the subsidiary share price. The same goes for the market where the correlation is 48% of the share price movement for parents. For

[23] Munk, Claus (2018), pp 54

a correlation coefficient to be looked upon as strong it must be 0.7+. 70% of the movement in subsidiaries is correlated with the movement in the market indicating strong correlation.

Where correlation tells something about the strength of the relationship between two variables in a linear context, R-squared tells what proportion of movement in one variable is explained by another variable. R-squared is calculated as the square root of the correlation coefficient displayed in equation 10.

Table 35 - R-squared matrix (LT - 360 days)

R-squared matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.09	1.00	
Market	0.23	0.49	1.00

The weak R-squared between parent and subsidiary tells that only 9% of the movement within the parent firm's stock is explained by the movement in the subsidiaries stock on the LT and vice versa. The market movements explanatory power is slightly higher at 23%, still considered very low. In comparison a high r-squared within investing is 85%-100%. The market is explaining 49% of the subsidiaries stock price development, indicating a medium explanation power.

As mentioned earlier the lock-up period is 180 days, indicating that parent firms can divest their position in the subsidiary further after the ECO. This can reduce both the correlation and the explanatory factor r-squared between the two variables. It is therefore relevant to conduct further analysis on the ST and LT.

Table 36 - R-squared & correlation matrix (MT - 150 days)

Correlation matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.81	1.00	
Market	0.87	0.97	1.00
R-squared matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.65	1.00	
Market	0.76	0.94	1.00

As displayed in table 36 the MT correlation is substantially higher for the portfolios. The parent and the subsidiaries have a correlation coefficient at 0.81, indicating strong correlation between the two. Further the parent and market are at 0.87, and the subsidiary and the market correlating with 97%, very close to full correlation at 100%. R-squared shows that on the MT, 65% of parent variation is explained by the variation in the subsidiary's stock price and vice versa. As a comparison to the LT r-square at 9% between the parents and subsidiaries, is after 180 days at 10%, not changing much in the period from 180 days to 260 days. In contrast is the above table 26 r-square at 65% just 30 days before. It shows a decoupling of the two variables explanatory power towards each other and the correlation in the period leading up to the lock-up period.

Table 37 - R-squared & correlation matrix (ST - 90 days)

Correlation matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.89	1.00	
Market	0.83	0.93	1.00
R-squared matrix	Parent	Subsidiary	Market
Parent	1.00		
Subsidiary	0.80	1.00	
Market	0.69	0.87	1.00

The 90-day horizon after the IPO date is similar to the MT, except a slightly higher correlation and thus r-squared between parents and subsidiaries and between the subsidiary and the market. With a r-squared of 80% the two portfolios have strong explanatory power towards each other's stock movements.

5.6.1 Industry correlation

For the industry specific correlation, the S&P 500 is used as the market benchmark as it is with the general group. The main reason is to establish which sectors correlate with the general market and the general group. Applying the industry ETF's would assumable yield higher correlation and R-squared but would not be comparable with the general group, thus revealing industry specific traits.

As displayed below in table 38, the correlation within the energy & power industry is high in the ST but weak over the long horizon. R-square indicates that 74% of the movement in the energy ECO's is explained by market movements the first 90 days, where it falls to 16% after 150 days and then stabilizes around 40 after 360 trading days. Financials show strong correlation and a high r-squared both long and ST. The ST r-square of 89% is substantially higher than the general group, but the LT horizon is remarkable higher the group. Which indicates that the performance of the financial companies has a higher beta, thus fluctuates more with the market than Energy & Power and High Technology. With this said it can be assumed that there is more market risk within Financials than the two other industries. High Technology displays weak correlation and r-square in the whole period unless in LT of 360 trading days, where it displays a medium strong correlation with the market. The numbers can primarily be explained by the fact, that most of the data on ECO's within the technology sector is concentrated around the dot.com bubble. Whereas ST volatility in the stocks is expected.

Table 38 - Industry specific R-squared & correlation

Correlation table	Energy	Financials	High Technology
Energy	1.00	n.a.	n.a.
Market *(90 days)*	0.86	0.94	0.02
Market *(150 days)*	0.40	0.93	0.02
Market *(252 days)*	0.68	0.95	0.28
Market *(360 days)*	0.64	0.89	0.70

R-squared matrix	Energy	Financials	High Technology
Energy	1.00	n.a.	n.a.
Market *(90 days)*	0.74	0.89	0.00
Market *(150 days)*	0.16	0.86	0.00
Market *(252 days)*	0.47	0.89	0.08
Market *(360 days)*	0.41	0.78	0.49

5.7 Volatility

To determine another characteristic of the parent and subsidiary firms their respective risk profile in terms of first volatility of the daily abnormal return is calculated for both portfolios. Since a comparison between the two portfolios is desired the MAM is used. An industry specific analysis will not be commented on, but the results can be found in appendix 9. As mentioned earlier a portfolio approach is used, which is why the following equations are used:

$$Var[r(\pi)] = \sum_{i=1}^{N}\sum_{i=1}^{N} \pi_i \pi_j Cov[r_i, r_j]$$
$$\sigma(\pi) = \sqrt{var[r(\pi)]}$$ [24]

Which can be depicted slightly more graphical in the following correlation matrix:

$$= [\, w_1\sigma_1 \;\; \cdots \;\; w_n\sigma_n \,] \; \mathrm{x} \begin{bmatrix} 1 & \rho_{12} & \cdots & \rho_{1n} \\ \rho_{21} & 1 & \cdots & \rho_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \rho_{n1} & \cdots & \cdots & 1 \end{bmatrix} \mathrm{x} \begin{bmatrix} w_1\sigma_1 \\ \vdots \\ w_n\sigma_n \end{bmatrix}$$

In practice a correlation matrix for first the parent firms are set up taking the correlation between each of the 114 firms. Then the annual volatility is calculated by taking the standard deviation of each firm's abnormal returns, then annualizing it by multiplying it with the square root of 252. The stocks are all weighted equal, to mirror an equally weighted portfolio with a weight of $1/114 = 0.0088$. It should be noted that it is the abnormal standard deviation i.e. the risk in excess of the market risk. A comparative table with the raw return-based volatility not adjusted for the market is displayed as well. To determine both ST and LT volatility differences the calculations are made for 5 time periods: 30 days, 90 days, 125 days, 252 days and 360 days. At each time horizon, the relative correlation matrixes and standard deviations are calculated. The output is listed below in table 39.

Table 39 - Standard deviation

Standard deviation	Parent PF	Subsidiary PF	Difference
30 days	11%	58%	-47%
90 days	8%	34%	-26%
125 days	7%	29%	-22%
252 days	6%	21%	-14%
360 days	6%	18%	-12%

As depicted in table 39, the parent firms display a 30-day volatility of 11%, whereas it decreases substantially on the LT of 360 days and seem to have reached a normalized level of 6%. The calculations take the announcement day return into account, which can explain the development, as determined earlier, the announcement day return is a significant stock performance factor. Above volatility will be put further in perspective in the Sharpe ratio analysis. The subsidiary based portfolio experiences a 30-day standard deviation of 58%, substantially higher than the one of parent firms. This might be contributed by the underpricing of 20% at the IPO date, which is included in the above. The subsidiaries show the same downwards volatility trend as the parents, going from the 58% to 18% after 360 days. From above it is clear that subsidiaries have higher standard deviation that parent firms in relative terms. The gap narrows in the LT, though still at 12%p, corresponding to 3x higher volatility in the subsidiaries than the parent firms.

[24] Munk, Claus (2018), pp 88

As the high underpricing and announcement date can influence the volatility making the data skewed due to the first day outlier it is relevant to exclude the first day return. The same table excluding the announcement date and underpricing return is show in table 40 below.

Table 40 - Standard deviation excluding day 0

Standard deviation	Parent PF	Subsidiary PF	Difference
30 days	4%	7%	-3%
90 days	4%	6%	-2%
125 days	5%	6%	-1%
252 days	5%	6%	-1%
360 days	5%	6%	-1%

By excluding the day 0 returns in the calculation of the volatility changes the output radically. After the adjustment, the parent portfolio displays lower volatility in the first 30 days of the announcement, than in LT. The volatility is 4% in the ST increasing to 5% LT, which indicates a more stable development than before. It should be noted that the volatility is very low for both portfolios, which is primarily due to diversification gains from pooling the stocks together, where their correlation is essential. It indicates low correlation between the stocks, which on a portfolio level will result in increased diversification an in this case it lowers the volatility. The general correlation with the market for parent and subsidiaries is low, as established in the correlation section. Subsidiaries display substantially lower volatility as well, starting at 7% decreasing to a stable 6% after 90 days towards the end of the test period. Subsidiaries are still 29% more volatile than the parent firms, but at lower levels compared to the 3x volatility with the included day 0 returns. The “normalized” volatility is thus lower, but still 29% higher for subsidiaries than parent firms in the LT (360 days).

Disregarding the portfolio perspective and looking directly at the volatility for each stock included in the two portfolios can shed light if the subsidiaries shows significantly higher volatility than the parents or vice versa. It can be determined by conducting a t-test for the two samples assuming the means are equal based on a narrower time period of 30-day, 125 day and the 360-day volatility.

Table 41 - t-Test for sample means

t-Test two sample means	Par (t=30)	Sub (t=30)	Par (t=125)	Sub (t=125)	Par (t=360)	Sub (t=360)
Mean	38%	52%	42%	53%	44%	54%
Variance	0.05	0.18	0.08	0.15	0.09	0.14
df	115	115	114	114	114	114
t Stat	-4.26***		-4.08***		-3.46***	
P(T<=t) two-tail	0.00004		0.00008		0.0008	

Table 41 shows strong significance when testing the two means assuming they are equal on the long- and short-time horizon. The results are all significant at a 1% level, the negative indicator in front of the t Stat should be disregarded as it is simply a question of which variable is included as variable 1 and 2 in the test.

Table 41 also displays the average volatility, that is not based on the portfolio method used above. It adds perspective towards the diversification gains in terms of volatility that is gained in portfolio theory. Directly compared with above it can be seen that the excluded (without day 0 returns) average LT (360 days) volatility for the parents is 44% and 54% for subsidiaries, substantially more than above calculated volatility.

It is found that there is significant difference between the individual parent and subsidiary firms regarding their volatility, but the findings are not based on a portfolio approach, which should be kept in mind.

5.8 Risk compensation

The Sharpe Ratio measures the relationship between the risk premium and the associated risk. It shows the reward in terms of return per unit of risk in excess of the risk-free rate. This measurement will allow for comparison in relation to how volatile the portfolios are relative to their risk. Comparing the parent and subsidiaries Sharpe ratios will give an insight in exactly this aspect of the risk adjusted analysis. The Sharpe ratio is calculated as follows[25]:

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

The risk-free rate used is the 20-year average of the fed funds rate, which is 1.9%, it will be fixed and not vary with the returns different time horizons. The raw returns are calculated to allow for comparison between parents and subsidiaries.

Table 43 displays the Sharpe Ratio for parent and subsidiaries including and excluding underpricing/announcement date returns. The return is not based on abnormal returns but on actual raw returns, not adjusting for the market. The standard deviation is calculated using the same approach in order to offer the most valid comparison.

Including underpricing and announcement day returns respectively, the Sharpe Ratio for parent firms remains decent during the first 125 days at 1.26, It means that investors are compensated close to ratio of 1x in returns relative to their risk. During the long horizons parents Sharpe ratio increases to 1.76 after 360 trading days, which is looked upon as a good Sharpe Ratio. The increase is driven by both a fallen standard deviation indicating less risk and increasing returns. Compared to the subsidiaries 125-day SR at 1.03, 252-day SR at 1.82 and their 360-day SR at 1.07 the parent's relative performance to risk seem more stable as it slowly increases towards a higher LT SR. The 252-day SR for subsidiaries includes the underpricing, and is seen as an attractive level, as investors are compensated 1.82x their risk in the period. But a notable decrease towards 360 days after IPO indicates still satisfactory levels to investors but, a bad trajectory.

[25] Bennigsen, F. Ravensholt, F. Lundquist, J. (2019) pp 31

Table 43 - Sharpe ratio

	Parent				Subsidiary			
With underpricing	STD	Return	Sharpe Ratio		*With underpricing*	STD	Return	Sharpe Ratio
30 days	11%	7%	0.43		30 days	58%	27%	0.43
90 days	8%	10%	1.10		90 days	34%	34%	0.95
125 days	7%	11%	1.26		125 days	29%	32%	1.03
252 days	6%	10%	1.36		252 days	21%	40%	1.82
360 days	6%	12%	1.76		360 days	18%	21%	1.07
Ex Underpricing					*Ex Underpricing*			
30 days	4%	3%	0.27		30 days	7%	4%	0.30
90 days	4%	6%	0.94		90 days	6%	8%	1.06
125 days	5%	6%	0.97		125 days	6%	10%	1.25
252 days	5%	6%	0.81		252 days	6%	13%	1.83
360 days	5%	8%	1.26		360 days	6%	5%	0.43

When adjusting both portfolios for their day 0 gains, the story is the same, with lower bases. Parent firms sees a positive development in their risk return relationship, where's subsidiaries peak after 252 days. Subsidiary SR does not differ that much, as the risk excluding the day 0 gain is decreasing substantially. But the LT decrease is more notable yielding a SR of only 0.43. Parent firms develop with the same positive trajectory and incurs a LT SR of 1.26.

LT risk compensation is satisfactory for parent firms both including and excluding day 0 gains. For subsidiaries, the relationship is descent with day 0 gains, but still shows worrying downwards development on the LT. Excluding underpricing underpins this observation as the LT and SR Sharpe Ratio falls below 1 at 0.43.

CHAPTER 6 – Empirical analysis: Multivariate

The last part of the analysis is the empirical multivariate analysis. It seeks to answer the second research question. To do this several regression analyses are conducted using a number of explanatory variables identified in chapter 2 & 4.

Having established the significance of the ST and the LT abnormal returns for both subsidiaries and parent firms including parent industries using the MM and the MAM leads to the next step of the analysis, the multivariate analysis. The multivariate regression analysis will test several independent variables against the dependent variable, which is the abnormal return at a given time using either the MM or the MAM. There will be conducted an analysis based on the full sample size at 5 different time horizons using the following independent model variables: Sales growth, Size, Leverage, ROA, Divest, Relatedness, Crisis, Beta, Majority control and relevant industries. The time horizons are: The event day, 30 days, 90 days, 125 days , 252 days, and 360 days, for both subsidiaries and parent firms. Further, there will be conducted a multivariate regression for the specific industries mentioned earlier, Energy & Power and Financials, the same as above independent model variables will be used together with the industry specific found in section 4 of the thesis. At last an analysis will be conducted of the subsidiaries performance based on the same variables as for parents, including some of the parent variables such as: Parent size, Parent ROA, Parent debt, in order to determine potential influential parent characteristics on the ST and LT subsidiary performance. Above will result in the determination of the influence the tested variables have on parent and subsidiary abnormal return performance.

Table 44 describes the variables used in the analysis. Where the variables are both calculated for parent and subsidiaries. A selected number for parent/subsidiary firms variables will be used in the test of subsidiary/parent firm's performance.

Table 44 - Description of the variables used in the multivariate regression analysis

Variable Code	Variable Name	Description
Size	Size	The narural logarithm of the total sales at the last fiscal quarter leading up to the ECO
Leverage	Debt to assets	Total debt as a proportion of total assets of the fiscal year end prior to the ECO
ROA	Return On Assets	Net Income scaled by total assets at the fiscal year end prior to the ECO
Relatedness	Relatedness	A dummy variable that takes to value 1 if the parent and subsidiary is within the same macro code and 0 otherwise
Crisis	Crisis	A dummy variable that takes to value 1 if the ECO year was between 1999-2001 and 2008-2009 and 0 otherwise
Beta	Beta	The [-220:-20 day] Market model estimated beta for the parent. Used as a proxy for systematic risk
Energy & Power	Energy & Power	A dummy that takes the value 1 if the industry is Energy & Power and 0 otherwise
Financials	Financials	A dummy that takes the value 1 if the industry is Financials and 0 otherwise
High Technology	High Technology	A dummy that takes the value 1 if the industry is High Technology and 0 otherwise

6.1 Multicollinearity

Before testing the variables in the multivariate regression, it is relevant to conduct a multicollinearity test to determine the dependence of the variables. The variables are assumed to be independent. It is done by making a VIF test, also known as a Variance Inflation Factor test. When there is multicollinearity in a model it often indicates that the variance between the variables is inflated and dependent on each other, which indicates correlation among the variables. If variables display strong correlation a solution is to exclude one of the variables in order to have a good model. After this the new variables are tested in an adjusted regression model. When calculating the variance inflation factors a result of 1 indicates low multicollinearity among the variables whereas a VIF at 5-10 indicates high multicollinearity. In such model it is often advised to exclude the high VIF variables[26].

VIF can be calculated using the regression output data as follows:

$$VIF_j = \frac{{S_{xj}}^2 (n-1) * {SE_{bj}}^2}{S^2}$$

Where ${S_{xj}}^2$ is the standard deviation in the variable, n is the sample size and ${SE_{bj}}^2$ is the squared standard error of the slope in the variable and S^2 is the mean error residuals squared. The mentioned input is derived by conducting a multivariate regression on a given dependent variable using the desired independent variables. In this case as a proxy for the data the CAR was used based on the MAM (ST). The results can be found in table 45.

[26] Akinwande, Dikko & Samson, 2015

Table 45 - All variables to the left, excluded calculation to the right

Variable	VIF	Variable	VIF
Sales growth	10.2	Size	1.29
Size	1.31	Leverage	1.21
Leverage	1.22	ROA	1.22
ROA	1.24	Relatedness	1.06
Divest	4.23	Crisis	1.15
Relatedness	1.09	Beta	1.05
Crisis	1.27	Sub Leverage	1.12
Beta	1.06	Sub Size	1.21
Majority Control	4.34		
Sub Leverage	1.12		
Sub size	1.21		
Mean VIF	2.58	Mean VIF	1.17

Obtaining the VIF' indicates a mean VIF at 2.58, which is substantially higher than the desired mean around 1. Variables such as Sales growth displays a VIF of 10.2, whereas Divest displays a VIF of 4.23 and Majority Control a VIF of 4.34. Which indicates high correlation between the variables, indicating an issue with multicollinearity among the variables. Adjusting for these variables a mean VIF of 1.17 is obtained with the highest VIF at 1.29, which is considered low. The VIF factors above 4 are excluded when conducting the analysis, so the independence assumption between variables holds.

6.2 Short-Term performance

The ST performance (announcement day) is measured using the two abnormal return models, CAR and AR. Table 46 displays that Leverage is a significant variable for CAR using both models. Using the MAM, the parent firms leverage prior to the ECO is significant at a 10% level, whereas it is significant at a 5% level using the MM. It indicates that for every increase in 1 unit of leverage the mean value of CAR will increase with 0.0008 for MAM and 0.001 for the MM. Using the MM Relatedness shows a significant negative relationship with CAR at a 10% level. The coefficient is -0.0275, indicating that when parent and subsidiaries are in the same industry the announcement day effects are on average -2.75% lower than if the two is not in the same macro industry, strongly suggesting diversification gains of cross-sector ECOs. Subsidiary size displays a significant (10%) positive relationship with AR, indicating that larger carve-outs result in higher AR for parent firms. This underpin the hypothesis about diversification gains, as the more of the assets that are diversified, the higher the AR.

The MM show significant F-statistics at a 5% level (MM), which tells that the model provides a better data fit than if it had not independent variables included.

Table 46 – Short-term IPO performance parents

	Market-adjusted model				Market model			
	CAR	t-statistics	AR	t-statistics	CAR	t-statistics	AR	t-statistics
Intercept	0.0264	1.07	0.0260	1.26	0.0222	0.76	0.0339	1.50
Size	-0.0001	-0.02	-0.0004	-0.18	-0.0032	-0.96	-0.0013	-0.50
Leverage	0.0008	1.98*	0.0005	1.56	0.0010	2.31**	0.0006	1.64
ROA	-0.0014	-1.30	-0.0006	-0.68	-0.0010	-0.89	-0.0004	-0.45
Relatedness	-0.0177	-1.23	0.0008	0.07	-0.0259	-1.71*	-0.0026	-0.20
Crisis	-0.0057	-0.37	-0.0020	-0.16	-0.0097	-0.61	-0.0043	-0.32
Beta	0.0079	0.25	0.0009	0.03	0.0339	1.05	0.0149	0.55
Sub Size	0.0041	1.08	0.0054	1.78*	0.0053	1.29	0.0059	1.71*
Adjusted R-squared	0.0440		0.0035		0.0860		0.0700	
F-statistics	1.65		1.06		2.41**		1.11	
N	112		112		105		105	

6.2.1 Subsidiaries short-term abnormal returns

Table 47 displays the AR for the subsidiaries using the general explanatory variables. ROA as an explanatory variable is excluded for subsidiaries due to the lack of publicly available information.

Table 47 – Short-term performance for subsidiaries

Market-adjusted model

General factors	AR	t-statistics	*Parent factors*	AR	t-statistics	*Industry factors*	AR	t-statistics
Intercept	0.2348	1.62	Intercept	0.4628	3.83***	Intercept	0.2359	4.05***
Size	-0.0109	-0.56	Parent Size	-0.0317	-1.89*	Energy and Power	-0.1416	-1.46
Leverage	-0.0038	-2.67***	Parent Leverage	-0.0020	-0.89	Financials	-0.1713	-1.48
Majority	0.0097	0.12	Parent ROA	0.0107	1.69*	High Technology	0.3457	2.92***
Relatedness	0.0169	0.17	Parent CAR MAM	-0.2481	-0.45			
Crisis	0.3209	3.03***						
Beta	0.0677	0.40						
Adjusted R-squared	0.1469			0.0350			0.1161	
F-statistics	4.16***			2.00*			5.82***	
N	111			111			111	

Leverage is significant at a 1% level, with negative sign, indicating that for increased leverage within the subsidiaries the underpricing will be smaller. The dummy variable crisis is also significant at a 1% level, thus positive with 0.32. It indicates that every time the dummy takes the value of 1 i.e. the event date is within a crisis the abnormal mean return within the model is 32% higher. The model is significant at a 1% level as well, looking at the f-statistics of 4.16. The adjusted R-squared is low at 0.145. Looking at the parent factors two variables display a significant influence on the subsidiaries underpricing AR, which are the parent's size and the parents ROA. Both variables at a 10% level. Parent size have a negative influence on the mean AR, the larger the parent firm is in terms of revenue it impacts the AR negative. So larger firms tend to have subsidiaries displaying smaller IPO underpricing. Parent ROA display a positive impact on the underpricing, indicating that investors look towards the parent firm profitability in order to determine future profitability of the subsidiaries.

The industry variables display that the High Technology sector is significant at a 1% level. This finding can be highly related to the Crisis variable since many of the High Technology companies where within the time frame of the dot.com bubble. Further the contribution toward the AR is similar. Energy & Power and Financials are both insignificant, but worth mentioning with negative signs.

6.2.2 Short-term Industry performance

The Energy and Power industry shows a significant negative relationship with the general CAR for both models and AR for the MAM. It has a negative CAR telling that if the ECO happens within the Energy and Power sector it will have a worse announcement day effect to the parent firm than the general group of -3.36% over the three day period of [-1;+1]. Using the AR in the MAM the number

is -2.51%. Another significant industry in the MM is High technology, also with a negative significant CAR at a 10% level. The sample size of High Technology (HT) is low at 12 samples, where most of the ECO in the industry happened around the dot.com bubble. The model in general is insignificant looking at the F-statistics, meaning that including the 3 sector dummy variables does not produces a better forecasting model than excluding them all. As two of the variables are significant, and the F-statistics is close to being significant it could have been relevant to test the model again excluding the insignificant Financials industry[27].

Table 48 – Short-term IPO performance

	Market-adjusted model				Market model			
	CAR	t-statistics	AR	t-statistics	CAR	t-statistics	AR	t-statistics
Intercept	0.0458	4.30***	0.0464	5.40***	0.0459	4.11***	0.0485	5.31***
Energy and Power	-0.0336	-1.86*	-0.0251	-1.72*	-0.0311	-1.64*	-0.0238	-1.53
Financials	-0.0152	-0.84	-0.0196	-1.34	-0.0081	-0.40	-0.0174	-1.07
High Technology	-0.0370	-1.49	-0.0192	-0.95	-0.0492	-1.90*	-0.0283	-1.34
Adjusted R-squared	0.0139		0.0066		0.0203		0.0047	
F-statistics	1.5218		1.2450		1.7267		1.1638	
N	112		112		106		106	

After having established that two of the industries display ST significance in CAR it is relevant to look at which factors, that influence the return in each industry. The same analysis is conducted based on the industries matched market returns as used in the univariate analysis. The market that is corrected from is thus not the S&P 500 but the industry specific ETF trackers. The variables tested are the same as used in the general multivariate regression and seeks to display if the single industries are influenced differently than the general group towards each explanatory variable.

Table 49 displays the results of the regression within the Energy & Power industry including the variables found to influence the industry, in this case the Oil and Natural gas price. Relatedness is the only significant parameter. It is significant in both models using CAR and AR. Using the MM and CAR relatedness is significant at a 5% level, with negative impact towards the model estimate of -0.1186. The general models displayed similar but not equal results, which can lead to the indication that there is some of the tested variables that differ in results within the Energy & Power industry around the announcement day for parents from the general model. An example is leverage, that is not significant within the industry. The oil price at the ECO is close to being significant using the MAM with a t-statistic at -1.58.

[27] The industries are three dummy variables taking the value 1 if it relates to the Energy & Power industry.

Table 49 – Short-term IPO performance: Energy & Power

Energy	Market-adjusted model				Market model			
	CAR	t-statistics	AR	t-statistics	CAR	t-statistics	AR	t-statistics
Intercept	0,0345	0,59	0,1142	2.24**	0,1624	1,69	0,1326	2.51**
Size	0,0008	0,17	-0,0027	-0,96	0,0005	0,09	-0,0033	-1,14
Leverage	0,0003	0,43	-0,0004	-0,74	-0,0001	-0,15	-0,0007	-1,37
ROA	0,0014	0,55	-0,0007	-0,37	-0,0019	-0,59	-0,0011	-0,58
Relatedness	-0,0569	-1.71*	-0,0521	-2.08**	-0,1186	-2,53**	-0,0579	-2.25**
Crisis	0,0360	1,05	0,0115	0,50	-0,0032	-0,07	0,0136	0,54
Beta	0,0012	0,02	0,0504	1,35	0,0535	0,77	0,0665	1,75
Sub size	-0,0048	0,01	-0,0050	-1,28	-0,0098	-1,22	-0,0040	-0,92
Natural gas	0,0262	0,69	0,0095	0,41	0,0258	0,59	0,0066	0,28
Oil	-0,0921	-1,58	-0,0074	-0,19	-0,0182	-0,22	-0,0092	-0,20
Adjusted R-squared	0,0946		0,1308		0,0907		0,2490	
F-statistics	1,33		1,43		1,29		1,89	
N	26		26		25		25	

Financials

The first test conducted on the ST abnormal returns included the factors found relevant in the industry analysis: AUM in active investments funds, FED rate, and GDP Y/Y growth.

Table 50 – Short-term IPO performance: Financials

Financial	Market-adjusted model				Market model			
	CAR	t-statistics	AR	t-statistics	CAR	t-statistics	AR	t-statistics
Intercept	0.1301	1.38	0.0062	0.08	0.1483	1.22	-0.0276	-0.27
Size	-0.0102	-2.12**	-0.0053	-1.38	-0.0083	-1.33	-0.0093	-1.75
Leverage	-0.0009	-1.33	-0.0010	-1.79*	0.0004	0.48	-0.0007	-0.99
ROA	-0.0041	-2.09**	-0.0025	-1.63	-0.0051	-2.27**	-0.0030	-1.59
Relatedness	-0.0455	-2.18**	-0.0391	-2.35**	-0.0532	-2.07*	-0.0408	-1.86*
Crisis	0.0015	0.03	0.0375	0.95	-0.0157	-0.26	0.0580	1.13
Beta	0.0641	1.27	0.0477	1.18	0.1122	1.95*	0.0871	1.77*
Sub size	0.0147	2.32**	0.0122	2.41**	0.0072	0.70	0.0185	2.09*
AUM	-0.0063	-0.75	0.0039	0.58	-0.0073	-0.73	0.0064	0.74
FED Rate	-1.7923	-1.72	-0.5156	-0.62	-1.3602	-1.14	-0.8957	-0.88
GDP	0.0048	0.49	0.0017	0.22	0.0066	0.57	0.0049	0.50
Adjusted R-squared	0.1814		0.2260		0.2300		0.2100	
F-statistics	1.55		1.73		1.65		1.59	
N	26		26		22		22	

Under the MAM using CAR, there is 4 significant variables, Size, ROA, Relatedness and Sub size, all at a 5% level. Using the MM Beta displays significance as well on a 10% level, where ROA and relatedness are significant at a 5% level. ROA and Beta is not significant in the general model, parent firms within financials differs from the general model with 2 unique significant variables. ROA under CAR in the MM is negative with -0.0051, indicating that the higher ROA gets, the lower impact it has on CAR, which is counterintuitive, as ROA is a profitability measure. Beta contributes positively to CAR with a coefficient at 0.1122, indicating that the higher the Beta is during the MM estimation window of [-220;-20] days before the event the CAR will be higher at the announcement day. Thus, indicating a higher systematic risk will lead to higher announcement day returns. The MM based CAR is insignificant using f-statistics at a 10% level. Financials display different significant explanatory variables than both Energy & Power and the general group at event day.

High technology was analysed as well displaying no significant parameters, thus not included or commented on further.

6.3 Medium-term performance

The medium-term (MT) abnormal return performance takes the 30 days, 90 days and 125 days after the event day into account. All days are trading days. In contrary to the ST performance the MT and LT performance analysis is based on the BHAR, thus excluding the event day, as it is seen as an anomaly skewing the data set. Excluded from below compared to the ST analysis is the subsidiary size and leverage as both was found insignificant and disturbing the broader picture when tested throughout the data.

The MM for the period is displayed in appendix 8, and not commented further on.

Table 51 displays the MAM BHAR, Size significant at a 5% level within the first 30 days only. Since the relationship is negative with the mean BHAR of the model, it indicates that larger firms tend to have smaller 30-day BHAR after the announcement. The beta is significant as well at a 5%, but with a positive relationship, indicating that a higher systematic risk for the parent firms leading up to the announcement has an influence on the 30-day post announcement performance. The 90-day BHAR display different significant variables: Leverage, ROA and the industry High Technology. As with the ST CAR the ROA is significant on a 1% level, still with a negative relationship towards the mean BHAR. It is surprising that better operating performance, as ROA is a proxy for, yields negative BHAR in the middle term for both 90 and 125 days. Leverage is significant at a 1% level for 90 and 125 days, also with a negative relationship, indicating that increased leverage leads to lower BHAR over the MT. High Technology on the 90-day is significant, indicating that firms within the HT industry tend to perform worse than the mean BHAR during the period. The highly significant intercept should be noted, as it after 125 days indicate a mean BHAR of 37.9% if all the explanatory variables where excluded, the finding is surprising compared to the univariate analysis. All the models are significant using the ANOVA based F-statistics, at respectively a 10%, 5% and 1% level. For the 30-day BHAR the proxy for explanation degree of the model r-squared is very low at 5.7%.

Table 51 - General medium-term performance

	Market-Adjusted Model					
	BHAR-30D	t-statistics	BHAR-90D	t-statistics	BHAR-125D	t-statistics
Intercept	0.1158	2.70***	0.3354	2.77***	0.3790	2.61**
Size	- 0.0116	-2.37**	- 0.0147	- 1.07	-0.0074	-0.45
Leverage	0.0000	0.00	- 0.0059	-3.19***	-0.0082	-3.71***
ROA	- 0.0012	- 0.65	- 0.0126	-2.45***	-0.0234	-3.79***
Relatedness	- 0.0297	- 1.16	0.0133	0.18	0.0123	0.14
Crisis	- 0.0006	- 0.02	0.0054	0.07	0.0199	0.22
Beta	0.1086	2.09**	- 0.0989	- 0.68	-0.2089	-1.19
Energy and Power	0.0375	1.10	0.0534	0.56	0.0417	0.36
Financials	- 0.0278	- 0.88	- 0.1267	- 1.41	-0.1605	-1.49
High Technology	- 0.0564	- 1.31	- 0.2475	-2.04**	-0.2167	-1.49
Adjusted R-squared	0.0570		0.1245		0.1816	
F-statistics	1.75*		2.75**		3.74***	
N	112		112		112	

6.3.1 Medium-term subsidiary performance

Conducting the MT subsidiary abnormal return performance for the 30- and 90-day time horizon no variables where significant, there are thus not included in table 52, displaying only the MT BHAR of the 125-day – they are included in appendix 6. Table 52 displays the 125 BHAR for subsidiaries. Of

the general factors only beta is significant, in contrast to the ST AR, where 3 variables displayed high significance. Beta is significant at a 5% level and has a negative relationship with the 125-day BHAR. The higher the parent firm's beta has been in the period of [-220-20] days leading up to the announcement day the lower the MT BHAR for subsidiaries are. The significant relationship indicate that subsidiaries with parents that have high market risk underperform relative to those with less systematic risk, most often counter cyclical companies. The parent-based variables are insignificant, and the industry variables the same.

Table 52 - Subsidiary medium-term performance

Market-adjusted model								
General factors	BHAR-125D	t-statistics	*Parent factors*	BHAR-125D	t-statistics	*Industry factors*	BHAR-125D	t-statistics
Intercept	0.2710	1.35	Intercept	0.2933	1.82*	Intercept	0.1154	1.42
Size	-0.0311	-1.15	Parent Size	-0.0289	-1.29	Energy and Power	-0.0662	-0.49
Leverage	-0.0023	-1.16	Parent Leverage	-0.0016	-0.54	Financials	-0.1060	-0.66
Majority	-0.0157	-0.14	Parent ROA	-0.0013	-0.16	High Technology	-0.1646	-1.00
Relatedness	-0.0297	-0.21	Parent CAR MAM	0.1244	0.17			
Crisis	0.0562	0.38						
Beta	-0.5496	-2.35**						
Adjusted R-squared	0.0327			-0.0109			-0.0109	
F-statistics	1.62			0.70			0.40	
N	111			111			111	

6.3.2 Medium-term Industry performance

Energy & Power displays significance in Size and Leverage during the 30-day period both at a 5% level. The relationship is negative. Compared to the general group, which had Size significant as well, the Leverage variable is different. Further, the industry does not display significant beta variable. On the 125-day period Relatedness is 5% significant, in contrast again to the general group. The relationship is positive, indicating that the mean BHAR is positively influenced if the ECO is within the same industry. This finding could be set in perspective towards several of the stated hypothesis, such as the asymmetry information hypothesis and the corporate focus hypothesis. If the parent firm divest a related subsidiary it can be because they think the entity is overpriced, they assumable have the industry knowledge to make such conclusion. Further it could be to increase focus on the core business, thus improving management focus and generate higher BHAR. The same hypothesis can be highlighted for the ST CAR in the MM for the general group where relatedness is being significant as well and for the energy & power industry CAR, thus with a negative relationship, making below finding non-consistent with the ST findings. None of the models display significance using the ANOVA based f-statistics

Table 53 - Energy & Power medium-term performance

	Market-Adjusted Model					
Energy and Power	BHAR-30D	t-statistics	BHAR-90D	t-statistics	BHAR-125D	t-statistics
Intercept	0.3008	2.84***	0.1352	0.49	-0.1532	-0.54
Size	-0.0182	-2.15**	-0.0230	-1.04	-0.0125	-0.55
Leverage	-0.0042	-2.72**	-0.0056	-1.37	-0.0048	-1.16
ROA	-0.0010	-0.22	0.0071	0.60	0.0148	1.21
Relatedness	-0.0277	-0.46	0.1843	1.16	0.3455	2.13**
Crisis	-0.0536	-0.85	0.1743	1.05	0.2788	1.64
Beta	-0.0801	-0.74	-0.0071	-0.03	-0.1668	-0.58
Natural gas SP	0.0919	1.32	-0.0459	-0.25	-0.0315	-0.17
Oil	-0.0050	-0.04	0.2614	0.89	0.0590	0.20
Adjusted R-squared	0.1891		0.1160		0.1733	
F-statistics	1.70		1.39		1.63	
N	25		25		25	

Financials had several significant variables when testing their ST performance, but when testing the medium-term performance, the significance of these variables have vanished. Thus, there is not significant variables during the MT.

Table 54 - Financials medium-term performance

	Market-Adjusted Model					
Financials	BHAR-30D	t-statistics	BHAR-90D	t-statistics	BHAR-125D	t-statistics
Intercept	0.1516	1.04	0.2449	0.77	-0.1742	-0.51
Size	- 0.0088	- 1.47	- 0.0172	- 1.31	-0.0127	-0.91
Leverage	- 0.0016	- 1.60	- 0.0014	- 0.63	-0.0016	-0.68
ROA	0.0014	0.46	0.0056	0.83	-0.0040	-0.56
Relatedness	0.0219	0.66	0.0430	0.60	-0.0076	-0.10
Crisis	- 0.0139	- 0.18	- 0.1897	- 1.11	-0.0921	-0.51
Beta	0.0456	0.61	0.2130	1.30	0.0032	0.02
AUM	- 0.0036	- 0.29	- 0.0152	- 0.56	0.0246	0.86
FED Rate	- 0.4055	- 0.27	- 2.3945	- 0.72	1.7092	0.48
GDP	- 0.0184	- 1.16	0.0055	0.16	0.0195	0.53
Adjusted R-squared	0.0524		0.0649		0.1422	
F-statistics	1.15		1.19		1.46	
N	26		26		26	

6.4 Long-term performance

The 252-day BHAR have one significant variable, Leverage. Leverage shows a negative relationship with the LT BHAR, significant at a 10% level. Leverage has been significant since the 90-day BHAR, indicating that the 1-year BHAR is statistically influenced by the debt levels of the parent firm at the fiscal year end, closest to the announcement of an equity carve-out. The larger the debt levels are to the total assets the worse 252-day BHAR. An investor should therefore look for below average debt to asset ratios in order not to experience a decrease in the mean BHAR following an ECO.

Looking at the 360-day BHAR leverage is not significant, indicating that the fiscal year around the announcement of the ECO only influences the BHAR until 252 days after the announcement. Another variable, ROA is significant at a 10% level. ROA have been a significant variable since the 90-day BHAR except the 252-day BHAR. The variable display a positive relationship indicating that higher ROA will on the LT result in significant BHAR. Profitability can thus be an outperformance variable among the ECO parent firms. The 252-day model is significant at a 10% level, whereas the 360-day model is insignificant.

Table 55 – Long-term performance

	Market-Adjusted Model			
	BHAR-252D	t-statistics	BHAR-360D	t-statistics
Intercept	0.1766	1.39	0.0720	0.41
Size	- 0.0196	- 1.55	- 0.0282	- 1.60
Leverage	- 0.0033	-1.86*	- 0.0015	- 0.58
ROA	0.0060	1.21	0.0130	1.87*
Relatedness	0.0881	1.21	0.1567	1.55
Crisis	- 0.0469	- 0.61	0.0270	0.25
Beta	- 0.1747	- 1.17	- 0.2160	- 1.04
Energy and Power	- 0.0392	- 0.41	- 0.0344	- 0.26
Financials	- 0.0745	- 0.83	- 0.0072	- 0.06
High Technology	- 0.1755	- 1.45	- 0.1704	- 1.01
Adjusted R-squared	0.0587		0.0335	
F-statistics	1.77*		1.43	
N	111		111	

6.4.1 Long-term subsidiary performance

The BHAR for the subsidiaries over a 252-day period indicates no significant variables. The previous significant ST and MT variables are now insignificant. Looking at the 360-day BHAR the Beta variable is significant at a 5% level, still indicating that the risk associated with the parent firm leading up to the ECO announcement has a significant negative influence on the LT subsidiary BHAR. It can also be a proxy for the inherent risk, within the subsidiary, which in turn would mean that if the parent firm display a high beta the subsidiary is more likely to do so as well. The negative relationship indicates that the LT BHAR is reliant on the parent beta, thus using an investor perspective, investors should look at the parent beta leading up to the ECO announcement before taking a long position in the listed subsidiary. High Technology is significant at a 5% level, indicating that firms within the High Technology industry on average underperform the mean BHAR. High Technology firms in the data sample is consisting primarily of subsidiaries IPO'ed during the dot.com bubble, thus a 360-day BHAR underperformance is not surprising, as the post period of their IPO have been influenced by general losses within the industry.

Table 56 – Long-term subsidiary performance

Market-adjusted model								
General factors	BHAR-252D	t-statistics	*Parent factors*	BHAR-252D	t-statistics	*Industry factors*	BHAR-252D	t-statistics
Intercept	0.4645	1.40	Intercept	0.2928	1.11	Intercept	0.0376	0.28
Size	-0.0430	-0.96	Parent Size	-0.0433	-1.18	Energy and Power	0.0026	0.01
Leverage	-0.0024	-0.75	Parent Leverage	0.0011	0.22	Financials	-0.0394	-0.15
Majority	-0.1933	-1.05	Parent ROA	0.0071	0.52	High Technology	0.1220	0.45
Relatedness	-0.1237	-0.53	Parent CAR MAM	-0.1794	-0.15			
Crisis	0.0686	0.28						
Beta	-0.6067	-1.57						
Adjusted R-squared	0.0068			0.0134			-0.0253	
F-statistics	1.13			0.36			0.09	
N	111			111			111	
General factors	BHAR-360D	t-statistics	*Parent factors*	BHAR-360D	t-statistics	*Industry factors*	BHAR-360D	t-statistics
Intercept	0.1824	0.93	Intercept	-0.0105	-0.07	Intercept	-0.0157	-0.20
Size	-0.0207	-0.78	Parent Size	-0.0229	-1.07	Energy and Power	0.0194	0.15
Leverage	0.0007	0.37	Parent Leverage	0.0041	1.40	Financials	-0.0540	-0.35
Majority	-0.0840	-0.77	Parent ROA	0.0010	0.12	High Technology	-0.2857	-1.82**
Relatedness	-0.0824	-0.60	Parent CAR MAM	-0.2576	-0.36			
Crisis	-0.1890	-1.32						
Beta	-0.4138	-1.80**						
Adjusted R-squared	0.0015			-0.0090			0.0076	
F-statistics	1.03			0.76			1.28	
N	111			111			111	

6.4.2 Long-term industry performance

The LT industry specific BHAR for the Energy & Power industry is shown in table 57 and excludes the Natural gas and Crude oil variable as they have been far from significant in the previous tests.

Table 57 – Long-term Energy & Power performance

	Market-Adjusted Model			
Energy and Power	BHAR-252D	t-statistics	BHAR-360D	t-statistics
Intercept	- 0.3635	- 1.59	- 0.3643	- 0.91
Size	- 0.0058	- 0.28	- 0.0071	- 0.20
Leverage	0.0001	0.03	- 0.0010	- 0.15
ROA	0.0228	2.21**	0.0191	1.05
Relatedness	0.4308	3.21***	0.5763	2.44**
Crisis	0.1450	1.20	0.1406	0.66
Beta	- 0.8241	-2.99***	- 0.6111	- 1.26
Adjusted R-squared	0.3476		0.0581	
F-statistics	3.13**		1.25	
N	25		25	

In the 125-day MT BHAR only shown significant Relatedness. Looking at the 252-day BHAR ROA is significant at 5%, Relatedness is significant at 1% and at last beta at 1%. It should be noted that beta is calculated based on the relationship between the ETF based index and the portfolio companies within the Energy & Power industry. ROA and Relatedness are a positive influence on BHAR. The fact that Relatedness display significant influence on the LT BHAR within the industry can be partly answered by the industry characteristics mentioned in section 4. Several firms are highly specialized within the industry, whereas the larger firms seek to control several parts of the value chain most often encounters issues. Conducting an ECO can therefore increase the specialization of the firm and thus reduce the conglomerate discount, while still potentially share synergies between the two now separate companies. The finding contradict the general literature, which expects a negative relationship between same industry ECO's and BHAR. The finding is contributed to industry specific traits – further research into the sub industries of the Energy & Power industry would be relevant. Beta is negative indicating that the higher the systematic risk is prior to the event the more negative the LT BHAR will be. This is consistent with various beta investment strategies, stating that a low beta strategy will yield significant abnormal returns. The model is significant and display a decent R-squared of 34.76%.

The 360-day BHAR display only one significant variable Relatedness, amplifying the statements above. It is significant at a 5% level and still share a positive relationship with BHAR. The 360-day model is overall insignificant and with low R-squared.

The Financial industry displays a 5% significant Crisis variable in table 58 over 252-days and a 360-day 10% significant Crisis variable. Both models are overall insignificant. The crisis variable has a negative relationship with BHAR, meaning that a financial company within a crisis displays negative LT BHAR. The financial industry tend to be highly correlated in terms of performance with the general economy, which is why the crisis variable in this case should be seen as a product of that, not specifically related to the fact that an ECO have happened during the period.

Table 58 - Long-term Financial performance

	Market-Adjusted Model			
Financials	BHAR-252D	t-statistics	BHAR-360D	t-statistics
Intercept	- 0.1187	- 0.69	- 0.2047	- 0.87
Size	0.0055	0.26	0.0067	0.23
Leverage	0.0013	0.36	0.0053	1.04
ROA	- 0.0076	- 0.71	- 0.0132	- 0.90
Relatedness	0.0746	0.63	0.0753	0.47
Crisis	- 0.3556	-2.46**	- 0.3661	-1.85*
Beta	- 0.0306	- 0.13	- 0.1735	- 0.52
Adjusted R-squared	0.0413		- 0.0422	
F-statistics	1.18		0.83	
N	25		25	

6.5 Part Conclusion

To sum up the multivariate analysis the summed findings are presented in table format in order to get a better overview and comparison of the results.

Table 59 - Event date parent sum up

		Parent			
		Market-adjusted Model		Market Model	
	Variable	CAR	AR	CAR	AR
Event day	Size	N	N	N	N
	Leverage	Y*	N	Y**	N
	ROA	N	N	N	N
	Relatedness	N	N	Y*	N
	Crisis	N	N	N	N
	Sub size	N	Y*	N	Y*
	Beta	N	N	N	N

Table 58 displays that parent firm's ST BHAR is significantly influenced by Size and Beta estimated in the estimation window. MT and LT two operational variables show significance, Leverage and ROA.

Table 60 - Parent sum up

		Parent								
		MAM	MM			MAM	MM			MAM	MM
	Variable	BHAR	BHAR		Variable	BHAR	BHAR		Variable	BHAR	BHAR
Day 30	Size	Y**	Y***	Day 90	Size	N	Y***	Day 125	Size	N	Y**
	Leverage	N	N		Leverage	Y***	N		Leverage	Y***	N
	ROA	N	N		ROA	Y***	N		ROA	Y***	N
	Relatedness	N	N		Relatedness	N	N		Relatedness	N	N
	Crisis	N	N		Crisis	N	N		Crisis	N	N
	Beta	Y**	Y*		Beta	N	N		Beta	N	N

		MAM			MAM
	Variable	BHAR		Variable	BHAR
Day 252	Size	N	Day 360	Size	N
	Leverage	Y*		Leverage	N
	ROA	N		ROA	Y*
	Relatedness	N		Relatedness	N
	Crisis	N		Crisis	N
	Beta	N		Beta	N

Subsidiary display several ST (Event day) significant variables such as Leverage, Crisis, Parent size, Parent ROA and the industry High Technology. The MT 30 day and 90 day displays no significant variables, where the 125 day displays 1, parent Beta from the estimation window. The LT, 360 day, is significant with parent beta and the High Technology industry.

Table 61 - Subsidiary sum up

Subsidiary								
		MAM			MAM			MAM
	Variable	BHAR		Variable	BHAR		Variable	BHAR
Event Day	Size	N	Day 125	Size	N	Day 360	Size	N
	Leverage	Y***		Leverage	N		Leverage	N
	Majority	N		Majority	N		Majority	N
	Relatedness	N		Relatedness	N		Relatedness	N
	Crisis	Y***		Crisis	N		Crisis	N
	Beta	N		Beta	Y**		Beta	Y**
	Parent Size	Y***		Parent Size	N		Parent Size	N
	Parent Leverage	N		Parent Leverage	N		Parent Leverage	N
	Parent ROA	Y*		Parent ROA	N		Parent ROA	N
	Parent CAR MAM	N		Parent CAR MAM	N		Parent CAR MAM	N
	Energy and Power	N		Energy and Power	N		Energy and Power	N
	Financials	N		Financials	N		Financials	N
	High Technology	Y***		High Technology	N		High Technology	Y**

CHAPTER 7 – Discussion & Relevance of findings

The seventh chapter will discuss the methodology and compare the findings of the thesis with the literature mentioned in chapter 2. It will also briefly comment on the hypothesis stated. At last it will recommend how to take corporate actions as share an investor perspective.

The choice of explanatory variables where made based on the characteristics analysis both seen from a macro perspective and an industry specific perspective. Further, the chosen explanatory variables was selected from previous literature, in order to both compare findings and test a newer data set against the previous stated hypothesis in the literature. Choosing other explanatory variables based on either a different characteristic analysis or other referenced literature would have changed the findings and conclusions of the thesis.

The thesis center around the market model (MM) and the market-adjusted model (MAM) using the S&P 500 as benchmark for both models. Other benchmarks could have been used in order to mirror the data. The benchmark was used in order to compare the two portfolios on an equal basis, and thus not differentiate towards size, and operating performance as a firm specific approach would do. A firm specific approach among academics is sometimes referred to a more precise measure, as it mirrors the specific firms' characteristics. Using such approach could have led to other findings, which is also indicated by the LT findings of Vijh (1999), who compare the two approaches and his findings. In the industry specific empirical analysis, the benchmark that is corrected for is the industry specific ETF's, thus seeking to correct for what should be a more comparable benchmark. The MAM is used in order to compare both the parent and subsidiary firms. The MM is not commented on in the LT, due to the stationary alpha and beta based on the [-220;-20] exploration window. A way to mitigate the issue would have been to lag the alpha and beta calculation. Such approach would though include the event day at some point, which is determined to skew the data regarding alpha. A lagged beta approach and fixed alpha could then have been adapted, but the approach seemed inadequate since the comparison between parent firms and subsidiaries would not be applicable in other settings than the MAM.

The time horizon is limited to 360 days in order to include the latest ECOs, but it could prove interesting to look at a longer horizon, both in order to test the explanatory variables and characteristics such as the volatility, correlation and Sharpe Ratio.

The formed hypothesis of the thesis, with findings and short comments are displayed below:

Hypothesis	Comment
"Parent firms will at announcement date incur average abnormal returns, whereas subsidiaries will incur average abnormal losses"	No, subsidiaries underpricing is higher than parents announcement data returns
"The parent firms will see better operating performance leading up to the ECO which will influence their abnormal returns positively in the period after, where subsidiaries will incur better operational performance following the ECO"	Yes, No. Parent firms see better operational performance leading up to the ECO, whereas subsidiaries sees a decline following the ECO
"Operating characteristics such as debt/asset levels, ROA, and sales influences the short, medium and long term related to abnormal returns"	Yes, some of explanetory operating characteristics have significant AR impact
"Subsidiary ECOs conducted during a crisis tend to outperform related to abnormal returns short term and underperform in the long term"	Yes, significant overperfomance short term, though insignificant underperformance long term
"ECO subsidiaries within the same industry as parents underperform related to abnormal returns short, medium and long term"	No, but the industry specific findings within energy sustain this hypothesis
"Industry abnormal returns are influenced differently from the explanatory variables in both the short, medium and long run"	Yes, several variables yielded different results on the industry specific analysis

Findings related to the literature

The average announcement day CAR is at 1.93% within the literature, with the highest CAR at 2.75% and the lowest at 1.83%. The findings of the thesis shows both the MAM and the MM yielding similar CAR at 3.1%, a bit higher than the findings in Klein, Rosenfeld and Barenck (1991). Though the benchmarked literature is conducted using a time period no later than 1998. The LT abnormal return performance for both parent firms and subsidiaries showed different results from each other and the literature. The 18-month parent BHAR of -4.54% excluding underpricing was found insignificant, where it was found significant in the literature with negative BHAR varying from -0.6% to -23.3%. Subsidiaries display a 12-month BHAR of -4.82%, also insignificant, where it changes to -5.91% after 18 months. The literature here has rather different results, varying from 12-month positive BHAR of 1.3% (Vijh 1999) to -16.2% (Gleason, Madura, and Pennathry 2006). The 12-month finding is thus an outlier looking at the literature but taking the 18-month negative return into account, it looks more aligned with the literature.

Vijh (2002) finds that the explanatory variable relatedness is significant at 1% level, with a negative impact on the abnormal returns for parent firms at announcement day, in line with the findings of the thesis where the negative impact is significant at a 10% level using the MM CAR. Conducting the industry specific analysis, the variable is significant at a 5%-10% level using the MM and MAM within Energy & Power + Financials. The Energy & Power findings on the MT and LT contradicts the ST findings and the findings among academics regarding the positive significant Relatedness variable. It is assumed that diversification gains are highest when parent firms divest a non-related subsidiary, due to among others the Corporate focus hypothesis. It indicates that the industry have unique traits and thus the parent firm can keep benefitting from the relationship, probably due to the value chain set-up of the industry.

More recent findings was the basis in choosing the thesis explanatory variables. Dasilas, Leventis (2018) finds, that using the two models on announcement day returns for parents, explanatory variables like Crisis, Relatedness and size is significant at a 5%-10% level. In comparison to the thesis, the findings of a significant crisis variable vary, but regarding relatedness and size the findings

are similar. More interestingly are the findings of the multivariate regression LT BHAR, where they discover that using a 125-day BHAR leverage, size, relatedness is significant at a 10% level, after 252 -and 360 days, relatedness and ROA is significant at a 5% level. Similar results were found in the thesis where only leverage is significant after 252 days at a 10% level and ROA after 360 days also at a 10% level.

Corporate actions

looking at the findings in relation to corporate actions, and the considerations of initiating an ECO seen from a board or management point of view several findings of the thesis and literature becomes relevant. Parent firms that have a conglomerate structure reduce their assumed conglomerate discount by conducting and ECO, but the question is, if an ECO is to be preferred over a spin-off, divestment or other types of restructuring measures. Most of the firms in the data was not divested fully, at the IPO indicating the ECO's most often are not used as a full divestment tool. The LT trends should be noted by managers even though they are statistically insignificant it shows that ECO's underperform the market excluding underpricing, the same applies for parent firms excluding announcement day returns. The real question here is, if the lack of an ECO, would have meant more severe underperformance for the parent firm, had it not conducted the ECO, and if another divestment tool, would have resulted in better stock performance. An industry specific angle is advised to take, based on the findings of significant LT positive BHAR for the Energy & Power industry.

Investment suggestions

Looking at volatility as a risk measure and setting it in relation to the returns using the Sharpe Ratio, an investor would earn a higher risk adjusted return by investing in the parent portfolio LT. Whereas the ST risk adjusted returns are higher for subsidiaries.

Outside potential investors are presumably not able to benefit from the announcement day abnormal returns since trading on such information would be categorized as insider trading. But investors will be able to purchase shares in the subsidiaries and be a part of the IPO. Institutional investors and high net worth individuals are an exception since most IPOs that experience underpricing are oversubscribed. Meaning that the investor allocation will be lower than the whole of their subscription request, limiting the actual dollar gains from the underpricing.

LT, investors should restrain from purchasing shares in parent and subsidiaries since they experience negative LT BHAR, though insignificant in this paper other findings display significant LT negative BHAR. A way to exploit this as an investor would be to short the parent and subsidiary shares after the announcement day and buy the market security.

CHAPTER 8 – Conclusion

The last chapter conclude on the research questions and the findings of the thesis.

The thesis seek to answer the two primary research questions. The first question examines if there is announcement day and IPO day abnormal returns for parent firms and subsidiaries in the United States from 1999-2019. It further examines the medium and long-term (LT) performance, and the three largest parent industries to identify industry specific variables and characteristics. Secondly the thesis examines a set of explanatory variables related to both the short-term (ST), medium-term (MT) and long-term (LT) performance. The two research questions will be examined separately starting with the first question:

1. *How does the stock of the parent firm react when an equity carve-out is announced and in the following 18 months of the announcement? How does the carved-out subsidiary stock react and perform at, and following the initial public offering?*

The thesis starts by examining the market reaction at the event date using an event study approach. For parent firms a market model (MM) and market-adjusted model (MAM) approach is used, whereas a MAM approach is used for subsidiaries. The immediate market reaction is based on a cumulative abnormal return (CAR) approach, using a 3-day event window [-1:+1] and an AR approach using only the event day. Using the MM for parent firms the estimation window is [-220:-20]. Examining the post announcement and IPO LT stock performance a buy-and-hold abnormal return (BHAR) approach is adopted.

It can be concluded that parent firms experience significant CAR at the announcement of an ECO at a 1% significance level, using both the MM and the MAM of 3.09%. The findings are in line with earlier literature on the topic, though a bit higher than the average findings in the literature of 1.93%. It can further be concluded that subsidiaries display a significant IPO underpricing of 20.45% in terms of AR, thus contradicting the part of the asymmetric information hypothesis, related to overvalued subsidiaries. The industry specific findings are not fully coherent with the general data. Energy & Power MM CAR was 1.07%, though insignificant in both models, whereas AR was significant at the event day and the following day. Financials CAR is more coherent with the general data and display a positive and significant CAR of 2.45% using the MAM and 2.45% using the MM, though the announcement day AR was slightly different using the two models. Technology was excluded due to a low level of data for the MM. It can thus be concluded that CAR within the industries display different results from the total data, with lower CAR in general and insignificant CAR for Energy & Power.

The MT performance display no significant BHAR, whereas it indicates that the lock-up period of approx. 180 days influence the performance, as BHAR fluctuations increase around this period.

The LT performance of the parent varies depending on the model used. The BHAR excludes the announcement day return and is using the MAM significant at a 10% level after 30 days, with a BHAR of 1.80%. After 18 months BHAR is -4.54%, though insignificant. The MM displays significant negative BHAR after 6 months and 12 months at a 10% level, with respectively a BHAR at -5.6% and -7.8%. Both models display LT negative BHAR, whereas the significance varies. It can be

concluded that the trend of the findings are aligned with previous research, but not in terms of significance. Several of the previous studies find significant underperformance, in some cases a lot higher than the findings of the thesis. The difference within the findings of the thesis and the literature can be due to the time period examined, where the literature examine data periods in the 80's and 90's. Further, other matching procedures will likely generate other results.

The industry analysis conclude on the findings of the LT stock performance using the MAM displaying unique and non-coherent results with the general data. Energy & Powers had a 360-day BHAR of 13.51%, significant at a 10% level. Financials display 12-month negative BHAR of -8.4% significant at 5%. It can be concluded that the industries display significant and different LT results than the general data.

Concluding on the LT stock performance for subsidiaries, they display a negative BHAR of -5.9%, though insignificant. It can be concluded that the subsidiaries including underpricing display 12-month significant BHAR of 23%, but excluding underpricing, nothing can be said with statistical significance.

Using volatility as a proxy for the risk associated with the parent and subsidiary firms, it can be concluded that there is significant difference between the two's risk, both ST & LT. Though the risk difference decreases over time subsidiaries have higher risk than parent firms. Their risk adjusted returns proxied by the Sharpe Ratio showed that excluding announcement day returns subsidiaries offer better risk adjusted returns on the ST, but parents at the LT.

2. *What explanatory variables can be identified to have an impact on the short, medium- and long-term stock performance for both parent firms and subsidiaries? and does the significance of these differ between industries?*

The thesis examines the characteristics and operating performance for the general data set and the three selected industries. It can be concluded that there is significant difference between parent firms and subsidiary firms regarding size and ebitda. It is further established that there is substantial economic difference between the different industries regarding size, EBITDA, debt/assets and ROA. Most of the explanatory variables stems from this part of the analysis. Before conducting the multivariate regression analysis, a multicollinearity test showed multicollinearity between some of the explanatory variables: majority control, divest and sales growth, which lead to their exclusion.

It can be concluded for parents that the explanatory variable leverage has a positive short-term (ST) relationship with CAR using both MAM and MM. Using the MAM Relatedness, a dummy variable used to determine if the carved-out entity is within the same industry has a significant negative relationship with CAR. Concluding that if the subsidiary is within the same sector it influences the CAR negatively, thus the parent firms incur ST diversification gains, in line with the divestiture gains hypothesis. Further, subsidiaries size proved significant at a 10% level with a positive relationship to the AR. For the MM using CAR it can be concluded that an overall relationship is present as the total model is significant. The overall findings are in line with broad perspectives of the contracting efficiency hypothesis, the incentive alignment hypothesis and the corporate focus hypothesis.

When testing the three industries at the event day, the Energy & Power industry displays significant negative influence on CAR in both models, whereas High Technology displays a negative and significant relationship in terms of CAR in the MM. It can be concluded that the two industries display a negative relationship with the announcement day CAR. Diving deeper and examining the variables on an industry level the Energy & Power industry displayed significant positive relatedness in both models, not in line with the general data. For High Technology, the MAM variables like (-)Size, (-)ROA, (-)Relatedness, (+)Sub size displayed significant announcement day influence, the sign indicates the relationship to the CAR. The MM displayed significant ROA, Relatedness and Beta related to CAR. Above states that the two industries show different significance among the variables than the general data, further financials display a variety of significant variables. It can be concluded that in the ST, the significance of the explanatory variables varies between the industries and the general data.

Turning to subsidiaries it can be concluded that Parent size and ROA influence the AR together with their own Leverage, if they are within a crisis year and if the firm as within the High Technology industry. The negative Leverage variable underpins the ST value creation hypothesis 'reduction of cost of capital', as more leverage in the subsidiaries influence the event day AR negatively. Higher leverage most often indicate higher risk for the equity holders and thus a higher return requirement.

The MT BHAR display more significant variables than the ST, which leads to the conclusion that the variables tested somewhat predict MT abnormal return and BHAR better than they predict the ST CAR, using both models. Size and beta are significant for 30 days using the MAM BHAR. the 90-day BHAR displays both leverage, ROA and High Technology significant, whereas the latest becomes insignificant after 125 days. All the models are significant, concluding that the variables have predictive power in the MT BHAR. The specific industries display insignificant models and only Energy & Power display a significant variable at 125 days. This concludes that there is an opposite difference between the industries and the general data in the MT as well. The same findings apply for subsidiaries, where only parent beta is significant in the MT. However, the findings are not surprising as the time passed by allows for other variables to affect the stock prices.

Finally testing the LT BHAR finds the 252-day model significant. This finding is surprising as no variables have been excluded due to insignificance throughout the regression analysis and only Leverage is significant at a 10% level. The 360-day BHAR model is insignificant, but ROA becomes significant again. It can further be concluded that the two industries display different significant variables, as the Energy & Power industry ROA, Relatedness and parent beta is significant after 252 days. Financials only find crisis significant, thus also different from the general group. The LT subsidiary stock performance at 360 days displayed only parent beta and the High Technology industry as significant. That parent beta in the estimation window is a significant LT subsidiary variable is surprising.

The thesis finds evidence for the divestiture gains hypothesis, primarily due to the significance of the negative ST Relatedness variable within the industries. It can be concluded that parent firms incur abnormal returns after the announcement of an ECO. The asymmetric information hypothesis is partly rejected based on the findings that subsidiaries incur significant IPO underpricing.

8.1 Further research

A sample of explanatory variables from previous literature have been elaborated above and put in perspective regarding the findings of the thesis. Further research on the typic could include more variables based on the more recent findings of ECO's in Europe in order to test the specific hypotheses such as the sub hypotheses of the divestiture gains hypothesis. Testing other relevant operational variables and the specific hypothesis stated using the same approach as previous literature would be relevant for further studies. Specific variables that could be included would center around corporate announcements/ follow up comments from the management. It would further be interesting to research if the parent firms had tried to sell the subsidiary in another way, like an unsuccessful partial sale, a spin-off or another divestiture type. This would shed light towards the attractiveness of the subsidiary as a company and thus allow for better understanding of the asymmetric information hypothesis.

In order to fully comprehend the decision around conducting an ECO and the strategic management perspectives, further research could include a case study allowing for a deep dive into the fundamentals of a case firm and relevant peers. A case study would allow for Operational and stock price performance could be compared at a high degree allowing for case specific conclusions.

It would be relevant to look and compare the findings of the thesis with another matching approach for determining the benchmark. Another way to approach this would have been to use matching firms when calculating the abnormal returns throughout the thesis. The matching firms could have been based on either book-to-market value, industry etc. Further, a calendar-time-approach would be relevant to further validate the findings and compare the results with the BHAR based.

Further industry specific research would be relevant – several analyses was excluded due to page limitations such as industry specific Volatility, Sharpe Ratio and further deep dive into the industries to find relevant explanatory variables. A more specific case study within those industries would provide relevant knowledge.

9.0 Literature

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10.0 Appendix

Appendix 0: List of abbreviations
Appendix 1: Data overview of subsidiary firms & Explanatory variables
Appendix 2: Data overview of parent firms
Appendix 3: Divestiture types
Appendix 4: Averages of volatility
Appendix 5: Multivariate regression
Appendix 6: Market adjusted medium-term (30 day) BHAR for subsidiaries
Appendix 7: Bank Prime Loan Rate
Appendix 8: Multivariate regression based on the Market Model
Appendix 9: Industry specific volatility output and comments

Appendix 0: List of abbreviations

a_i	observed alpha for security i
AR	abnormal returns
ABHAR	average buy-and-hold abnormal return
AUM	asset under management
β_i	observed beta for security i
BHAR	buy-and-hold abnormal return
B/M	book-to-market
BTU	british Thermal Units
bn	billion
CAPM	capital asset pricing model
CAAR	cumulative average abnormal return
CAR	cumulative abnormal return
EBITDA	earnings before interest and taxes
ECO	equity carve-out
e_{it}	observed error term of security i at time t
ETF	exchange traded fund
GDP	gross domestic product
HML	high minus low
HT	high technology
IPO	initial public offering
LT	long-term
MAM	market-adjusted model
MM	market model
MT	medium-term
OLS	ordinary least squares
OTC	over the counter
ROA	return on assets
RR	raw return
r_f	risk free rate
SEO	seasoned equity offering
ST	short-term
SR	sharpe-ratio
R_{mt}	return of the market
[x;y]	indicates the time period from day x to day y.
#	indicates number of

Appendix 1: Data overview of subsidiary firms & explanatory variables

Please find below

Subsidiary firms used in the empirical analysis			Performance						Explanatory Variables						
Ticker Subsidiary	Event date	Industry	AR MAM	BHAR [1;30]	BHAR [1;90]	BHAR [1;125]	BHAR [1;252]	BHAR [1;360]	Size	Leverage	Relatedness	Crisis	Parent Size	Parent Leverage	Parent ROA
LTHM US Equity	10-10-2018	Materials	-0.00035	0.06613	-0.23684	-0.29215	-0.62710	-0.42351	4.79	5.14	1	0	6.83	29.16	12.93
ELAN US Equity	19-09-2018	Consumer Products and Services	0.49463	-0.04686	-0.08980	-0.08708	-0.29023	-0.26348	6.63	33.80	0	0	8.58	28.41	1.03
ARLO US Equity	02-08-2018	High Technology	0.37632	-0.22277	-0.57865	-0.65314	-0.83793	-0.84258	4.88	0.00	0	0	5.60	0.00	-1.61
EQH US Equity	09-05-2018	Financials	0.00732	0.01578	0.01838	0.00874	-0.00272	-0.02916	7.99	2.13	1	0	11.19	1.27	0.66
BXG US Equity	16-11-2017	Real Estate	-0.07962	0.35118	0.59853	0.49532	-0.15685	0.03302	5.18	20.73	0	0	5.42	9.85	5.52
NBLX US EQUITY	14-09-2016	Energy and Power	0.16503	0.18069	0.52299	0.69361	0.58017	0.61506	3.85	0.00	1	0	6.97	31.69	-0.05
FHB US EQUITY	03-08-2016	Financials	0.05121	0.10391	0.33228	0.30530	0.07612	-0.02728	5.16	0.18	1	0	5.16	0.18	0.00
MGP US EQUITY	19-04-2016	Real Estate	0.04501	0.08251	0.11967	0.09585	0.11663	0.17248	4.71	38.22	0	0	7.69	50.35	-1.72
MTCH US Equity	18-11-2015	High Technology	0.21217	-0.07302	-0.24093	-0.03149	0.11766	-0.03981	5.59	12.24	1	0	6.73	24.83	5.36
HLI US EQUITY	12-08-2015	Financials	0.06572	0.04695	0.03027	0.09981	-0.02424	0.23222	4.99	6.32	1	0	7.60	39.24	2.21
GLBL US EQUITY	31-07-2015	Energy and Power	-0.04487	-0.30499	-0.71155	-0.71550	-0.74659	-0.75025	3.25	57.99	0	0	5.78	66.33	-8.94
CCR US Equity	30-06-2015	Materials	0.02467	-0.15715	-0.18026	-0.43440	-0.43742	0.18849	4.16	44.00	0	0	6.54	28.04	1.41
GPP US EQUITY	25-06-2015	Materials	0.00297	-0.00459	-0.01590	-0.00644	0.01135	0.21967	1.22	11.45	1	0	6.60	40.00	6.93
CAFD US EQUITY	18-06-2015	Energy and Power	-0.03419	-0.22002	-0.31747	-0.35179	-0.28273	-0.27610	0.78	31.33	0	0	6.92	3.18	5.88
BKFS US EQUITY	19-05-2015	High Technology	0.10717	0.14087	0.34166	0.34104	0.20746	0.43814	5.43	46.18	0	0	7.78	21.93	2.18
CPPL US EQUITY	05-02-2015	Energy and Power	0.15449	0.03841	-0.02430	-0.13396	-0.41553	-0.45606	5.83	22.65	1	0	7.20	39.86	2.43
9966611D US Equity	04-11-2014	Energy and Power	0.12403	-0.13091	-0.12596	-0.15294	-0.20727	-0.10966	3.27	38.53	1	0	11.50	6.05	9.29
SHLX US EQUITY	29-10-2014	Energy and Power	-0.00905	0.00166	0.10804	0.10062	0.06146	0.00289	3.85	0.00	1	0	11.61	12.47	3.51
GWB US EQUITY	14-10-2014	Financials	-0.00158	0.12746	0.06396	0.12573	0.30508	0.28449	4.60	8.90	1	0	9.69	22.12	0.71
CFG US EQUITY	23-09-2014	Financials	0.07926	0.01668	0.00286	0.04832	0.04849	-0.12253	7.35	12.47	1	0	9.19	24.21	-0.67
SYF US EQUITY	30-07-2014	Financials	-0.00006	0.05733	0.19854	0.22662	0.43009	0.21846	8.02	36.36	0	0	10.58	45.62	1.95
WLKP US EQUITY	29-07-2014	Materials	0.28703	0.03768	-0.05822	-0.20922	-0.28346	-0.41895	6.26	33.91	0	0	6.91	18.31	16.69
NEP US EQUITY	26-06-2014	Energy and Power	0.28118	0.07144	0.11488	0.05307	0.21393	-0.23097	4.09	67.27	1	0	8.21	41.97	3.08
VNOM US EQUITY	17-06-2014	Energy and Power	0.02288	-0.09277	-0.34517	-0.55087	-0.48740	-0.55588	2.76	98.38	1	0	4.57	24.23	6.05
ENBL US EQUITY	10-04-2014	Energy and Power	0.13088	0.08161	0.10274	0.03934	-0.35839	-0.40137	6.91	22.92	1	0	7.67	38.85	1.51
OUT US Equity	27-03-2014	Media and Entertainment	0.05547	0.04921	0.08034	-0.01332	-0.00174	-0.19909	5.84	46.21	0	0	8.12	23.24	6.48
SNOW US EQUITY	30-01-2014	Media and Entertainment	-0.01960	0.13127	-0.13740	-0.18421	-0.25693	-0.14193	4.63	51.46	0	0	5.48	10.59	6.84
SC US EQUITY	22-01-2014	Financials	0.04943	-0.03626	-0.24540	-0.27517	-0.31111	-0.15564	7.13	88.23	1	0	9.49	33.47	0.32
FGL US EQUITY	10-12-2013	Energy and Power	0.11318	0.02123	0.13491	0.06688	0.12746	-0.00366	5.77	1.34	1	0	0.00	0.00	0.00
VLP US EQUITY	06-11-2013	Energy and Power	0.22057	0.22261	0.45907	0.46218	0.28461	0.50866	3.50	0.56	1	0	7.25	17.54	-0.53
MEP US EQUITY	24-10-2013	Telecommunications	-0.03704	0.01609	0.11912	0.19959	-0.02811	-0.34994	7.23	5.55	1	0	10.50	14.18	5.42
COMM US EQUITY	15-10-2013	Financials	-0.00392	0.11605	0.52364	0.54301	0.31679	0.66603	6.79	62.82	0	0	7.42	38.35	2.35
LEAF US EQUITY	10-10-2013	Energy and Power	-0.01667	-0.14545	-0.11594	-0.19773	-0.36828	-0.67208	3.93	6.77	1	0	6.74	47.54	0.14
WNRL US Equity	09-10-2013	Energy and Power	0.09488	-0.06651	0.05365	0.16114	0.19350	-0.07692	0.51	0.00	1	0	5.38	0.00	6.84
AR US EQUITY	08-08-2013	Energy and Power	0.18147	-0.04575	-0.01021	0.10108	-0.11875	-0.39930	5.60	52.81	1	0	7.80	21.75	18.16
QEPM US EQUITY	07-08-2013	Industrials	0.05564	0.00047	0.00375	-0.01461	-0.04201	-0.43766	3.60	0.00	1	0	11.47	5.67	10.69
FOXF US EQUITY	17-07-2013	Industrials	0.24447	-0.03351	-0.13156	-0.15268	-0.30039	-0.30296	4.41	14.60	0	0	6.61	30.97	2.06
UCP US EQUITY	01-05-2013	Financials	-0.06944	-0.00810	-0.02527	-0.05202	-0.16429	-0.35043	3.16	16.25	0	0	5.50	29.90	-0.22
VOYA US EQUITY	18-04-2013	Financials	0.07803	0.25533	0.34898	0.33548	0.42019	0.48653	7.67	1.57	1	0	4.16	21.14	-4.29
HAWK US EQUITY	31-01-2013	Healthcare	0.13757	-0.14839	-0.10364	-0.24388	-0.20682	-0.19140	5.42	0.00	0	0	9.92	27.14	0.31
ZTS US EQUITY	17-01-2013	Industrials	0.19526	0.03170	-0.06795	-0.15396	-0.18956	-0.21237	7.07	9.29	0	0	9.01	42.74	4.40
NCLH US EQUITY	17-01-2013	Real Estate	0.29909	0.22171	0.15969	0.13370	0.10035	0.04229	6.22	50.27	1	0	9.47	21.28	5.12
CONE US EQUITY	17-01-2013	Materials	0.11015	-0.00728	-0.07930	-0.09357	-0.16760	-0.17834	4.06	46.02	0	0	5.41	26.38	4.60
SXCP US EQUITY	16-01-2013	Energy and Power	-0.04512	0.06468	0.06117	0.08039	0.17590	0.19590	5.23	25.41	1	0	5.91	93.57	-0.35
CVRR US EQUITY	19-11-2012	Energy and Power	0.00180	0.15346	0.06526	0.02427	-0.26272	-0.19036	7.50	34.23	0	0	6.17	36.94	4.13
ALDW US EQUITY	01-11-2012	Consumer Products and Services	0.14955	0.24818	0.21900	0.11775	-0.53846	-0.31280	6.72	38.68	1	0	7.76	23.33	13.13
RH US EQUITY	01-11-2012	Energy and Power	0.28491	0.11411	0.14213	0.10544	0.69659	0.62470	5.99	10.45	0	0	7.56	34.41	1.26
DKL US EQUITY	25-10-2012	Consumer Staples	0.05336	-0.02066	0.19761	0.17329	0.08306	0.11808	5.52	31.77	1	0	8.85	6.87	1.74
WWAV US EQUITY	25-10-2012	Energy and Power	-0.01770	-0.05918	-0.09518	-0.12233	-0.10122	0.29158	6.41	36.00	1	0	0.00	0.00	0.00
MPLX US EQUITY	10-10-2012	Real Estate	0.23337	0.10604	0.12210	0.14359	0.12886	0.35066	4.85	0.87	1	0	7.71	61.08	2.09
RLGY US EQUITY	19-09-2012	Energy and Power	0.27285	0.08890	0.24843	0.23769	0.05285	0.03543	7.10	62.15	0	0	9.85	13.12	10.15
SUN US EQUITY	19-09-2012	Real Estate	0.11638	0.11041	0.22886	0.27317	0.18701	0.20771	7.01	59.17	0	0	5.38	62.24	-3.00

SRC US Equity	22-03-2012	Energy and Power	-0.00119	0.13981	0.26029	0.23844	0.01503	0.08113	4.22	59.43	0	0	7.32	38.82	4.90
WHZT US Equity	06-03-2012	Real Estate	0.23021	-0.07379	-0.16690	-0.24267	-0.45575	-0.55508	2.89	0.00	1	0	8.66	38.71	0.52
SIR US EQUITY	15-12-2011	Energy and Power	0.02700	0.01093	0.11921	0.07045	0.03526	-0.00380	3.32	23.28	1	0	6.15	21.25	9.89
NRGM US EQUITY	21-07-2011	Real Estate	0.03499	0.05276	0.02012	0.09267	0.14466	0.08098	3.85	10.88	0	0	5.49	47.69	1.70
AMTG US EQUITY	19-04-2011	Energy and Power	-0.08105	0.00723	-0.14333	-0.11956	-0.02778	0.03211	-0.50	53.51	0	0	5.96	53.71	2.80
ANDX US Equity	31-03-2010	Financials	0.11332	0.04560	0.07240	0.08005	0.37160	0.60594	1.84	32.31	1	0	6.57	22.63	0.00
PRI US EQUITY	12-10-2009	Industrials	0.31327	0.28656	0.18307	0.09911	0.15012	-0.03270	6.41	3.29	1	0	8.61	20.59	2.64
1467202D US Equity	10-02-2009	Consumer Staples	-0.08772	-0.08274	-0.13411	-0.22406	-0.36513	-0.23876	4.70	47.10	0	1	10.21	39.61	-0.57
MJN US EQUITY	14-05-2008	Real Estate	0.15037	0.03437	0.05901	0.10172	0.22685	0.37398	6.56	146.91	0	1	5.07	29.41	-18.00
AGNC US EQUITY	13-08-2007	High Technology	-0.03651	-0.05520	0.09281	0.27147	0.21676	0.58459	2.34	88.80	0	1	8.57	21.97	14.34
SPR US EQUITY	15-11-2006	Industrials	0.11588	0.13940	0.07293	0.11498	0.14180	-0.20871	6.75	44.29	0	0	0.00	41.12	6.88
KBR US EQUITY	12-07-2006	Financials	0.21818	0.25889	-0.05721	-0.01044	0.69236	0.37639	7.74	2.84	0	0	8.32	25.17	5.04
COWN US EQUITY	25-05-2006	Industrials	0.00344	-0.14949	-0.02070	0.18268	-0.06218	-0.43825	4.43	23.47	1	0	7.99	20.84	17.12
MWA US EQUITY	03-05-2006	Energy and Power	0.03550	0.04090	-0.17465	-0.25081	-0.21889	-0.34290	6.08	52.26	0	0	0.00	0.00	0.00
DK US EQUITY	25-01-2006	Retail	0.01971	-0.13607	0.16245	0.06224	0.02354	0.41146	0.00	0.00	1	0	5.75	67.89	0.56
CMG US EQUITY	28-06-2005	Retail	1.00172	-0.06902	0.35631	0.25168	0.16576	0.62065	5.23	0.69	1	0	7.07	55.99	8.36
DBI US Equity	15-02-2005	High Technology	0.25928	0.02436	-0.13509	-0.02582	0.23551	0.15900	5.62	0.00	1	0	8.58	28.97	8.83
WEX US Equity	24-05-2004	Financials	-0.05331	0.07495	0.06718	0.12495	0.38592	0.54879	3.96	21.61	1	0	6.47	33.01	-2.93
GNW US Equity	04-02-2004	Financials	-0.00169	0.10769	0.14570	0.23241	0.29308	0.42522	8.01	1.96	0	0	8.41	33.82	4.19
531621Q US Equity	12-02-2002	Retail	0.05579	0.05653	0.00759	-0.09712	-0.03882	-0.07616	8.06	3.59	1	0	10.51	47.09	2.45
GME US EQUITY	31-01-2002	Healthcare	0.12066	-0.00750	0.20953	-0.04354	-0.47329	-0.31354	5.60	0.00	1	0	10.30	37.96	1.45
ZGEN US EQUITY	09-08-2001	High Technology	-0.01078	-0.05348	-0.34331	-0.30476	-0.10014	0.20522	1.60	0.00	0	0	6.76	26.85	-1.87
MYK US EQUITY	13-06-2001	Industrials	0.08342	-0.17696	-0.15239	-0.14589	-0.40287	-0.42805	3.68	0.00	0	1	6.57	5.81	0.00
FTI US EQUITY	17-05-2001	Financials	0.11136	-0.09798	-0.35128	-0.38790	0.12916	0.05319	6.17	18.71	0	1	5.06	42.99	11.55
INGP US Equity	14-05-2001	Energy and Power	0.21452	0.11249	-0.24251	-0.41941	-0.54019	-0.73823	5.98	23.09	0	1	6.10	34.76	1.30
KMR US EQUITY	13-08-2002	Energy and Power	-0.00133	0.00524	0.18736	0.25982	0.21417	0.37002	0.00	0.00	1	1	5.50	0.00	11.42
NS US Equity	27-03-2001	High Technology	0.13474	-0.03492	0.12328	0.27490	0.31012	0.43113	3.16	9.55	1	1	6.94	53.40	6.80
3527578Q US Equity	15-02-2001	High Technology	-0.02224	0.15250	-0.11724	-0.26358	-0.30761	-0.63065	7.08	0.79	0	1	8.30	26.19	6.03
RSTN US EQUITY	05-02-2001	Energy and Power	0.08042	-0.18196	0.40280	0.24447	0.14157	-0.72022	3.56	0.00	1	1	8.38	16.24	-1.11
MMP US Equity	09-11-2000	High Technology	0.11269	0.44443	0.31475	0.45683	1.03707	0.79161	3.01	26.94	1	1	0.00	0.00	0.00
LMNE US EQUITY	03-11-2000	High Technology	0.01690	-0.55159	-0.58772	-0.55285	-0.81648	-0.82088	3.88	0.00	1	1	7.91	30.20	1.75
OCPI US EQUITY	04-10-2000	Retail	0.16548	-0.34280	-0.50523	-0.46831	-0.81173	-0.86308	3.73	1.31	0	1	4.30	13.55	-9.27
INRG US EQUITY	21-09-2000	Telecommunications	1.89220	-0.18378	-0.49520	-0.65563	-0.78241	-0.66025	3.96	1.14	0	1	0.00	0.00	0.00
ACLS US EQUITY	10-07-2000	Industrials	0.09029	-0.20882	-0.61509	-0.59525	-0.25540	-0.32589	5.11	0.00	1	1	6.44	42.78	3.39
STLW US EQUITY	26-06-2000	High Technology	0.61541	0.01605	-0.19390	-0.37320	-0.64871	-0.82974	3.70	0.00	1	1	7.69	35.24	9.31
OSCA US EQUITY	14-06-2000	Energy and Power	0.13635	-0.14046	0.01997	-0.24557	0.81237	0.33710	3.28	105.57	0	1	4.45	0.35	9.52
NRG US EQUITY	31-12-2003	Energy and Power	-0.00205	-0.12384	-0.10767	0.01589	0.42445	0.37453	5.81	71.77	1	1	5.91	32.04	6.48
AWE US EQUITY	26-04-2000	Telecommunications	0.08952	-0.11329	-0.20978	-0.37449	-0.26554	-0.45929	7.70	5.95	0	1	6.63	0.00	5.87
PALM US EQUITY	01-03-2000	High Technology	1.49230	-0.66332	-0.68789	-0.62817	-0.75173	-0.93238	5.61	0.23	1	1	9.46	25.05	11.76
3518429Q US Equity	25-02-2000	Consumer Products and Services	0.63034	-0.46466	0.05262	0.09210	0.37687	0.84385	4.01	0.00	0	1	7.10	0.61	10.59
3464235Q US Equity	10-02-2000	Telecommunications	1.37283	0.42722	-0.31618	-0.29773	-0.69021	-0.86933	3.08	5.89	0	1	6.72	10.20	0.52
RGCIP US Equity	24-01-2000	Media and Entertainment	-0.00094	0.00162	-0.00691	-0.08890	0.01484	0.01717	1.85	30.33	0	1	5.52	76.93	-17.60
XPDR US EQUITY	15-12-1999	High Technology	0.36119	0.11338	-0.41527	-0.42471	-0.97059	-0.99976	3.70	3.47	0	1	4.82	15.30	6.12
MCAF US EQUITY	01-12-1999	High Technology	2.66032	0.16674	-0.18356	-0.50452	-0.85341	-0.83225	2.33	0.00	1	1	5.03	31.31	6.94
A US Equity	17-11-1999	Industrials	0.47326	0.73499	1.56269	0.80481	0.04482	-0.16605	7.52	6.23	0	1	3.23	28.51	-10.51
RETK US EQUITY	17-11-1999	High Technology	1.17742	1.36856	0.52468	-0.40524	0.26925	-0.31414	2.43	0.00	0	1	9.34	13.79	10.42
NXTV US EQUITY	09-11-1999	Telecommunications	1.54602	0.21629	2.14013	0.54154	-0.21845	-0.87767	3.23	9.63	0	1	4.21	0.38	14.99
XMSR US EQUITY	04-10-1999	Media and Entertainment	-0.01699	0.36882	1.37458	2.00367	1.95034	0.23576	0.00	0.00	0	1	6.27	0.00	8.02
WCGRQ US EQUITY	01-10-1999	Telecommunications	0.14914	-0.16366	0.07470	0.28348	-0.44564	-0.52963	6.21	52.55	0	1	1.64	4.90	-32.37
BBI US EQUITY	10-08-1999	Media and Entertainment	0.02644	0.06635	0.33092	1.61872	0.08411	0.28390	1.60	3.27	0	1	7.60	42.95	0.46
3464235Q US Equity	29-07-1999	Telecommunications	1.37283	0.28729	0.87624	2.72830	2.33174	0.25467	2.54	10.05	0	1	0.00	0.00	0.00
93039Q US Equity	28-07-1999	Materials	-0.01119	-0.05667	-0.26487	-0.24929	-0.10691	0.00561	6.49	33.14	1	1	5.32	84.31	-15.47
DNA US EQUITY	19-07-1999	Healthcare	0.31712	0.36791	0.33118	1.14531	1.55873	1.22958	5.92	2.35	0	1	0.00	0.00	0.00
PHS US EQUITY	14-07-1999	Consumer Products and Services	0.03169	-0.02209	-0.19363	-0.27973	-0.21734	-0.74661	7.81	13.56	0	1	4.14	7.60	8.91

TIBX US EQUITY	13-07-1999	High Technology	1.16230	-0.17625	1.55646	3.28734	8.20471	3.12767	3.05	0.00	0	1	6.31	38.12	3.95
TWE US EQUITY	23-06-1999	Financials	-0.05155	-0.30449	-0.49174	-0.33912	-0.32648	-0.34526	5.68	49.11	1	1	7.87	8.85	13.69
NXRA US EQUITY	18-05-1999	Consumer Products and Services	-0.02337	-0.26988	-0.43253	-0.21288	-0.46943	-0.65046	3.59	77.81	1	1	6.54	16.75	0.24
PBG US EQUITY	30-03-1999	Consumer Staples	-0.04987	-0.06789	0.03338	-0.26757	-0.19568	0.27070	7.51	42.98	1	1	2.90	40.18	2.32
PRGY US EQUITY	10-02-1999	High Technology	0.86891	0.29364	-0.25357	-0.33429	-0.37192	-0.68468	3.55	0.00	1	1	8.54	16.36	9.83

Appendix 2: Data overview of parent firms
Please find below:

Parent firms used in the empirical analysis

				Performance								
Ticker Parent	Ticker Subsidiary	Event date	Industry	CAR MM [-1;+1]	CAR MAM [-1;+1]	Alpha [-220;-20]	Beta [-220;-20]	BHAR [1;30]	BHAR [1;90]	BHAR [1;125]	BHAR [1;252]	BHAR [1;360]
FMC US Equity	LTHM US Equity	08/27/18	Materials	0,14277	0,14741	0,00116	-0,05796	0,03337	0,15952	0,22185	-0,00732	0,01288
LLY US EQUITY	ELAN US Equity	07/24/18	Healthcare	0,06920	0,05986	0,00015	0,11009	0,07081	0,24607	0,31357	0,04756	0,09868
NTGR US EQUITY	ARLO US Equity	07/06/18	Telecommunications	-0,06933	-0,03312	0,00144	-0,25837	-0,05450	-0,03277	-0,04258	0,07926	-0,30335
CS FP Equity	EQH US Equity	11/13/17	Financials	-0,00088	0,00191	0,00056	0,42478	-0,07741	-0,00751	-0,03631	-0,21152	-0,34898
BBX US Equity	BXG US Equity	10/23/17	Financials	0,09098	0,09456	0,00258	0,36467	0,00852	0,02964	0,09426	-0,04941	-0,23678
NBL US EQUITY	NBLX US EQUITY	10/22/15	Energy and Power	0,02039	0,00651	-0,00232	0,17169	-0,05427	-0,08651	-0,04020	-0,04897	-0,15825
FHB US EQUITY	FHB US EQUITY	07/08/16	Financials	n.a.	0,00794	n.a.	n.a.	0,12511	0,26484	0,23342	0,04583	-0,03090
MGM US EQUITY	MGP US EQUITY	03/22/16	Media and Entertainment	0,10849	0,10048	-0,00037	0,02287	-0,01448	-0,07242	-0,04097	0,09479	-0,03357
IAC US Equity	MTCH US Equity	10/16/15	High Technology	0,02036	0,03399	0,00045	-0,11671	-0,08302	-0,17446	-0,23947	-0,35480	-0,22101
8591 JT Equity	HLI US EQUITY	07/10/15	Financials	0,00146	-0,02252	0,00024	0,02895	-0,01737	0,02876	0,00109	-0,11751	0,04462
SUNEQ US Equity	GLBL US EQUITY	05/07/15	High Technology	0,12400	0,12362	0,00101	0,73364	0,11652	-0,56716	-0,70262	-0,99209	-0,99830
CNX US EQUITY	CCR US Equity	04/01/15	Energy and Power	0,04766	0,03893	-0,00149	-0,00757	0,06420	-0,52041	-0,60476	-0,60858	-0,46023
GPRE US EQUITY	GPP US EQUITY	05/18/15	Materials	-0,01098	-0,01316	-0,00033	0,19583	-0,11760	-0,29446	-0,31958	-0,50949	-0,23178
FSLR US EQUITY	CAFD US EQUITY	03/10/15	High Technology	-0,00433	-0,00071	-0,00134	-0,13966	0,04853	-0,27589	-0,14424	0,20562	-0,25984
FNF US EQUITY	BKFS US EQUITY	12/23/14	Financials	n.a.	0,06058	n.a.	n.a.	0,06127	0,05932	0,03945	0,01183	-0,07991
NI US EQUITY	CPPL US EQUITY	09/29/14	Energy and Power	0,05706	0,05663	0,00103	0,00165	0,01115	0,06104	-0,00394	0,05283	0,36937
XOM US EQUITY	9966611D US Equity	02/06/14	Energy and Power	0,02963	0,02130	0,00050	0,17558	0,02540	0,02591	0,00959	-0,12528	-0,24881
RDSA LN Equity	SHLX US EQUITY	06/18/14	Energy and Power	0,02399	0,01652	0,00106	0,01644	-0,00413	-0,12673	-0,24849	-0,34445	-0,41471
NAB AU Equity	GWB US EQUITY	08/28/14	Financials	0,01074	0,00899	-0,00025	0,07104	-0,12407	-0,19964	-0,15406	-0,32511	-0,39698
RBS US EQUITY	CFG US EQUITY	05/12/14	Financials	0,00259	0,01252	0,00077	-0,10793	-0,08853	-0,19710	-0,17877	-0,29531	-0,48274
GE US EQUITY	SYF US EQUITY	03/13/14	Industrials	-0,01553	-0,00773	0,00071	-0,11408	0,03961	-0,00921	-0,04373	-0,11298	-0,09912
WLK US EQUITY	WLKP US EQUITY	04/29/14	Energy and Power	0,09067	0,08485	0,00180	0,00032	0,11486	0,29171	0,06417	-0,03905	-0,31131
NEE US EQUITY	NEP US EQUITY	05/20/14	Energy and Power	-0,00548	-0,00899	0,00076	-0,01997	0,01226	-0,07469	-0,00075	-0,06957	-0,01353
FANG US EQUITY	VNOM US EQUITY	05/07/14	Energy and Power	-0,03666	-0,02052	0,00368	-0,09030	0,14633	-0,05032	-0,14719	-0,08273	-0,15638
CNP US EQUITY	ENBL US EQUITY	11/25/13	Energy and Power	-0,06447	-0,06255	0,00109	0,06579	-0,03520	-0,03207	-0,04744	-0,10405	-0,25414
VIAC US Equity	OUT US Equity	06/27/13	Media and Entertainment	-0,00136	-0,00116	0,00159	0,37748	0,04108	0,12322	0,10233	0,01413	-0,16762
FIG US EQUITY	SNOW US EQUITY	11/12/13	Financials	0,01203	0,03842	0,00217	-0,30272	-0,01730	-0,17087	-0,17688	-0,21721	-0,18530
SAN US EQUITY	SC US EQUITY	07/03/13	Financials	0,02070	0,01415	0,00156	-0,16840	-0,11407	-0,24066	-0,14520	-0,03846	-0,02713
LNG US EQUITY	CQH US EQUITY	08/29/13	Media and Entertainment	-0,03245	-0,00648	0,00352	-0,13584	0,24459	0,33534	0,55340	1,30106	0,98196
SPB US Equity	FGL US EQUITY	09/19/13	Financials	0,05398	0,05229	-0,00003	0,01334	0,09572	0,16470	0,11233	0,14825	0,17029
VLO US EQUITY	VLP US EQUITY	06/14/13	Energy and Power	-0,03716	-0,01464	0,00173	-0,28730	0,16715	0,33814	0,46241	0,30843	0,34653
EEP US EQUITY	MEP US EQUITY	08/02/13	Energy and Power	0,01179	-0,00070	0,00010	0,23420	0,05180	-0,04740	-0,11117	-0,12164	-0,00257
CG US EQUITY	COMM US EQUITY	08/15/13	Financials	n.a.	0,02892	n.a.	n.a.	-0,07068	-0,23653	-0,22211	-0,07315	-0,17997
FIG US EQUITY	LEAF US EQUITY	07/25/13	Financials	0,03169	0,03242	0,00115	0,13803	0,14246	0,20105	0,24740	0,27334	0,04149
WNR US EQUITY	WNRL US Equity	06/13/13	Energy and Power	0,03492	0,04036	0,00170	0,47900	-0,02193	0,20417	0,18830	0,14510	0,04750
XOM US EQUITY	AR US EQUITY	05/09/13	Energy and Power	-0,00064	0,00101	0,00063	0,35908	-0,00732	-0,10705	-0,07824	-0,09451	-0,16126
QEP US EQUITY	QEPM US EQUITY	07/08/13	Energy and Power	0,03263	0,02032	0,00023	0,05126	0,05310	-0,07836	-0,11226	0,00145	-0,43659
CODI US EQUITY	FOXF US EQUITY	04/04/13	Financials	0,03471	0,02226	-0,00001	0,03459	-0,04028	-0,05072	-0,03054	-0,17181	-0,27062
PICO US EQUITY	UCP US EQUITY	11/09/12	Real Estate	0,08491	0,09917	0,00084	-0,02145	-0,07135	-0,06206	-0,05963	-0,02851	-0,22249
INGA NA Equity	VOYA US EQUITY	03/18/13	Financials	0,02473	0,02453	-0,00029	0,28674	0,01192	0,16249	-0,12102	0,13274	0,26372
SWY US EQUITY	HAWK US EQUITY	08/10/12	Retail	0,01562	0,01578	-0,00022	0,36506	-0,12060	-0,06560	-0,01551	0,29907	0,21323
PFE US EQUITY	ZTS US EQUITY	07/15/11	Healthcare	-0,00624	-0,00594	0,00056	-0,04183	-0,01796	0,03449	0,07304	0,01479	-0,04158
GTHKF US Equity	NCLH US EQUITY	08/08/12	Industrials	0,15278	0,16649	0,00134	0,00865	-0,03001	-0,23216	-0,31389	-0,18322	-0,33635
CBB US EQUITY	CONE US EQUITY	08/08/12	Telecommunications	0,15540	0,14596	-0,00082	0,04709	0,34807	0,29516	0,10095	-0,29582	-0,33490
SXC US EQUITY	SXCP US EQUITY	09/28/12	Materials	0,00372	0,00502	0,00151	-0,01052	-0,03765	-0,09121	-0,09266	-0,23396	0,00678
CVI US Equity	CVRR US EQUITY	08/31/12	Financials	0,07050	0,08029	0,00261	-0,23434	-0,01248	0,25548	0,15938	-0,17375	-0,27828

ALJ US Equity	ALDW US EQUITY	09/09/11	Energy and Power	-0,13531	-0,10576	0,00298	-0,06954	-0,20474	-0,21960	-0,32944	0,05787	0,35470
RSA LN Equity	RH US EQUITY	07/11/12	Financials	-0,07001	-0,01713	0,00238	-0,55452	-0,00499	-0,13496	-0,14702	-0,15740	-0,10646
DK US Equity	DKL US EQUITY	08/07/12	Energy and Power	0,02821	0,01808	-0,00044	0,03472	0,16869	0,26141	0,18036	0,12117	0,03036
DFODQ US Equity	WWAV US EQUITY	07/02/12	Consumer Staples	0,36430	0,35937	0,00143	-0,27454	-0,09041	-0,05642	-0,04582	0,07433	-0,21204
MPC US EQUITY	MPLX US EQUITY	06/08/12	Energy and Power	-0,00049	0,00569	0,00354	-0,09409	0,05148	0,20597	0,30924	0,34153	0,25225
APO US EQUITY	RLGY US EQUITY	06/22/12	Financials	0,10438	0,06115	0,00061	-0,37456	0,00533	0,06715	0,15447	0,57405	1,01815
SUSS US EQUITY	SUN US EQUITY	11/10/11	Retail	0,06051	0,10124	-0,00099	-0,29638	0,02165	-0,05607	-0,10251	0,09188	0,15088
MQG AU EQUITY	SRC US Equity	12/16/11	Financials	0,13351	0,11426	0,00240	0,08574	-0,10718	0,03599	0,00762	-0,03219	0,26299
WLL US EQUITY	WHZT US Equity	12/22/11	Energy and Power	0,02407	0,02509	-0,00138	0,10569	0,03050	0,04157	-0,14559	-0,20273	-0,24956
EQC US Equity	SIR US EQUITY	08/24/11	Real Estate	0,03260	0,00938	-0,00058	-0,10041	0,10941	-0,02326	-0,02500	-0,21155	-0,07287
CEQP US Equity	NRGM US EQUITY	03/21/11	Retail	-0,00113	-0,03778	-0,00236	0,09111	-0,10444	-0,20074	-0,44680	-0,42368	-0,32310
APO US EQUITY	AMTG US EQUITY	01/04/11	Financials	n.a.	-0,03644	n.a.	n.a.	-0,04995	-0,28701	-0,39099	-0,25798	-0,34472
ANDV US Equity	ANDX US Equity	11/05/09	Energy and Power	0,03557	0,03088	-0,00104	0,00724	0,22287	0,19597	0,12520	0,18234	0,05943
C US EQUITY	PRI US EQUITY	07/28/09	Financials	0,01575	0,00491	0,00187	0,32901	-0,21081	-0,14296	-0,06310	-0,13717	-0,17083
FIG US EQUITY	1467202D US Equity	12/19/08	Financials	0,18436	0,16748	0,00208	-0,17421	0,07224	-0,22938	-0,04595	-0,26372	-0,10086
BMY US EQUITY	MJN US EQUITY	02/11/08	Healthcare	0,00506	0,05708	0,00188	-0,25307	-0,03209	-0,14132	-0,24307	-0,19673	-0,25200
ACAS US EQUITY	AGNC US EQUITY	04/26/07	Financials	0,03540	0,00820	-0,00029	0,02849	0,04538	-0,19636	-0,37023	-0,88564	-0,87183
ONEXF US Equity	SPR US EQUITY	04/14/06	Financials	-0,03099	-0,02691	0,00091	0,06436	0,01481	-0,02621	0,08636	0,43318	0,55352
HAL US EQUITY	KBR US EQUITY	03/21/06	Energy and Power	0,02560	0,00274	0,00080	-0,22115	-0,06052	-0,14748	-0,34603	-0,25946	-0,27746
GLE FP Equity	COWN US EQUITY	02/03/06	Financials	0,05041	0,03854	0,00259	0,17490	0,04712	0,02623	0,07203	0,03354	-0,00845
WAL GR Equity	MWA US EQUITY	02/08/06	Materials	0,00361	0,01028	0,00181	-0,24440	0,07634	-0,16899	-0,16445	-0,28323	-0,25757
DLKGF US Equity	DK US EQUITY	10/24/05	Energy and Power	0,01868	0,00352	n.a.	n.a.	-0,03097	0,02513	-0,00322	-0,10630	-0,16970
MCD US EQUITY	CMG US EQUITY	03/14/05	Retail	0,01394	0,00262	0,00302	-0,28876	-0,02833	-0,02967	-0,05606	0,07344	0,10114
1625512D US Equity	DBI US Equity	11/22/04	Retail	0,20282	0,21559	0,00000	0,03185	0,08126	0,36930	0,19389	0,38084	0,78450
CAR US Equity	WEX US Equity	01/20/04	High Technology	0,02279	0,02077	0,00051	0,64224	-0,05897	-0,08009	-0,07019	-0,24371	-0,33083
GE US EQUITY	GNW US Equity	10/24/03	Industrials	0,00300	-0,01400	-0,00034	-0,14020	-0,04028	-0,04792	-0,01872	0,03293	0,04018
C US EQUITY	531621Q US Equity	08/24/01	Financials	0,03788	0,01507	0,00110	-0,14265	0,02239	-0,06518	-0,18457	0,00408	0,02086
BKS US EQUITY	GME US EQUITY	09/10/01	Retail	-0,01803	-0,01531	0,00064	-0,14792	-0,09337	-0,31479	-0,28497	-0,38426	-0,50268
NOVOB DC Equity	ZGEN US EQUITY	03/16/01	Consumer Products and Services	-0,05938	-0,03421	0,00445	-0,00788	0,03297	-0,12630	-0,12731	-0,12627	-0,17787
0202445Q US Equity	MYK US EQUITY	02/20/01	Healthcare	-0,02192	-0,04242	0,00094	0,07432	0,04127	0,24483	0,20353	0,00227	-0,10951
FMC US EQUITY	FTI US EQUITY	02/08/01	Materials	0,00214	0,03145	-0,00064	0,18403	0,10153	-0,04779	-0,10006	-0,05331	-0,08268
2764557Q LN Equity	INGP US Equity	02/20/01	Media and Entertainment	0,02605	0,02832	0,00125	-0,01300	-0,08061	-0,13776	-0,12860	-0,35228	-0,54536
KMP US Equity	KMR US EQUITY	08/14/00	Energy and Power	-0,00263	0,03141	-0,00054	0,06409	0,04330	0,06397	0,14377	0,07466	0,11921
UDS US Equity	NS US Equity	12/11/00	Energy and Power	0,00639	0,00703	0,00241	-0,17750	0,04508	0,31117	0,41562	1,24981	1,46144
LU US EQUITY	3527578Q US Equity	09/18/00	Telecommunications	0,29024	0,29986	0,00040	0,01922	0,03014	-0,56321	-0,51653	-0,52781	-0,69413
CS US EQUITY	RSTN US EQUITY	10/30/00	High Technology	0,07442	0,07073	-0,00337	0,22391	-0,03110	0,08707	0,04103	-0,05557	-0,08946
WMB US EQUITY	MMP US Equity	07/26/00	Energy and Power	0,08796	0,06076	0,00082	0,05656	-0,10540	0,18016	0,15265	-0,10598	-0,32935
MRVC US EQUITY	LMNE US EQUITY	08/31/00	High Technology	-0,18876	-0,14535	0,00227	-0,14112	0,02411	-0,75530	-0,69071	-0,87205	-0,90682
5801 US EQUITY	OCPI US EQUITY	06/16/00	Industrials	n.a.	-0,16898	n.a.	n.a.	-0,33179	-0,36519	-0,35864	-0,79304	-0,82483
SPXC US EQUITY	INRG US EQUITY	06/05/00	Industrials	0,05740	0,06596	0,01227	0,12287	0,18413	0,11760	0,06677	0,12597	0,04086
ETN US EQUITY	ACLS US EQUITY	05/04/00	Industrials	-0,02968	0,00809	0,00132	0,15232	-0,13125	-0,25609	-0,19356	0,12192	0,12042
METHB US EQUITY	STLW US EQUITY	04/14/00	High Technology	-0,21896	-0,15581	0,00600	-0,16567	-0,03772	0,40846	0,14734	-0,42170	-0,22629
723588Q US Equity	OSCA US EQUITY	03/08/00	Materials	0,04589	0,02753	-0,00180	0,06324	0,13635	0,04309	0,05081	0,24420	0,10748
NSP US EQUITY	NRG US EQUITY	04/19/00	Energy and Power	-0,08570	-0,09889	0,00469	0,47098	0,26298	0,84429	0,71228	0,16154	0,98295
T US EQUITY	AWE US EQUITY	02/02/00	Telecommunications	0,08551	0,07869	0,00008	0,10950	-0,01184	-0,07005	-0,09645	0,14949	-0,01509
1778808D US Equity	PALM US EQUITY	12/13/99	High Technology	0,11519	0,11733	0,00043	0,37575	-0,04578	-0,22524	-0,13388	0,17034	-0,41441
IAC US Equity	3518429Q US Equity	11/09/99	Media and Entertainment	-0,00115	-0,01189	0,00119	0,02226	0,07398	-0,13395	-0,05774	-0,18450	0,05888
ICIX US EQUITY	3464235Q US Equity	01/18/00	Telecommunications	0,11784	0,13887	0,00245	0,65641	0,62273	-0,34505	-0,44356	-0,61172	-0,55653

CCU US EQUITY	RGCIP US Equity	11/24/99	Media and Entertainment	-0,01434	-0,01181	0,00185	-0,17460	0,20972	-0,12840	-0,17658	-0,20694	0,07368
MMWW US EQUITY	XPDR US EQUITY	10/18/99	Consumer Products and Services	0,16025	0,11796	-0,00047	-0,12459	0,30114	-0,08540	-0,02124	0,29567	0,44615
MFE US Equity	MCAF US EQUITY	09/23/99	High Technology	-0,06759	-0,05439	-0,00333	-0,09433	-0,07869	0,16427	0,50318	-0,05284	-0,70118
HPQ US Equity	A US Equity	08/16/99	High Technology	-0,00266	-0,02119	0,00415	0,11677	-0,09831	-0,10799	0,07469	0,16837	-0,28275
FICO US Equity	RETK US EQUITY	09/10/99	Consumer Products and Services	-0,00715	-0,00905	-0,00068	0,01629	0,25404	0,76115	0,81265	0,41503	0,62531
827663Q US Equity	NXTV US EQUITY	08/27/99	Telecommunications	0,04143	0,04164	0,00287	0,40984	-0,06704	0,36611	0,40796	0,23868	0,38060
SKYT US Equity	XMSR US EQUITY	07/23/99	Telecommunications	0,09411	0,14279	0,01241	-0,50174	0,06216	2,81857	3,80909	0,16805	-0,76183
WMB US EQUITY	WCGRQ US EQUITY	04-09-99	Energy and Power	0,15812	0,15714	0,00079	0,24404	0,07042	-0,10009	-0,14247	-0,16765	-0,14486
VIACA US Equity	BBI US EQUITY	05/06/99	Media and Entertainment	0,00644	0,03819	0,00266	-0,28959	0,02773	0,10086	0,03062	0,11273	0,37374
ICIX US EQUITY	3464235Q US Equity	04/27/99	Telecommunications	0,05583	0,05056	-0,00021	-0,46566	-0,26632	-0,27702	-0,35208	-0,08554	-0,19866
PEC FP Equity	93039Q US Equity	04/21/99	Materials	0,05794	0,05261	-0,00055	-0,01295	0,07612	0,38176	0,45992	0,00252	-0,08801
ROG US EQUITY	DNA US EQUITY	06/14/99	Healthcare	0,01884	-0,00658	0,00005	0,09408	0,15128	0,31171	0,25578	0,92812	1,09504
SKO US EQUITY	PHS US EQUITY	02/04/99	Retail	0,02979	0,05343	0,00069	-0,22444	-0,05886	0,01958	0,08261	-0,49500	-0,53403
2764557Q LN Equity	TIBX US EQUITY	05/11/99	Media and Entertainment	0,01718	0,00761	0,00230	-0,16925	0,01036	0,04936	-0,32818	0,04746	0,17055
TD US EQUITY	TWE US EQUITY	04/30/99	Financials	0,00874	0,00773	0,00076	-0,24872	-0,03148	-0,23258	-0,16134	-0,17001	-0,07558
MMGR US Equity	NXRA US EQUITY	09/18/98	Consumer Products and Services	-0,02262	-0,00047	0,00092	0,03168	-0,00392	0,01134	-0,23345	0,16269	0,25299
PEP US EQUITY	PBG US EQUITY	01/08/99	Consumer Staples	-0,02592	-0,01577	0,00081	-0,16462	-0,03499	-0,15558	-0,17864	-0,25411	-0,18782
TELECOA1 MM Equity	PRGY US EQUITY	09/25/98	High Technology	0,08928	0,10752	-0,00162	-0,23824	0,11541	0,38651	0,64877	0,87368	2,69901

Appendix 3: Divestiture types

Restructuring and Financing Mechanisms	Split-Up	Split-Off	Tracking Stock	Spin-Off	Sell-Off	Equity Carve-Out	IPO	Secondary Equity Offering
Primary Motivation	Restructuring	Restructuring	Restructuring	Restructuring	Restructuring	Restructuring and Financing	Financing	Financing
Cash flow receiver	NA	NA	Parent	NA	Parent	Parent and/ or Subsidiary	Existing shareholders and/ or company	Parent
Owner of subsidiary	Existing investors	Existing investors	Existing investors	Existing investors	New investors	New and/or existing investors	New investors	New and/or existing investors
Ownership stake of parent in subsidiary firm following transaction	NA (parent ceases to exist)	0%-99% (usually 0%)	100%	0%	0%	0%-99%	NA	NA
Selling entity	Parent	Parent	Parent	Parent	Parent	Parent and/ or subsidiary	Parent	Parent
Sold entity	Parent/ Subsidiary	Subsidiary	Subsidiary	Subsidiary	Subsidiary	Subsidiary	Parent	Parent
Trading prior to event	No	No	No	No	No	No	No	Yes
Trading post event	(Usually) Yes	(Usually) Yes	Yes	Yes	No (if consolidated by buyer)	Yes	Yes	Yes

Source: Own representation, based on Gaughan (2002), p.397-424, Stienemann (2003), p. 43, Kaserer/Ahlers (2000), p.541, Langenbach (2001), p.232, Bühner (2004), p.15. See also sources quoted in the text.

[28]

Appendix 4: Averages of volatility

Average	Parent	Parent (-)	Sub	Sub (-)
30 days	41%	37%	89%	51%
90 days	42%	40%	69%	51%
125 days	42%	41%	66%	52%
252 days	44%	43%	60%	52%
360 days	44%	44%	59%	53%

[28] Badola, S. (2012). pp. 9

Appendix 5: Multivariate regression

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.576436
R Square	0.332278
Adjusted R	-0.04332
Standard E	0.046613
Observatio	26

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	9	0.0173	0.001922	0.884675	0.558385
Residual	16	0.034764	0.002173		
Total	25	0.052064			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Jpper 95.0%*
Intercept	0.064578	0.101413	0.636782	0.533272	-0.15041	0.279564	-0.15041	0.279564
Size	-0.00309	0.004178	-0.74049	0.469729	-0.01195	0.005764	-0.01195	0.005764
Leverage	-0.00036	0.000716	-0.5053	0.62024	-0.00188	0.001156	-0.00188	0.001156
ROA	-0.00322	0.002163	-1.49003	0.155665	-0.00781	0.001362	-0.00781	0.001362
Relatednes	-0.03433	0.022954	-1.49581	0.154167	-0.083	0.014326	-0.083	0.014326
Crisis	0.027595	0.054307	0.508134	0.618293	-0.08753	0.142721	-0.08753	0.142721
Beta	0.017744	0.052353	0.338925	0.739074	-0.09324	0.128727	-0.09324	0.128727
AUM	0.001689	0.008593	0.196546	0.846658	-0.01653	0.019905	-0.01653	0.019905
FED Rate	-0.74634	1.057646	-0.70566	0.490547	-2.98845	1.495771	-2.98845	1.495771
GDP	0.003075	0.011078	0.27761	0.784867	-0.02041	0.026559	-0.02041	0.026559

Appendix 6: Market-adjusted medium-term (30 day) BHAR for subsidiaries

Market-adjusted model

General factors	BHAR-30D	t-statistics	*Parent factors*	BHAR-30D	t-statistics	*Industry factors*	BHAR-30D	t-statistics
Intercept	0.0746	0.88	Intercept	0.0720	1.09	Intercept	0.0450	1.35
Size	0.0069	0.61	Parent Size	-0.0065	-0.71	Energy and Power	-0.0311	-0.56
Leverage	-0.0011	-1.31	Parent Leverage	-0.0005	-0.39	Financials	-0.0200	-0.30
Majority	-0.0477	-1.02	Parent ROA	0.0012	0.34	High Technology	-0.0488	-0.72
Relatedness	-0.0293	-0.50	Parent CAR MAM	0.2405	0.80			
Crisis	-0.0364	-0.59						
Beta	-0.0458	-0.46						
Adjusted R-squared	-0.0255			-0.0206			-0.0218	
F-statistics	0.54			0.44			0.22	
N	111			111			111	

Appendix 7: Bank Prime Loan Rate

Source: Fred.stlouisfed.org (2020). URL

Appendix 8: Multivariate regression based on the Market Model

	Market Model					
	BHAR-30D	t-statistics	BHAR-90D	t-statistics	BHAR-125D	t-statistics
Intercept	0.1557	2.65***	0.2449	2.24**	0.2069	1.50
Size	- 0.0203	-3.11***	- 0.0362	-2.97***	-0.0358	-2.34**
Leverage	0.0008	0.84	- 0.0015	- 0.88	-0.0017	-0.80
ROA	0.0000	0.02	0.0031	0.68	0.0018	0.32
Relatedness	- 0.0427	- 1.23	0.0500	0.78	0.0823	1.01
Crisis	- 0.0383	- 1.11	- 0.0481	- 0.75	-0.0630	-0.78
Beta	0.1135	1.64*	- 0.0096	- 0.07	-0.0822	-0.51
Energy and Power	0.0515	1.13	0.0204	0.24	-0.0158	-0.15
Financials	- 0.0350	- 0.80	- 0.0500	- 0.61	-0.0533	-0.52
High Technology	- 0.0300	- 0.53	- 0.0747	- 0.71	0.0491	0.37
Adjusted R-squared	0.0720		0.0436		0.0229	
F-statistics	1.91*		1.53		1.27	
N	106		106		106	

Appendix 9: Comments and findings of the Industry specific volatility analysis

It has been established that the day 0 returns are an outlier in terms of volatility, that influence the following period substantially. When conducting the industry specific volatility analysis, the day 0 returns will be excluded. The industry specific volatility analysis will provide better knowledge to how the underlying data is acting and help define sectors with above or under group volatility. The same portfolio based is used as above calculating the specific industry as a portfolio for itself. The volatility is only calculated for parent firms, as mentioned earlier several equity carve-outs are cross-sectional, which will make them non comparable as in accordance with the delimitation.

As table 42 displays below, the volatility for parent firms excluding the first day shows an increasing trend in contrast to the general group, having a slight decreasing trend over time. The energy & power industry shows higher ST volatility than the group, with its 8% volatility against the groups of 5%. The total number of firms analysed was 26 and incurs as mentioned less diversity than the group analysing 114 firms. Over time the volatility of the industry moves towards the group around 4-5%. The financial industry shows a reverse trend compared to the general group and the energy & power industry. Starting with lower volatility, but still above the groups, at 6.2% increasing to 8.7% in the LT. This finding indicates that financials do not benefit in terms of risk reduction doing equity carve outs. Another indication to this seen from the market-based LT (360 days) volatility at 4.2%.[29] High technology displays the same reverse trend as financials, going from 19% to 26% volatility in the period. High techs volatility is substantially higher than the group and the two other industries. This finding is somehow not surprising as it has been established that 1) a large proportion of the industries ECO's happened leading up the dot.com bubble and 2) because the sample size is relatively small with 12, firms compared to the two other industries.

Table 42 - industry specific standard deviation

Standard deviation	Energy Parent PF	Financials Parent PF	High Tech Parent PF
30 days	8.1%	6.2%	19%
90 days	6.1%	6.2%	22%
125 days	5.7%	7.3%	23%
252 days	5.8%	8.3%	27%
360 days	5.6%	8.7%	26%

[29] Calculated using the same approach as the parents (substituting parent returns with market matched returns)