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**Differences between determinant factors
of the corporate cash holdings strategy
of companies in oil, gas & consumable
fuels and renewable energy sectors**
Evidence from Developed Europe

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Abstract

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Title of the dissertation: Differences between determinant factors of the corporate cash holdings strategy of companies in oil, gas & consumable fuels and renewable energy sectors. Evidence from Developed Europe.

In the field of corporate finance the corporate cash holding strategy is one of the debatable topics. Existing literature presents several determinants and impacts of the cash holdings. The optimal cash holding level is constantly been discussed. This study examined the significance of determinant factors suggested by the literature in the context of oil, gas & consumable fuels energy sector and independent power & renewable electricity producers sector. Empirical analysis was based on 10-Year financial ratios of the listed companies operating in Developed Europe. Thomson Reuters Eikon software was used to collect the data sample. The sample of the analyzed panel data contains 350 observations. The study was inspired by the increasing popularity of the energy production thru renewable sources. The author is curious to check the difference between cash holdings determinants of the long established fossil fuel energy producers and cash holdings determinants of the renewable energy producers. Using OLS regression model, this paper tests the trend and significance of the selected variables. The study concluded that cash flows, liquidity, leverage, dividend payouts and capital expenditures are significant for cash holdings explanation in case of oil, gas & consumable fuels energy sector. On the other hand, firm size, market-to-book ratio, liquidity and dividend payouts are significant explanatory variables of cash holdings in case of renewable electricity production sector. Moreover, the paper concluded that oil, gas & consumable fuels energy sector follows the trade-off model, whereas renewable electricity production sector combines factors from free cash flow theory and trade-off model.

Key words: Corporate cash holdings; Corporate finance; Investment opportunity; Trade-off model; Pecking-order theory; Free cash flow theory; Panel data.

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Chapter 1. Introduction

A corporate cash holding is a wide topic which was debated over years. Cash holdings together with cash include cash equivalents due to their short-term perspective and simple conversion into cash. It is claimed that the main advantages of holding cash and cash equivalents is the risk aversion. In particular during the times of financial distress cash might be used as a hedging tool (V. V. Acharya et al., 2007). In addition, with sufficient funds a company without difficulties can meet a market demand. It is crucial due to the fact that the market conditions constantly change and new competition can appear unexpectedly. Cash holdings may be also viewed as a part of working capital investment to cover short-term business responsibilities and business expenses. On the other hand cash which is held on the balances of a company generates low returns. Even in the case when a company decides to hold cash and cash equivalents on bank deposits it is still unlikely to received desirable interest rate. The mentioned dilemma is a standing ground for trade-off theory. The theory compares benefits with costs to identify optimal level of cash holdings. All the pointed out information proves that the topic is relevant till nowadays.

To narrow down the area of the research two sectors which are included in the energy industry were chosen. First is oil, gas & consumable fuels energy sector. The sector includes companies which are connected with the exploration and production of energy from the oil and natural gas. Second is independent power & renewable electricity producers sector. It includes companies which use alternatives to fossil fuels to generate energy. The main area of operations for the companies are wind energy, hydroelectric energy, and photovoltaic energy. One of the reasons for the research of the energy industry is that in the case of small private companies meeting the needs of shareholders may be linked with keeping money on deposit for safety. However, taking energy sector brings completely different mentality. Broader shareholders base require to be more focused on investment of excessive cash in order to create possible positive strategic decisions. Furthermore, the energy sector is a large network of firms which are highly dependent on multiple factors of economy and government regulations. The most common regulations are connected to environmental issues. Due to the scale companies are usually financed with a mixture of short- and long-term funds and cash is a part of it.

The main motivational factor for the research is the change of trends in energy sector. It is intriguing to see how big companies react as the issue of oil and other

resources depletion becomes the topic for a debate. The research will look into determinant factors of cash holdings policy analysis for the 10 year period of volatile oil and gas prices. Determinant factors are expected to show the tactics of petroleum companies. Furthermore, the topic was widely research in the past and the probability of change in determining factors of the corporate cash holdings for energy industry exists. To sum up, the purpose of the study is to cover the determinants of cash holdings for energy sector companies and find the correlation of different levels of cash holdings with chosen indicators. To achieve the goals will be performed a comparison of companies in the energy sector with different cash holdings strategies. Furthermore, companies operating in the production of renewable energy will be clustered separately. The primary findings of the determinants of cash holdings in the literature contain the following variables which will be analyzed in the empirical results of the thesis. The variables are cash flow, firm size, market-to-book ratio, liquidity, acquisitions, leverage, dividends, R&D and capital expenditures (A. Ozkan & N. Ozkan, 2004), (C. Kim et al., 1998), (Y. Guney et al., 2007), (M. A. Ferreira and A. S. Vilela, 2004), and (T. Opler et al., 1999).

The following chapters of this thesis are organized as listed below. First, the objectives, problems and hypothesis of the study are provided. Those parts will give clear explanation to the area of interest and concerns associated with the research. Second, theoretical background and variables specifications are provided. Relevant literature and related to the topic papers are examined in order to obtain benchmark for explanatory variables. Next, methodology chapter which presents the methods of data collection and analysis. Afterwards, summary statistics and results of the models are presented. Last part includes conclusions and recommendations for the potential future research.

Chapter 2. Objectives of the Study

Presented below are the main objectives of the study:

- 1) To define the determinants of corporate cash holdings for the firms operating in oil, gas & consumable fuels energy and independent power & renewable electricity production sectors.
- 2) To determine the relationship between cash held on the balances and investment opportunities for both sectors.
- 3) To establish whether oil, gas & consumable fuels energy industry has a significant difference in determinant factors comparing to independent power & renewable electricity production industry.

Chapter 3. The Research Problem

The study takes into account several problems which can be connected with the cash holdings.

- 1) Without proper cash holdings strategy a company may have excessive opportunity costs due to the substantial amount of liquid assets held on the balance.
- 2) Poor cash holdings management may restrict the availability of the capital for investment financing, as a result the company may lose the opportunity to invest or pay additional premium for the funds.

Chapter 4. Hypothesis

There are two main hypotheses which are considered in the study. Hypotheses are presented below:

H1: Growth in investment opportunities negatively correlates with the corporate cash holdings of renewable electricity production firms.

H2: Shortage of investment opportunities may increase the likelihood of holding excess cash for oil, gas & consumable fuels energy companies.

The author's main hypotheses are compared to the findings in the relevant subject literature in the theoretical background chapter. Afterwards, empirical results are analyzed and conclusion to reject or not reject the hypotheses is made.

Chapter 5. Theoretical Background

In the following chapter the theoretical background and relevant literature connected to the topic of corporate cash holdings is analyzed. In the first place, the definition of cash holdings, the possible motives to hold cash, the benefits connected with corporate cash holdings and the costs associated with corporate cash holdings are presented. Afterwards, the review of the trade-off model, pecking order theory and free cash flow theory is made. In addition, based on the theory the positive and negative correlation between cash holdings and cash flow, firm size, market-to-book ratio, liquidity, acquisitions, leverage, dividends, R&D, capital expenditures is explained.

5.1 Corporate cash holdings

Competitive financial environment created a base for the research area of cash holdings management. Liquidity created by the cash are often seen as safety pillows for the business. The presence of cash on the balances of a company secures the pay off of the company's obligations in instances of issues connected to operating activity. In the published finance and economics articles of A. Ozkan & N. Ozkan (2004), C. Kim et al. (1998), Y. Guney et al. (2007), M. A. Ferreira and A. S. Vilela (2004), and T. Opler et al. (1999) the cash is identified as cash and cash equivalents or cash and marketable securities. Cash equivalents are the securities which are easily exchangeable to cash in a short period of time. Cash equivalents are comprised of the short-term debt obligations financed by a government, corporate commercial papers and alternative money market instruments.

In the literature there are shown four general motives of holding cash. As the maximization of shareholders' value is crucial for a company, the theories justify a change of cash holdings in accordance to value creation. Below is presented the summary of the theories.

1. The precautionary motive. The general idea of the motive is to prevent bankruptcy of the company during the times of economic distress or during the drastic changes in costs of raw materials used by the company. Furthermore, the motive plays a crucial role in cases when the firm has restricted access to external funding. Most of the articles point out the risk of cash flows and availability of investment opportunities as parts of precautionary strategy. Research study written by V. V. Acharya et al. (2007) suggests a model which concludes that firms which

accumulate cash on their balances are not interested in reducing debt levels. The mentioned result supports the precautionary motive. Empirical study shows that the positive relationship exists between cash flows and liquid assets during the times when the company has financial restrictions (H. Almeida et al., 2004). In the overview of investment opportunities and cash holdings, C. Custodio et al. (2005) concluded that companies tend to hold more cash in cases when external funding is limited in order to account for possible future investments.

2. The transaction motive. The term transaction motive is generally understood to mean the cash used by a company to cover daily operating activities. Rates of cash required to cover firm's operating activities depend on the industry and type of business. As an example, the management of cash in retail sector will differ from the energy sector, which was chosen for this study due to distinct turnover levels. Furthermore, the transaction motive is affecting differently large businesses. Large firms tend to hold less cash comparing to the smaller entities due to the advantage given by economies of scale (T. W. Bates et al., 2009).
3. The tax motive. The tax motive is mentioned in the research papers of T. W. Bates et al. (2009) and C. F. Foley et al. (2007). The papers target US multinational corporations and disclose that the corporations which operate internationally hold more cash balances. The mentioned conclusion is explained by the fact that the analyzed firms need to account for tax expenses associated with conversion of foreign income.
4. The agency motive. Some preliminary work on the topic of the agency motives was carried out in the year 1986 by Michael C. Jensen. The results showed that managers who occupy the position for the long period of time prefer to keep cash inside the firm instead of redistributing it to shareholders. The conclusion holds even when investment opportunities are not available to the company. Additional research provided by J. Harford et al. (2008) suggests that entrenched managers are likely to maintain increased cash balances, however at the same time they use the balances in the short period of time.

The transaction motive and the precautionary motive can be traced in the trade-off model and pecking order theory. Theories which are appearing the most in the academic journals are trade-off theory of capital structure, pecking order and free cash flow theory. The mentioned theories will be explained in the following part of the thesis.

5.2 Trade-off Model

The trade-off model of capital structure draws attention to the amount difference between debt finance and equity finance which company balances taking into consideration costs and benefits. A. Kraus and R. H. Litzenberger (1973) were one of the first researchers who considered equilibrium between bankruptcy costs and the tax shields. It is important to notice that the firm which uses higher debt financing faces a risk of financial distress, therefore costs arising may exceed the benefits. Looking from the perspective of cash holdings, cash holdings similarly to debt create expenses and benefits. At the same time the benefits of cash holding are linked to the liquidity. Using trade-off model also mentioned as the transaction costs model (T. Opler et al., 1999) firms set the most advantageous level of corporate cash holdings by accounting for benefits and costs of holding cash. There are three main advantages of the cash holdings stated in the paper of M. A. Ferreira and A. S. Vilela (2004). First, cash holdings help to optimize the investment strategy of the firm. Second, holding cash acts as a margin of safety during financial distress. Third, managing cash resources minimizes the negative effects in case of increased costs of funds obtained externally. It is also important to note that additional amount of cash lowers transaction costs in case when a firm is required to raise funds or to liquidate assets. Alternatively, the corporate cash holdings can result in costs for the company. Asymmetry of the information can switch the benefits to costs. Moreover, the striking disadvantage of cash holding is that the company will need to bear the losses connected to the opportunity cost of equity. Referring to the commonly used phrase which states that high risk equals to high return it is possible to understand why the cash holdings are connected to the costs of lost opportunity. Liquid assets provide less risk comparing to other asset classes. As a result, cash holding generates minor returns comparing to reinvestment. In the literature it is also mentioned that the mechanism of cash holding has differences across sectors, as a consequence, results may differ from sector to sector. The next paragraphs present the relevance of determinant factors of the corporate cash holdings in accordance to trade-off model.

Cash flow. In the papers written by R. Duchin (2010) and M. B.J. Schauten (2011) the cash flow is viewed as a provider of liquidity. For this reason, the cash can be replaced by the cash generated at the end of the period. According to trade-off model the negative correlation between cash holdings and cash flow is expected to take place.

Firm size. According to M. Faulkender (2002) the demand for cash decreases with increase of company's size. The effect is explained by the economies of scale, as with growth of the firm the cost of additional funds required decreases. The company which is involved in large-scale business activities is expected to have less chance of sudden costs. As a result, the relationship in accordance to trade-off model is expected to be negative.

Market-to-book ratio. The existence of opportunities to invest brings additional value to cash and cash equivalents. It is justified by the fact that the company loses value in instances when funds are not available (T. W. Bates et al., 2009). The positive correlation is expected due to the fact that trade-off model mentions the benefit of cash as support for investment policy.

Liquidity. The liquid assets are comprised of total inventories and total receivables which are easily convertible into cash. According to A. Ozkan & N. Ozkan (2004) the cash can be replaced by liquid assets. Similarly to cash flow the negative correlation between cash holdings and liquidity is expected.

Acquisitions. The acquisitions expenses are connected to the outflow of funds linked only to acquisitions. Furthermore, acquisition activity can place financial distress on the firm (T. W. Bates et al., 2009). Corresponding to the fact that trade-off theory seeks to minimize financial distress, the relationship between acquisitions and cash holdings expected to be positive.

Leverage. Leverage reflects the ability of the firm to raise debt. Firms which are actively using borrowed capital are more likely to raise debt with lower costs, as a result they do not need high levels of cash (M. A. Ferreira and A. S. Vilela, 2004). Nonetheless, contrary opinion exists. V. V. Acharya et al. (2007) use the argument that cash holdings can be as a hedging tool against the risk appearing during the time when the company is overleveraged. In this instance the relation between leverage and cash holdings changes from negative to positive. In conclusion, the influence of leverage is uncertain.

Dividends. Dividend is considered to be one of the alternatives to raise additional funds for the company. Irrelevance and relevance of dividends are actively debatable topics. As stated by A. Ozkan & N. Ozkan (2004) the dividend payout is negatively correlated to cash holdings. The company can free additional funds by adjusting the dividend policy from aggressive, when the company is actively paying dividends to stakeholders; to restrictive, when the company cuts dividend payout. Contrary to the mentioned opinion is dividend signaling hypothesis which points out possible negative

outcomes of lower dividends (C. Ghosh and J. R. Woolridge, 1988). As the result, company would accumulate cash for stable dividends payouts.

R&D. Research and Development can be seen from two perspectives. First of all, R&D expenses require significant cash investments. As a result, with increased R&D expenditures the level of cash should decline (T. W. Bates et al., 2009). Secondly, R&D can be seen as a measurement for the firm's investment opportunities (T. W. Bates et al., 2009). In this instance, the cost of financial distress should be taken under control with accordance to trade-off model. Therefore, the correlation of the variable is ambiguous.

Capital expenditures. Capital expenditures include the funds spent on the long-term assets of the company. The long-term assets are connected to the assets which are needed for proper operation of the business. T. W. Bates et al. (2009) states that capital expenditures can be positively correlated to cash holdings as well as negatively correlated to cash holdings. Positive correlation is explained by the usage of capital expenditures as collateral for the debt. Negative correlation is explained by the fact that capital expenditures are connected to financial distress costs. From the point of view of trade-off model the correlation is unknown.

5.3 Pecking-order theory

The second theory which could be found in the literature is the pecking-order theory. The pecking-order theory may be considered as a competitive theory to trade-off theory. Apart from financial distress factor the pecking-order theory also takes into account asymmetric information. It points out the following imperfections in mentioned theory. First, lowest debt ratios usually belong to the most profitable firms. Second, firms intentionally use low leverage. Last but not least, firms tend to use debt issues more often than equity issues. The theory was first observed by Myers (1984). Myers (1984) stated that firms are following a specific order in decision process of financing. It was suggested due to the difference in the availability of the information for shareholders and an individual responsible for the supervision of the business. Arising asymmetry increases the cost of funds obtained externally. Below is presented the order of financing given by the theory. The theory suggests in first place that the company should obtain funds internally. Next, the company should consider debt financing. As the last resort the company may issue shares and obtain funds thru equity. The order is grounded by four facts. First, dividend policy is stable. Second, firms select internal financing in contrast

to external financing. Third, firms issue safe securities in case of external financing. Fourth, in an event of lack of funds a firm will use “pecking order” meaning a company will move from safe debt to riskier debt. The next paragraphs present the relevant determinants of cash holdings in accordance to pecking-order theory.

Cash flow. According to pecking-order theory the firm should prioritize financing taken from retained earnings. In the instance of positive cash flow firm is encouraged to retain cash to insure the security of future investments. As a result, the positive correlation between cash flow and cash holdings is expected.

Firm size. In this variable the focus is placed on the multinational corporations comparing to small entities. Multinational corporations as well as larger size companies are more likely to bring higher returns. As the result, according to the pecking-order theory the managers would use this opportunity to increase levels of cash holdings.

Market-to-book ratio and Acquisitions. The variables are accounting for the opportunities for business to grow (M. A. Ferreira and A. S. Vilela, 2004). In the instances of the growth opportunities management will retain cash in order to insure the financing of possible projects.

Leverage. According to hierarchy of the pecking-order theory the relationship of leverage and cash holding is negative. When the amount of internal funds is not sufficient for investment purposes the company should switch to the debt option.

5.4 Free cash flow theory

Free cash flow theory is related to agency problem which may appear between shareholder and manager. It also undertakes to suggest standard for an optimal cash holdings. According to M. C. Jensen (1986) and also mentioned in the recent paper by M. S. Tahir et al. (2016) managers view increased levels of cash holdings as an opportunity to gain control and enhance the number of total assets. The mentioned behavior negatively influences value provided to shareholders owing to miss match of interests and distortion of information. Furthermore, it was mentioned that managers can directly influence firm’s investment and financing decision. As an example could be an accumulation of excessive cash due to unwillingness of making payouts. The next paragraphs present the relevant determinants of cash holdings in accordance to free cash flow theory.

Firm size. Larger firms give an individual on the manager position greater power to influence outcomes of investment decisions and financial policies. The mentioned

effect appears due to elevated shareholder dispersion (M. A. Ferreira and A. S. Vilela, 2004). Positive correlation was proposed, meaning in larger firms levels of cash holdings are greater than in smaller firms.

Market-to-book ratio and Acquisitions. From the free cash flow theory perspective, any investment opportunities are expected to have negative influence on levels of cash holdings. It is explained in the research paper prepared by M. A. Ferreira and A. S. Vilela, (2004) as an outcome of the poorly undertaken investment decisions performed by the managers.

Leverage. From the perspective of M. A. Ferreira and A. S. Vilela, (2004) monitoring of the firm depends on the levels of debt and debt instruments used by the firm. Consequently, firms with lower leverage have increased cash reserves.

5.4 Relevance according to recently published literature

To start with, most of the recent papers and academic journals similar to the subject of the research were conducted in the year 2010 based on U.S. market. However, papers present useful examples of the determinants which can be applicable to the research of Developed Europe. Producers of renewable electricity and producers of energy thru oil, gas & consumable fuels require substantial spending on the equipment and technology. T. W. Bates et al. (2009) found out that R&D relative to capital expenditures has a permanent effect on the cash ratio. Companies with greater R&D spending usually hold a greater cash buffer against future shocks.

According to the paper prepared by L. Fresard (2010) which concentrates on how firms' cash holdings strategically influence product market outcomes exists the evidence that larger relative-to-rivals cash reserves lead to systematic future market share gains at the expense of industry rivals. In case of the energy sector the companies are regulated by government and as a result competitiveness in the field differs from other sectors. Nonetheless, the existence of strong peers should be accounted in the research of the determinants.

R. Duchin (2010) presented the conclusion that multidivisional firms hold approximately half as much cash as specialized firms. The conclusion should be taken into account due to the fact that the Oil & Gas Integrated industry are relatively diversified. Paper also stated that diversification mainly affects cash through the correlation between a firm's investment opportunities and cash flows.

In the area of corporate governance M. B.J. Schauten et al. (2011) concluded that the value of the level of excess cash is not related with shareholder rights, disclosure policy and board composition.

The research prepared by M. A. Ferreira and A. S. Vilela (2004) holds great significance for the thesis as it focuses on Economic and Monetary Union of the European Union. Miguel A. Ferreira and Antonio S. Vilela (2004) found out that banks have influence on cash holdings. Companies which are in close relation with banks allow themselves to hold less cash.

Table 1 below presents a summary of the determinant factors of cash holdings and direction of the correlation predicted by trade-off model, pecking-order theory and free cash flow theory.

Table 1 Correlation summary according to the theory predictions

Determinant variable	Trade-off model	Pecking-order theory	Free cash flow theory
Cash flow	Negative	Positive	N/A
Firm size	Negative	Positive	Positive
Market-to-book ratio	Positive	Positive	Negative
Liquidity	Negative	N/A	N/A
Acquisitions	Positive	Positive	Negative
Leverage	Negative/Positive	Negative	Negative
Dividends	Negative/Positive	N/A	N/A
Research and Development	Negative/Positive	N/A	N/A
Capital expenditures	Negative/Positive	N/A	N/A

In case of the absence of the theory prediction the cell is marked as “N/A”.

Chapter 6. Methodology and Specification of the variables

In the following part of the thesis will be explained which software has been used for the data collection, the description of the sample, the factors used in companies selection, research methods and expectation concerning determinant factors of cash holdings.

6.1 Source of Information and Sampling Method

Two main sources were used in data collection for the research. First, the annual reports prepared by selected companies. The data about firm's financial statements is generally disclosed on the webpage of the company due to the fact that only listed companies are taken for the research. Most of the annual reports are located in investor's relation category. Furthermore, in the same category are placed upcoming events and most recent quarterly results. The only limitation connected to annual reports is the time interval. In most cases it is challenging to find annual reports which were prepared seven years ago. In order to find the data which was not presented on the official pages of the companies the Thomson Reuters Eikon software has been used. Thomson Reuters Eikon is a software which targets the needs of financial professionals. The data in the software is constantly updated and the tools used in the software are highly customizable. Thomson Reuters Eikon provides clearly visualized data and analytics of a firm. Furthermore, as an open platform Eikon allows to shape and export data to Microsoft Excel which is used for the sampling.

6.2 Sampling Method

To start with, companies were taken from two sectors which will be compared in the following chapters of this thesis. First sector is Oil, Gas & Consumable Fuels. Second sector is Independent Power and Renewable Electricity sector. Both sectors are connected to the production of energy. Furthermore, research will be focused on separation between companies which extract the energy from fossil fuels in comparison to companies which produce renewable energy. As a population the author decided to take all the companies geographically located in Developed Europe. In line with Thomson Reuters Eikon definition Developed Europe includes: Austria, Belgium, Denmark, Faroe Islands, Finland, France, Germany, Gibraltar, Greece, Guemsey, Iceland, Isle of Man, Italy, Jersey, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom. For the initial sample all the listed companies

in specifically chosen countries will be taken. The data is collected over the period of ten years starting from 2009 and finishing with 2018. The decision to narrow the timeline to ten years was made due to the fact that financial crisis had great effect on companies and economy in general. The mentioned effect could possibly distort the results of the study. Afterwards, the companies with missing values in categories of capital expenditures, total assets, research & development, total debt, total equity, acquisition of business, cash & short term investments, cash flow, total debt to enterprise value, accounts payable, total receivables, total inventory and cash dividend paid were removed from the sample. In the cases when the company did not report the acquisition of business or expenses on R&D the values are considered to be equal to zero. Final sample includes 20 companies operating in oil, gas & consumable fuels sector and 15 companies operating in renewable electricity production sector. All the received information about the sample is grouped into one panel database. The advantage of the panel data is the opportunity to observe multiple variables across multiple time series for the same sample of companies. In the following part presented the data analysis methods.

6.3 Data analysis

Analysis of the data is based on the quantitative method. First of all univariate descriptive statistics will be used to define mean, median, standard deviation, skewness, maximums and minimums for the individual variables. Using summary statistics distribution of the sample will be checked. Furthermore, graphical representation of the distribution prepared by the software will be used for the description of the variables. Next, Ordinary Least Squares regression model will be applied to determine which explanatory factors affect changes in cash holdings. Furthermore, correlation matrix analysis will be used as a part of multicollinearity problem analysis. With the help of the tool it will be possible to check intercorrelation between independent variables.

6.4 Specification of the variables

6.4.1 Dependent variable

Corporate cash holdings

The main objective of the research is to study determinant factors of the corporate cash holdings. Therefore, as the dependent variable will be chosen corporate cash holdings. Consequently, corporate cash holdings are considered to be dependent on

independent variables which should show the difference between determinant factors for the chosen sectors. Academic papers prepared on the topic of cash holdings specify several methods of calculation for the cash ratio.

First method is commonly used in literature. It is mentioned in the empirical studies of papers prepared by A. Ozkan & N. Ozkan (2004), C. Kim et al. (1998) and Y. Guney et al. (2007). The authors define the variable as the ratio of cash and cash equivalents to total assets. Furthermore, in few instances cash and cash equivalents are replaced by the cash and marketable securities, for example in the study of T. W. Bates et al. (2009). Marketable securities are deemed to be similar to cash equivalents due to their liquidity. In other words, the mentioned assets are easily converted into cash. With the help of the ratio it is possible to identify the proportion of cash in total assets of the selected firm.

Second method has a change in the denominator of the cash ratio. It is used in the empirical studies of papers prepared by M. A. Ferreira and A. S. Vilela (2004), and T. Opler et al. (1999). The ratio is calculated as cash and marketable securities to net assets. Net assets are measured as the difference between total assets and cash & marketable securities. Similarly to the previous ratio the cash and marketable securities to net assets ratio gives an observation of how much the liquid assets amount of the assets of a firm.

In this thesis the first method of the cash ratio calculation will be used. Cash and short term investments will be taken for the numerator of the ratio. In the thesis short term investments are taken into account and are allocated to the group of liquid assets, as cash equivalents and marketable securities, due to the short term trading perspective. The sum of all the assets held by a company will be taken for the denominator of the ratio. In addition, the availability of the information was taken into account. The final version of the variable is measured as cash and short term investments to the book value of total assets.

6.4.2 Independent variables

Choice of the independent variables is based on the suggestions from the academic articles, books and research papers. The goal is to find industry-specific factors. Independent variables which were used in this empirical study are Cash flow, Firm size, Market-to-book ratio, Liquidity, Acquisitions, Leverage, Dividends, R&D, Capital expenditures. The mentioned variables are important to consider according to T. W. Bates

et al. (2009), A. Ozkan & N. Ozkan (2004), Y. Guney et al. (2007), M. A. Ferreira and A. S. Vilela (2004) and T. Opler et al. (1999). Below are presented independent variables chosen as determinants of corporate cash holdings:

Cash flow

The cash flow generated by a company is measured as cash flow divided by total assets with accordance to A. Ozkan & N. Ozkan (2004) studies. The cash flow data was exported from Thomson Reuters Eikon software. In Thomson Reuters Eikon software the cash flow is defined as the sum of net income after taxes minus preferred dividends and general partner distributions plus depreciation and amortization of intangibles for the fiscal year.

Firm size

Firm size is measured as the natural logarithm of the book value of total assets (T. W. Bates et al., 2009) (A. Ozkan & N. Ozkan, 2004). Natural logarithm helps to identify the growth rate of the selected sample of companies. In the following variable applies economies of scale. As the oil, gas & consumable fuels and independent power & renewable electricity sectors consist of companies which vary in size the factor is relevant.

Market-to-book ratio

Market-to-book ratio is identified as the book value of total assets minus the book value of total equity plus the market value of total equity to the book value of total assets (J. Farinha et al., 2018) (T. W. Bates et al., 2009). The ratio is a part of financial valuation metric which compares book value given in a balance sheet to a company's current market value. The ratio should show the investment opportunity and the availability of funds in a firm. The book value of total assets was found in the balance sheets of the chosen companies. The total equity was collected from Thomson Reuters Eikon software. The parameter includes equity value of preferred shareholders, limited partners, general partners and common shareholders. It is worth noting that the interest of minority shareholders is not included in the parameter. To include the interest of minority shareholders and to calculate the market value of total equity enterprise value will be used due to the similarity of the results and availability of the information.

Liquidity

According to studies of T. A. John (1993) cash holdings can be influenced by liquid assets. For example, it means that firm's cash can be easily interchanged by other liquid assets. The proxy for the liquidity is the ratio of the total receivables plus total

inventory minus accounts payable in the numerator and total assets in the denominator (J. Farinha et al., 2018). Total receivables is measured as the sum of accounts receivables and other parameters connected to the receivables in short term. Definition of inventories is highly dependent on the sector and the core of the firm's business. The data connected to the company's total inventory were exported from Thomson Reuters Eikon software and defined as all the assets expected to be sold plus goods involved in the manufacturing process of the assets to be sold. Accounts payables were based on debt obligations to the suppliers and the assets bought on an open account.

Acquisitions

In the case of acquisitions the acquisitions to total assets ratio has been used. In the empirical study of this paper the variable of acquisition activity is connected to the acquisition of business. Acquisitions are defined as acquisition of business/book value of total assets (T. W. Bates et al., 2009). Acquisition of business represents an outflow of cash to purchase a new business. It is important to point out that only the cash transactions are taken into account. Furthermore, the acquisition expenditures are outflows connected only to acquisitions.

Leverage

To measure the leverage was used the ratio which has in the numerator the value of total debt and in the denominator the book value of total assets (T. W. Bates et al., 2009). Total debt includes short term debt, total long term debt and capital leases. The general usage of leverage is enhancement of funds availability. Furthermore, leverage provides greater opportunity for timely action. Nonetheless, it could be connected with risks.

Dividends

The variable represented by the dividend payout dummy variable. The dummy variable takes values of one in cases when the company paid the dividend. In the cases when the company did not distribute the dividends to shareholders the variable takes value of zero. The dummy variable is based on the cash dividend distributed among common stockholders collected from Thomson Reuters Eikon software. Common stockholders have a low position in stockholders ladder. Therefore, they have greater possibility of receiving dividend payment with the stocks allocated to income stocks, due to the stability of payouts. Utilities sector is commonly known for its income stock characteristics.

Research and Development

The ratio measures the opportunity of a company to invest. Research and development is calculated as the ratio of expenses connected with the research and development to total assets (J. Farinha et al., 2018) (T. W. Bates et al., 2009). Taking into account changing environment of energy sector it will be valuable to track down the differences for the research and development expenses. Furthermore, the ratio has additional significance due to the fact that it is calculated within one industry.

Capital expenditures

The proxy for the capital expenditures is the ratio of capital expenditures to total assets (T. W. Bates et al., 2009). The ratio measures to what extent a company invests in costs associated with maintenance, property, plant and equipment. Since an average energy company owns a large package of assets the mentioned ratio shows how many funds are allocated to the previously performed investments.

Table 2 Summary of the formulas and measurements used for the variables calculation

Dependent variable	
Corporate cash holdings	$\frac{\text{Cash and short term investments}}{\text{Total assets}}$
Independent variable	
Cash flow	$\frac{\text{Net income after taxes} - \text{Dividends paid} + \text{Depreciation and Amortization}}{\text{Total assets}}$
Firm size	Natural logarithm of the book value of total assets
Market-to-book ratio	$\frac{\text{Total assets} - \text{Total equity} + \text{Market value of total equity}}{\text{Total assets}}$
Liquidity	$\frac{\text{Total receivables} + \text{Total inventory} - \text{Accounts payable}}{\text{Total assets}}$
Acquisitions	$\frac{\text{Acquisition of business}}{\text{Total assets}}$
Leverage	$\frac{\text{Total debt}}{\text{Total assets}}$
Dividends (dummy)	Cash dividend paid out = 1; Cash dividend not paid out = 0
Research and Development	$\frac{\text{Research and development}}{\text{Total assets}}$
Capital expenditures	$\frac{\text{Capital expenditures}}{\text{Total assets}}$

6.5 Expected relationship of the variables with cash holdings

In the Table 3 the author of the thesis summarizes the correlation expectations.

Cash flow. It is expected to have positive relation between cash flow and cash holdings for oil, gas & consumable fuels energy and negative relation for renewable energy sector. Renewable energy sector is expected to spend retained earnings on technology enhancement.

Firm size. For both sectors the negative relationship between firm size and cash holdings is expected due to the fact that the large size companies can guarantee profitable alternatives in comparison to cash funding.

Market to book ratio. Financially constrained firms will be behind the rivals in the race for investment opportunities where fast availability of funds plays crucial role. The author of the research expects in the case of oil, gas & consumable fuels energy companies to see larger amounts of cash deposited due to expectations of investment opportunities. In the case of renewable energy sector the relationship is expected due to be positive, in order to account for investment opportunities.

Liquidity. For both industries the negative relationship between liquidity and cash holdings is expected due to the fact that the availability of alternative liquid assets may push the firm to cross change the liquid assets.

Acquisition activity. As the energy industry is highly regulated exposure to acquisitions may show low importance, however the factor also may show the shift of the oil sector to new opportunities. Therefore, positive correlation is expected. Renewable energy sector is expected to hold more cash during the time of growth opportunities for the purposes of activity expansion.

Leverage. The expectations are ambiguous due to the fact that the companies may want to repay the existent debt with cash or on contrary increase level of debt and use cash as a safety mechanism.

Dividend dummy. Oil, gas & consumable fuels energy sector mostly includes income stocks. Income stocks with constant payment of dividends are considered as less risky investment. As a result, those companies have benefits in access to capital markets and funds. Therefore, negative correlation between the cash holdings and the dividend payment is expected, due to the fact of easy funds availability for income stocks. On the

other hand, renewable energy sector includes growth stocks which are expected to have positive relationship of dividend payout with cash holdings.

R&D. The expectations are ambiguous due to the fact that the companies may not invest in R&D or use alternative liquid assets for the investment.

Capital expenditures. The correlation between the corporate cash holdings and capital expenditures for both industries is anticipated to be ambiguous. Main reason for the ambiguity is the unknown means of expenditures financing.

Table 3 Summary of the expected correlations

Variables	Expected correlation	
	Oil, Gas & Consumable Fuels energy	Renewable electricity
Cash flow	+	-
Firm size	-	-
Market-to-book ratio	+	+
Liquidity	-	-
Acquisitions	+	+
Leverage	-/+	-/+
Dividends	-	+
R&D	-/+	-/+
Capital expenditure	-/+	-/+

Chapter 7. Empirical Results

In the empirical results chapter the outcomes will be analyzed with accordance to the scheme established by the methodology. All the tables and calculations presented in the chapter are prepared with the statistical package software named Gretl. Gretl software is mainly concentrated on the econometrics tools. One of the key advantages of the software is that it is part of open-source software movement. The description of the results will be performed in the following sequence. First, the descriptive statistics is analyzed. Second, the model is checked for the possible existence of multicollinearity. Last but not least, the results of pooled OLS model are examined.

7.1 Descriptive statistics

Table 4 and Table 5 illustrate the summary statistics for researched sectors. The variables marked “OGC” represent the ratios calculated based on the data of Oil, Gas & Consumable Fuels sector. The variables with the indicator “RE” represent the ratios calculated based on the data of Independent Power and Renewable Electricity sector.

Table 4 presents ten variables calculated on the bases of twenty companies operating in Oil, Gas & Consumable Fuels sector over ten year period starting from 2009 till 2018. Analyzing the mean values from the Table 4 it is observable that the value of mean for all the variables except OGC_Dividends is higher than the median value. The relationship between mean and median for dividend payout can be explained by the fact that OGC_Dividends is the dummy variable. The data is likely to have outliers resulting from the fact the mean value of the variables is greater than the median. Outliers at the end of data frequency distribution can be seen in the values of minimum and maximum. The key information which can be taken from the value of Standard deviation for the variables is the spread relative to mean. All the factors except OGC_Firm size have high rates of standard deviation, meaning that the sample taken for the purposes of the research is concentrated on the Oil, Gas & Consumable Fuels sector firms which are similar in size. Only one negative parameter of mean value can be encountered in the seventh row, titled OGC_Acquisitions. OGC_Acquisitions shows the negative value of mean as the acquisition activity is connected with outflow of funds. Mean values of OGC_Cash holdings and OGC_Leverage which are equal to 0,086242 and 0,28015 respectively show that companies which were taken for the sample prefer debt to cash. Furthermore, for oil,

gas & consumable fuels sector firms cash and cash equivalents represent 8,6242% of total assets which is 19,3908% lower than the amount of total assets held in debt.

Table 4 Summary Statistics for Oil, Gas & Consumable Fuels (OGC) sector

Variable	Mean	Median	Minimum	Maximum
OGC_Cash holdings	0,086242	0,072853	0,00096613	0,32505
OGC_Cash flow	0,077061	0,075403	-0,14022	0,42485
OGC_Firm size	22,892	22,659	17,994	26,692
OGC_Market.to.book	1,4017	1,2996	0,70315	5,4214
OGC_Liquidity	0,11530	0,086977	-0,15596	0,52352
OGC_Acquisitions	-0,0064607	0,00000	-0,22608	0,0015878
OGC_Leverage	0,28015	0,22992	0,0056392	0,67454
OGC_Dividends	0,76500	1,0000	0,00000	1,0000
OGC_R&D	0,0070961	0,00015943	0,00000	0,14510
OGC_CAPEX	0,070130	0,057177	0,0031855	0,36511
Variable	Std. Dev.	C.V.	Skewness	Missing obs.
OGC_Cash holdings	0,066454	0,77055	1,2007	0
OGC_Cash flow	0,060352	0,78316	0,91467	0
OGC_Firm size	2,3585	0,10303	-0,082213	0
OGC_Market.to.book	0,49842	0,35558	3,8327	0
OGC_Liquidity	0,11732	1,0175	1,6373	0
OGC_Acquisitions	0,022745	3,5204	-6,3031	0
OGC_Leverage	0,15736	0,56170	0,48646	0
OGC_Dividends	0,42506	0,55564	-1,2500	0
OGC_R&D	0,015961	2,2492	4,8192	0
OGC_CAPEX	0,055640	0,79338	1,9207	0
Variable	5% Perc.	95% Perc.	IQ range	
OGC_Cash holdings	0,010637	0,23846	0,082349	
OGC_Cash flow	-0,011806	0,15226	0,058245	
OGC_Firm size	18,635	26,385	3,5838	
OGC_Market.to.book	0,89298	2,0713	0,34209	
OGC_Liquidity	0,0086306	0,42281	0,087601	
OGC_Acquisitions	-0,037945	0,00000	0,0011581	
OGC_Leverage	0,047271	0,57894	0,23155	
OGC_Dividends	0,00000	1,0000	0,00000	
OGC_R&D	0,00000	0,032188	0,0077036	
OGC_CAPEX	0,012021	0,18902	0,062529	

The indicators of the main focus in the Table 5 are mean, median, minimum, maximum and standard deviation. Table 5 mirrors the variables from Table 4, however for the base line of the calculation for variables with the “RE” indicator were taken 15 companies operating in the sector of renewable electricity over the period of 10 years starting from 2009 till 2018. The data includes minor number of outliers as seen by the similarity in values of mean and median. The noticeable difference comparing to the previous table is the importance of cash and cash equivalents as they amount to 9,4454% of total assets. Furthermore, it can be seen that composition of total debt as a part of total assets on average exceeds the level of 40%.

Table 5 Summary Statistics for Independent Power and Renewable Electricity (RE) sector

Variable	Mean	Median	Minimum	Maximum
RE_Cash holdings	0,094454	0,072838	0,0026594	0,38229
RE_Cash flow	0,048864	0,058832	-0,20831	0,11435
RE_Firm size	22,227	22,243	18,507	25,451
RE_Market.to.book	1,4521	1,4330	0,91492	2,6507
RE_Liquidity	0,035709	0,036533	-0,11872	0,29833
RE_Acquisitions	-0,0048273	0,00000	-0,089312	0,0011277
RE_Leverage	0,43924	0,44839	0,14726	0,78765
RE_Dividends	0,71333	1,0000	0,00000	1,0000
RE_R&D	0,00015498	0,00000	0,00000	0,0049277
RE_CAPEX	0,067203	0,047755	0,00071252	0,52870
Variable	Std. Dev.	C.V.	Skewness	Missing obs.
RE_Cash holdings	0,070336	0,74466	1,3314	0
RE_Cash flow	0,037961	0,77688	-2,7447	0
RE_Firm size	1,8477	0,083130	0,11301	0
RE_Market.to.book	0,28254	0,19457	1,2100	0
RE_Liquidity	0,044564	1,2480	0,71314	0
RE_Acquisitions	0,012950	2,6827	-3,7910	0
RE_Leverage	0,13292	0,30262	0,066640	0
RE_Dividends	0,45372	0,63606	-0,94353	0
RE_R&D	0,00067408	4,3495	5,3891	0
RE_CAPEX	0,071410	1,0626	3,3130	0
Variable	5% Perc.	95% Perc.	IQ range	
RE_Cash holdings	0,016222	0,23272	0,088542	
RE_Cash flow	-0,011685	0,090841	0,035723	
RE_Firm size	19,742	25,264	3,3570	
RE_Market.to.book	1,1009	1,9710	0,31183	
RE_Liquidity	-0,042240	0,085564	0,047763	
RE_Acquisitions	-0,032538	0,00000	0,0016600	
RE_Leverage	0,19450	0,67273	0,18321	
RE_Dividends	0,00000	1,0000	1,0000	
RE_R&D	0,00000	0,0011196	0,00000	
RE_CAPEX	0,0080548	0,20736	0,040581	

To summarize, key statistical differences of oil, gas & consumable fuels and renewable electricity sectors are analyzed. The levels of cash holdings for both sectors are similar amounting to 8,6242% of total assets for oil, gas & consumable fuels sector and amounting to 9,4454% of total assets for independent power and renewable electricity sector. As expected the companies from oil, gas & consumable fuels sector are on average larger in size than the companies from renewable sector. The mentioned results supports the prediction of negative relationship between cash reserves and company's size stated by the trade-off model. Looking at the mean values of OGC_Market-to-book ratio and RE_Market-to-book ratio it is noticeable that companies connected to renewables sector have more investment potential. At the same time, mean of OGC_Acquisitions shows that companies involved in the oil, gas & consumable fuels sector invest more in business acquisitions.

7.2 Ordinary Least Squares regression model analysis

First of all the model was checked for the possible existence of multicollinearity problem. Multicollinearity was analyzed by through the use of correlation matrix function in Gretl. Afterwards, ordinary least squares method of checking linear regression has been analyzed. The results of OLS models are presented in Tables 8 and 9.

7.2.1 Multicollinearity

Table 6 and Table 7 address the multicollenearity for variables used in model for oil, gas & consumable fuels sector and for renewable electricity sector. The importance of the test is the elimination of the independent variables which may accurately explain and highly correlate with other explanatory variables. In turn this may lead to the misrepresentation of the results.

Table 6 Correlation coefficients for OGC variables

OGC_ CAPEX	OGC_ R&D	OGC_ Dividends	OGC_ Leverage	OGC_ Acquisitions	OGC_ Liquidity	OGC_ Market.to.book	OGC_ Firm size	OGC_ Cash flow	OGC_ Cash holdings	Independent variables
-0,1443	-0,0802	-0,1373	0,2912	0,0424	-0,1780	0,0128	-0,1629	0,2036	1,0000	OGC_ Cash holdings
0,1005	-0,0840	0,1861	-0,2061	-0,0386	-0,1416	0,1307	0,2492	1,0000		OGC_ Cash flow
0,1736	0,0566	0,4599	-0,4119	-0,0571	-0,3239	-0,0456	1,0000			OGC_ Firm size
0,4269	0,2227	-0,0308	0,1537	-0,0942	-0,1428	1,0000				OGC_ Market.to.book
-0,2161	-0,1540	-0,1779	-0,0594	0,0809	1,0000					OGC_ Liquidity
-0,0258	-0,0906	-0,0168	-0,0993	1,0000						OGC_ Acquisitions
-0,1320	-0,0595	-0,1024	1,0000							OGC_ Leverage
0,0361	-0,1684	1,0000								OGC_ Dividends
0,4890	1,0000									OGC_ R&D
1,0000										OGC_ CAPEX

Table 7 Correlation coefficients for RE variables

RE_ CAPEX	RE_ R&D	RE_ Dividends	RE_ Leverage	RE_ Acquisitions	RE_ Liquidity	RE_Market. to.book	RE_ Firm size	RE_ Cash flow	RE_Cash holdings	Independent variables
0,1244	0,4010	-0,1731	-0,0640	0,1063	-0,1000	-0,1610	-0,4182	-0,2082	1,0000	RE_Cash holdings
-0,2546	-0,0527	0,5371	-0,1372	-0,2341	0,0107	0,0297	0,5084	1,0000		RE_Cash flow
-0,3171	-0,1890	0,5740	-0,3206	-0,0747	-0,0116	-0,0973	1,0000			RE_Firm size
0,3365	-0,1953	-0,0412	0,4203	-0,2619	-0,2157	1,0000				RE_Market.to. book
-0,3206	-0,0340	0,2388	0,1758	-0,0085	1,0000					RE_Liquidity
0,1347	0,0524	-0,1638	-0,1142	1,0000						RE_Acquisitions
0,0108	-0,1519	-0,2541	1,0000							RE_Leverage
-0,2750	0,0637	1,0000								RE_Dividends
0,1734	1,0000									RE_R&D
1,0000										RE_CAPEX

Perfect correlation exists when correlation coefficients are equal or close to 1, perfect positive correlation or -1, perfect negative correlation. Referencing to the Table 6 and Table 7 it is evident that none of the chosen explanatory variables intercorrelate.

7.2.2 Pooled OLS model analysis

In the following section, are presented the results of two pooled OLS models. The pooled OLS model analysis contains the final version of the regression models. Few of the explanatory variables presented in the multicollinearity paragraph were eliminated from the final regression due to statistical insignificance. The first model presented in Table 8 shows the determinant factors selected out of the explanatory variables for oil, gas & consumable fuels sector. The second model provided in Table 9 demonstrates the determinant factors selected out of the explanatory variables for renewable electricity sector.

Table 8 Regression results for OGC

Model 1: Pooled OLS, using 200 observations

Included 20 cross-sectional units

Time-series length = 10

Dependent variable: OGC_Cash holdings

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0,0752645	0,0167304	4,499	<0,0001	***
OGC_Cash flow	0,319672	0,0726373	4,401	<0,0001	***
OGC_Liquidity	-0,107044	0,0376106	-2,846	0,0049	***
OGC_Leverage	0,125987	0,0276660	4,554	<0,0001	***
OGC_Dividends	-0,0294486	0,0101881	-2,890	0,0043	***
OGC_CAPEX	-0,200802	0,0780379	-2,573	0,0108	**
Mean dependent var	0,086242	S.D. dependent var		0,066454	
Sum squared resid	0,676899	S.E. of regression		0,059069	
R-squared	0,229749	Adjusted R-squared		0,209898	
F(5, 194)	11,57322	P-value(F)		8,55e-10	
Log-likelihood	285,0674	Akaike criterion		-558,1348	
Schwarz criterion	-538,3449	Hannan-Quinn		-550,1262	
rho	0,703433	Durbin-Watson		0,493154	

According to the empirical model the equation for the Model 1 in Table 8 is:

$$\text{OGC_Cash holdings} = 0,0752645 + 0,319672 \cdot \text{OGC_Cash flow} - 0,107044 \cdot \text{OGC_Liquidity} + 0,125987 \cdot \text{OGC_Leverage} - 0,0294486 \cdot \text{OGC_Dividends} - 0,200802 \cdot \text{OGC_CAPEX}$$

The results for oil, gas & consumable fuels sector show that cash flow and leverage are positively correlated to cash holdings. As a result, the company will increase cash reserves in instances when gains on retained earnings grow. The company will also increase cash reserves in circumstance when amount of carrying debt increases. The variables which are negatively correlated to cash holdings are liquidity, dividends and capital expenditures. The decrease in cash holdings can be expected when company has other liquid assets to substitute the cash, company pays out dividends, and company allocates more funds to capital expenditures. Beta of the explanatory variable CAPEX is statistically significant at 5% significance level. According to P-value of F test the betas of the cash flow, liquidity, leverage and dividends are statistically significant at 1% significance level. Adjusted R-squared of the model is equal to 0,209898, indicating that chosen variables explain 21% of dependent variable.

Table 9 Regression results for RE

Model 2: Pooled OLS, using 150 observations					
Included 15 cross-sectional units					
Time-series length = 10					
Dependent variable: RE_Cashholdings					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	0,640547	0,0797737	8,030	<0,0001	***
RE_Firm size	−0,0208696	0,00341454	−6,112	<0,0001	***
RE_Market-to-book ratio	−0,0624262	0,0183965	−3,393	0,0009	***
RE_Liquidity	−0,321124	0,121667	−2,639	0,0092	***
RE_Dividends	0,0278859	0,0142447	1,958	0,0522	*
Mean dependent var	0,094454	S.D. dependent var	0,070336		
Sum squared resid	0,546308	S.E. of regression	0,061381		
R-squared	0,258874	Adjusted R-squared	0,238429		
F(4, 145)	12,66205	P-value(F)	7,30e-09		
Log-likelihood	208,2997	Akaike criterion	−406,5995		
Schwarz criterion	−391,5463	Hannan-Quinn	−400,4838		
rho	0,654444	Durbin-Watson	0,613701		

Based on the empirical model the equation for the Model 2 in Table 9 is:

$$\text{RE_Cash holdings} = 0,640547 - 0,0208696 \cdot \text{RE_Firm size} - 0,0624262 \cdot \text{RE_Market-to-book ratio} - 0,321124 \cdot \text{RE_Liquidity} + 0,0278859 \cdot \text{RE_Dividends}$$

The results presented in Table 9 are based on the renewable electricity sector. Explanatory variables which are negatively influence cash holdings for the mentioned sector are firm size, market-to-book ratio and liquidity. At the times of limited options to invest, company enlarges the amount of cash held on the balances. Cash held on the balances of the companies will gradually decrease as the company grows. Based on the correlation results, an increase in other liquid assets will lead to the decrease in the amount of cash held. Positive correlation could be seen for dividend payouts. It implies that higher dividend payouts lead to higher cash holdings. Beta of the independent variable Dividends is statistically significant at 10% significance level. According to P-value the betas of the firm size, market-to-book ratio and liquidity are statistically significant at 1% significance level. Adjusted R-squared of the model is equal to 0,238429, indicating that chosen variables explain 24% of dependent variable.

Chapter 8. Conclusions and Recommendations

First, the research concentrates on the generally accepted determinant factors of corporate cash holdings provided by the literature. Afterwards, using Thomson Reuter Eikon software and annual reports of the companies the sample of listed firms in Developed Europe is estimated. The variables for the sample of 20 oil, gas & consumable fuels energy sector firms and 15 independent power & renewable electricity producers sector firms over the period of 10 years starting from 2009 to 2018 was obtained. The database contains 350 observations, from which 200 relate to oil, gas & consumable fuels energy sector and 150 to renewable electricity producers sector. The database was structured as a panel data by the author. The study concludes that the companies from mentioned sectors in a general sense follow the predictions of trade-off model, pecking-order theory and free cash flow theory. The coherency between cash flow, firm size, market-to-book ratio, liquidity, acquisitions, leverage, dividends, R&D, capital expenditures and cash holdings is supported by ordinary least squares regression model. For the oil, gas & consumable fuels energy sector the statistically significant explanatory variables are cash flow, liquidity, leverage, dividends and capital expenditures. The results show positive sign of correlation between cash holdings and cash flows, as well as, positive correlation between cash holdings and leverage. The outcomes of OLS model show that cash holdings are negatively correlated with liquidity, dividend payouts and capital expenditures. Looking at the results of correlation matrix calculated with a help of Gretl software it is observable that positive correlation exists between cash holdings and investment opportunities in oil, gas & consumable fuels energy industry. The result supports the hypothesis of the author. On the other hand, the statistically significant explanatory variables for independent power & renewable electricity producers sector are firm size, market-to-book ratio, liquidity and dividends. Firm size, market-to-book ratio and liquidity are negatively correlated to cash holdings. Dividend payout is positively correlated with cash holdings. Behavior of dividends varies across the sectors. Showing that companies in oil, gas & consumable fuels energy sector are more likely to distribute retained earnings between shareholders, whereas renewable electricity producers firms do not decrease cash levels during the payment of the dividends.

Looking at the signs of the correlations it seems that oil, gas & consumable fuels energy sector follows the trade-off model, whereas renewable electricity production sector combines factors from free cash flow theory and trade-off model.

Overall, it is possible to derive the conclusion that if renewable energy producers grow, it will shift to the less cash reserves policy. As a result, mirroring the older established fossil fuels energy producers.

Below are presented limitations based on the results of the study and recommendations for future works:

1. The study does not cover the period of financial crisis. Therefore, the study of the crisis period can potentially show contrary insides on the relationship of cash holdings and determinant variables during the times of economic distress.
2. The present study reveals the significance of debt in the balance sheets of the firms. The study performed on the topic of determinant factors of the debt structure might be valuable.
3. The present research focuses on energy sector. The research for the different sectors of the business may provide additional explanatory variables for the cash holdings strategy justification.

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