LUT School of Business and Management

Bachelor's thesis

Financial management

European Central Bank's monetary policy and its effects on capital structures after financial crisis

Euroopan keskuspankin rahapolitiikka ja sen vaikutukset pääomarakenteisiin finanssikriisin jälkeen

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ABSTRACT

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Object of this thesis is to examine how European Central Bank's monetary policy has affected capital structures after financial crisis. This thesis is a quantitative research, where correlations and linear regression are used explaining results.

Theory section consists overview of ECB's monetary policy and most known theories considering capital structures. Research sample and results are addressed after theory section. Variables used in research considering capital structures are total, long-term and short-term debts with respect to total assets. Variables representing monetary policy are short-term and long-term interest rates, inflation, GDP growth and money supply.

Results suggest, that European Central Bank's monetary policy has affected capital structures of certain industries. Results also prove that firms adjust their capital structure after economic cycle. Short-term interest rate and GDP growth affected most variables illustrating capital structure ratios. Short-term interest rates, having maturity of one year at most, correlated positively with capital structure as GDP growth correlated negatively. Between industries there is differences in capital structures, such as how strongly variables of monetary policy affect capital structures.

TIIVISTELMÄ

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Tämän kandidaatintutkielman tavoitteena on tutkia Euroopan keskuspankin rahapolitiikkaa ja sen vaikutuksia pääomarakenteisiin finanssikriisin jälkeen. Tutkimus on toteutettu kvantitatiivisena tutkimuksena, käyttäen muuttujien välisiä korrelaatioita sekä lineaarista regressiota tulosten saamiseksi.

Teoriaosuus koostuu katsauksella EKP:n rahapolitiikkaan sekä tunnetuimpiin teorioihin koskien pääomarakenteita. Tutkimusaineisto ja tulokset käsitellään teoriaosuuden jälkeen. Tutkimuksessa käytettyjä muuttujia koskien pääomarakennetta ovat kokonais-, pitkäaikainen- sekä lyhytaikainen velka suhteessa taseen vastaaviin. Rahapolitiikkaa kuvaavia muuttujia ovat lyhyen ja pitkän aikavälin korot, inflaatio, BKT:n kasvu sekä rahan tarjonta.

Tutkimustulokset osoittivat, että Euroopan keskuspankin rahapolitiikalla on vaikutuksia tiettyjen toimialojen pääomarakenteisiin. Tulokset osoittavat myös sen, että yritykset muokkaavat pääomarakenteitaan taloussuhdanteen vaihtelun mukaisesti. Lyhyen ajan korot sekä BKT:n kasvu vaikuttivat eniten käytettyihin pääomarakenteita kuvaaviin tunnuslukuihin. Lyhyet, vuoden päästä erääntyvät korot korreloivat positiivisesti pääomarakenteiden kanssa, kun BKT:n kasvu korreloi positiivisesti. Toimialojen välillä on eroja pääomarakenteissa, kuten myös siinä kuinka vahvasti rahapolitiikan muuttujat pääomarakenteisiin vaikuttavat.

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1 Introduction

In the end of 2007 financial crisis started from subprime crisis, which led to a eurozone crisis. Some say financial crisis was result of Bush's reckless monetary policy and Fed's loose monetary policy. Bank's had tendency to excessive risk appetite, which led to leveraging with too small equity. This was bad for small investment banks.

Iqbal & Kume (2015) state, that the financial crisis had impacts on capital structures in Europe. Factors on capital structure decisions are not only firm-specific, but they also are dependent on institutional settings and macroeconomic uncertainty. Financial crisis resulted to a lower demand on consumption and high uncertainty of economic recovery. When economy is downturned, investment opportunities are rare due weak need of external capital, which is why firms' leverage ratios will decrease. (Graham et al. 2014)

Apart from United States, Europe is the largest economic area in the world. On January 1999, euro was created as a new currency for Europe. As ECB states, "Primary objective of the Eurosystem is to maintain price stability." By monetary policy, economic growth, job creation and social cohesion are maintained best. Quantitative objective for the monetary policy is to maintain inflation rate close to, but below, 2% per annum, on a medium-term. In the short-term ECB will affect economic variables, such as outputs and prices, by changing money market interest rates. (ECB 2011a, 62)

Object of this bachelor's thesis is to investigate, how capital structures have changed after financial crisis, in terms of monetary policy executed by European Central Bank (ECB). This thesis explains what monetary policy is, and how it affects firms. Do capital structures vary depending on monetary policy, in times of economic recovery?

1.1 Literature review

At many studies interest rate has been introduced as a determinant for capital structure, but it has not been examined so much there would be any agreement is it a sig-

nificant factor. As Mokhova & Zinecker (2013) state, companies are affected both internal and external determinants, which externals company cannot control. Still, both have a huge impact on corporate capital structure. Knowledge about those impacts will determine the decisions according capital structure. Their study shows, that at European countries, long-term and short-term interest rates have both positive and negative relations between capital structure. In Germany long-term and short-term interest rates had significant positive influence on firms' leverage. Depending on country and macroeconomic factors, the results were divided.

The study considering Romanian firms' debt ratio shows, that Central Bank's interest rate has no effect on capital structures on Romanian listed firms. They still assumed that economic growth affects firms by counter-cyclical behaviour. During slow economic growth and low interest rates, firms would use mostly debt as a primary financial resource. (Brendea, 2015). Bokpin (2009) finds that increase in interest rates influence companies to value long-term debt for short-term debt over equity. Leland (1994) show that level of interest rate has very sensitive impacts on capital structures. As Kokert et.al. (2014, 13) state in their study considering debts of EU countries, maintaining long period of low interest rates can make easier to bear debts of high level. By their study the low interest rates, invigorating monetary policy, will strengthen the economy, and high debt ratios are possible to turn over in a short period of time.

Mokhova & Zinecker (2013) researched how various macroeconomic factors have effects on capital structures. Results were shattered across dependent variables. As they examined how those factors affected Germany, inflation rate was the only monetary variable having negative correlation, all other factors, interest rates, money supply and GDP growth had positive correlations. Köksal & Orman (2014) studied, that GDP growth has a negative correlation with leverage, and inflation is positively correlated.

Studies show, that results about macroeconomic factors considering monetary policy and its effects on capital structures vary from not significant to significant, and also in some cases it has affected capital structures, and sometimes not.

However, research hasn't been made considering specific industries. As researchers have studied capital structure changes in certain countries with macroeconomic variables, no studies have been made where certain industries are being researched with only monetary data.

1.2 Research problem, objectives and limitations

As the object of this thesis is to research how monetary policy affects capital, the next research questions have been chosen. Primary question for this thesis is:

"How European Central Bank's monetary policy has affected companies' capital structures after financial crisis?"

And the sub-questions are:

"What has been ECB's monetary policy from 2009 to 2017?"

"How capital structures have changed from 2009 to 2017 in the manufacturing industry?"

By finding answers to these sub-questions, also the primary research question should be able to answer.

Thesis is limited to concern only European Central Bank, other central banks, such as central banking system of the United States of America (Federal Reserve, FED), are not covered in this thesis. Germany was selected as the country of which industry is scrutinized, because Germany is fourth largest economy in the world, largest economy in Europe, and one of the most developed country (IMF 2018). Germany also has one of the most stable economy in the Europe. From Germany's manufacturing industry, three different sections are chosen to the thesis: automotive & parts, chemical, and electronics & electrical parts. Time span of the thesis is post-crisis, from 2009 to 2017, and the main objective is to investigate how macroeconomic factors affect economy.

1.3 Research strategy/structure

The rest of the paper is organized as follows. The thesis is parted into two main parts. Second and third chapters represent theory to this thesis. In the second chapter, main monetary policy theory is presented, in addition to explaining how European Central Bank implements its monetary decisions, along with what ECB has done in terms of monetary policy. In the second chapter reader should understand the general view of central bank actions. In the third chapter main capital structure theories are showed, to reader have a better understanding how firms make their capital structure choices and if there are any conflicts.

At the fourth chapter, empirical part of the thesis, empirical research is being displayed. The data for capital structures and macroeconomic factors are presented. After that comes the main part of empirical research, Pearson correlation analysis is made for capital structure variables, along with variables representing monetary policy. After that, linear regression is being made and analyzed to get in-depth information, to show how much certain variables influence capital structures.

The fifth section includes conclusions and summary considering the empirical findings. Fifth section will also include possible new research questions and if there is something how this research could have been different.

2 The ECB’s monetary policy

In this chapter European Central Bank’s monetary policy is displayed, how it is implemented into real economy, what are its goals, and why it is important to achieve these goals.

ECB can influence the economic developments by controlling the money supply, which has effects on monetary bases. Inflation is a monetary phenomenon, and because of the neutrality of money, by changing the money supply central bank can control the inflation rate in the long-run, but it does not affect economic growth. High monetary growth is united with high inflation, and this way ECB can affect price levels. (ECB 2011a, 55)

2.1 European Central Bank and Eurosystem

European Central Bank was established in January 1999 along with the European System of Central Banks (ESCB). Eurosystem includes ECB and all National Central Banks (NCBs) of those 19 EU members whose currency is the euro, and ESCB contains ECB and all EU members. Even if all ESCB members don’t belong to Eurosystem, they still encompass the Eurosystem. As ECB coordinates monetary operations, NBCs execute these actions within their country. National Central Banks of the Eurosystem own the European Central Bank. (Mishkin 2016, 371-372)

When Eurosystem and ESCB were established, the primary premise was to free common currency from any political interferences, so that monetary policy couldn’t be used specifically to manipulate public sector deficits. ECB oversees Eurosystem’s tasks are completed, either by ECB or NBCs. (Micossi 2015, 1) Members of the EU, whose currency is not euro, do not participate in ECB’s monetary policy (ECB 2011a, 13).

2.2 Price stability

ECB's primary object today is to maintain price stability at a stable level. Price stability's maintaining is considered primary objective, because The Treaty has given mandate about it. Absolute price stability is not the object, but inflation near 2% per annum. Inflation and deflation are both not wanted phenomena, because of their costs. Price stability stabilizes these costs, so they don't rise to too high level. When prices are stable, price changes are more easily recognizable, which leads to better consumption and investment decisions. Second, inflation risk premia reduce because creditors don't need to demand higher interest rates. Unnecessary hedging activities can be avoided, and firms can allocate those resources to production, which leads to economic growth. (ECB 2011b, 6, 29-33)

ECB's monetary policy strategy is composed by two main elements, which are the quantitative definition of price stability, along with two-pillar analysis of risks to price stability. The quantitative definition is already mentioned in this thesis, maintaining inflation near, but under 2% p.a. By given this object, it increases transparency of ECB, and stabilizes inflation expectations. Knowing the primary object and its measure, public has the luxury of keeping ECB accountable. ECB's monetary policy is focused on the whole Euro area, because of single monetary policy, and the possibility to steer only average money market interest rate. (ECB 2011, 64, Micossi 2015, 3-4)

The two pillars of analyzing risks to price stability are economic analysis and monetary analysis. Economic analysis identifies risks from short term to medium-term, and monetary analysis identifies risks from medium-term to long-term to price stability. "The economic and monetary analyses include a large number of indicators that are monitored", as stated by Jung (2010). These analyses are being discussed monthly at Governing Council. As monetary growth and inflation are in a relationship, monetary analysis has a huge role in ECB's monetary policy strategy. Monetary analysis is an analysis about the money growth in medium to long-term, as money supply does not affect inflation in short-term. Economic analysis focuses on economic and financial variables, like developments in output, aggregate demand and fiscal policy. (Jung et.al. 2010)

2.3 Monetary policy's role in creating inflation

As high inflation is bad economy, and inflation rate can be set in the long run, why does high inflation still exist? Following the quantity theory of money, changes of money quantity leads to changes in the price level. From this we can lead, that quantity theory of money, is also a theory of inflation. "The inflation rate equals the growth rate of the money supply minus the growth rate of aggregate output", is how inflation rate is calculated. By this theory monetary authorities have affected to the inflation rate through money supply. (Mishkin 2016, 529)

Bordes & Clerc (2007) state, that using quantity theory of money, ECB can stabilize inflation level. ECB can affect inflation rate along with money supply by changing interest rates. ECB's targets price stability in the medium-term, but ECB calculates its own models, as quantity theory of money is only a fraction (Sarodni & Wray, 2006).

2.4 The transmission mechanism of monetary policy

Understanding the monetary policy transmission mechanism is important, in case of understanding how policy is implemented to all over Europe, across borders (Deutsche Bundesbank 2018, 1). Transmission mechanism of monetary policy transmits monetary decisions through real economy, all the way to price levels. Monetary policy actions take uncertain amount of time to have effect on the economy, because the process involves numbers of different mechanisms at various stages. Also, estimating the effects to real economy is hard, depending on state of the economy, size and strength of the different effects, and all kinds of shocks around the globe, i.e. changes of oil price. (ECB 2011a, 58)

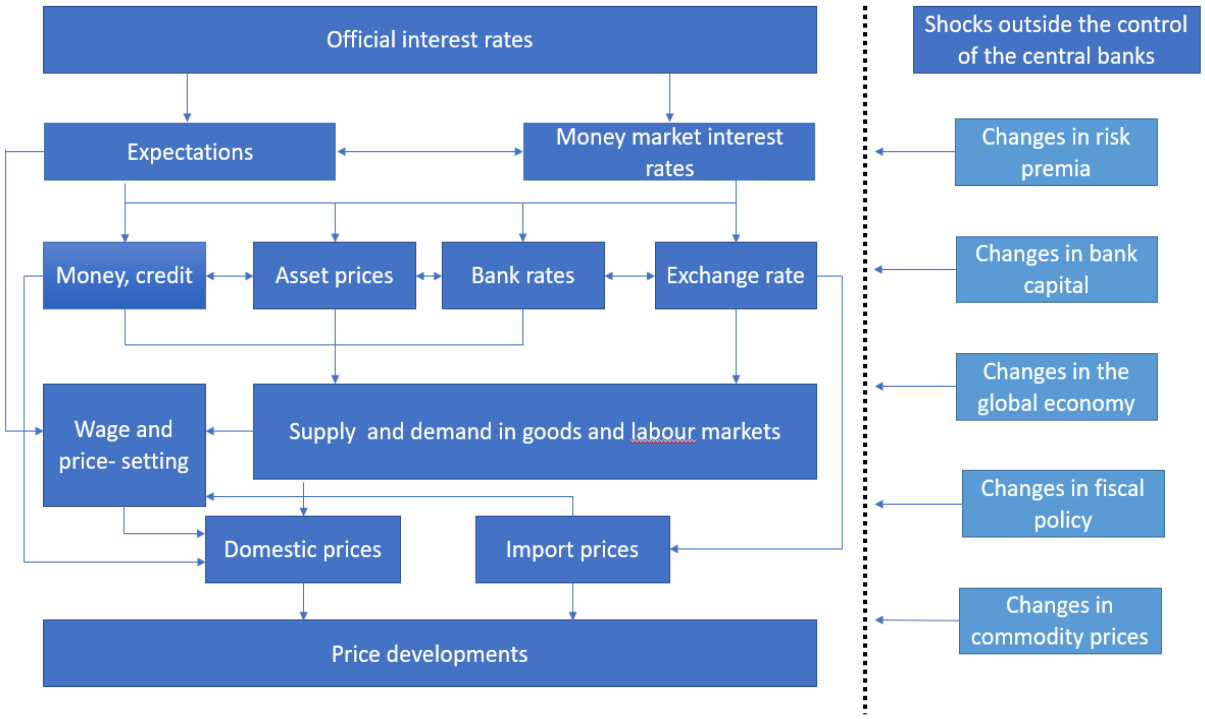

Figure 1. The transmission mechanism of monetary policy. (ECB 2011a, 59)

Monetary policy impulses can transfer to the real economy through several channels. By changing official interest rates, the central bank starts a long chain effect, which in the end, affects the price levels. ECB is a monopoly in terms of creation of monetary base, which is why ECB controls the interest rates. This is called “interest rate channel”, because ECB sets the interest rate, followed by banks’ lending money to their customers. By interest rate channel ECB steers money market interest rates directly. As seen in figure 1, money market interest rates affect bank and exchange rates, and the interest rate channel keeps on widening. In the end of the channel is price development, affected by all these variables. (ECB 2011a, 59-60)

When short-term interest rates are influenced by authorities in the monetary markets, they also meddle in the foreign exchange markets. Exchange rate channel affects price development of imported goods and resources. Exchange rates have either downward or upward pressure on foreign inflation. (Coricelli, Egert & MacDonald 2006, 12)

The expectation channel functions because of credibility of monetary policy by ECB and Central Bank's communication. If both private and public sectors believe the ability to maintain price stability, there is no need to raise prices or wages in fear of inflation. There are also several other channels how official interest can affect price development, but interest rate channel, exchange rate channel and expectation channel are the best known. (ECB 2011a, 61; Coricelli et.al. 2006, 20)

2.5 Open market operations

Open market operations consist four different type of operations: main refinancing operations (MROs), longer-term refinancing operations (LTROs), fine-tuning operations (FTOs) and structural operation. In an open market operation, the central bank swaps currency for bonds. "Open market operations are used for steering interest rates, controlling liquidity on the market and signaling the state of monetary policy", which is how

Chart 1. Open market operations (ECB 2011, 95).

Monetary policy operations	**Type of transaction**		**Maturity**	**Frequency**
	Liquidity proving	**Liquidity absorpting**		
Open market operations				
Main refinancing operations	Reverse transactions	–	One week	Weekly
Longer-term refinancing operations	Reverse transactions	–	Three months	Monthly
Fine-tuning operations	Reverse transactions	Reverse transactions	Non-standardised	Non-regular
		Collection of fixed-term deposits		
	Foreign exchange swaps	Foreign exchange swaps		
Structural operations	Reverse transactions Outright purchases	Issuance of ECB debt certificates Outright sales	Standardised /non-standardised –	Regular and non-regular Non-regular

ECB (2011a) describes open market operations. All four ECB's open market operation categories are in the figure 2, which shows maturity and frequency of operations.

Main refinancing operations are the most important liquidity providers. They can be controlled either with fixed or variable rate tenders. When ECB uses fixed tenders, they announce the interest rate, and the banks bid the amount of money wanted. When variable rate tender is used, banks bid both the wanted amount of money, and the interest rate of borrowing money. Banks can submit multiple bids at the same tender. ECB decides the amount of liquidity provided, regardless of fixed or variable rated tender. (Ayuso & Repullo 2013) ECB can execute also longer-term refinancing operations, which maturity is standardized as three months, but they can also be longer up to one year. Object of LTROs is to provide liquidity for a longer period. Fine-tuning operations and structural operations are not standardized, and they can also be used to absorb liquidity from the markets, meaning they are mostly reverse transactions. Structural operations are used to providing or absorbing liquidity for money markets in long term. (ECB 2011, 106-108)

2.6 Minimum reserves

Minimum reserves stabilize money market interest rates. Minimum reserves are compulsory deposits made by credit institutions at the National Central Banks. Reserve base of the credit institution commands the amount of required reserves. (ECB 2011a, 96-97)

Reserve ratio has been the same, 2% from the start of third phase of EMU, which launched at the 1999. Lump-sum allowance is the sum institutions can deduct from their reserve requirement, in case of administrative costs. Maximum amount of this lump-sum is 100 000€. Required reserves are being remunerated. (Bindseil et.al. 2006) Formula for the reserve requirement:

Reserve base x reserve ratio – lump allowances = reserve requirement

Banks can make averaging provisions to meet reserve requirements. By this way compliance of reserve requirements are average of daily balances. During the period, banks doesn't need to have the required amount at the balance. (ECB 2011a, 102)

2.7 Standing facilities

The Eurosystem restricts volatility of money market by controlling short-term interest rates and offering liquidity to its counterparties with two standing facilities. Standing facilities, marginal lending facility and deposit facility have overnight maturity, so banks can draw or deposit funds overnight. The interest rate of the marginal lending is higher than the money market lending rate, and the deposit facility is lower than the money market rate. These two market rates set ceiling and floor to the overnight money market rates. These so-called boundaries se the edges for the corridor of standing facility interest rates, within the overnight interest rate may fluctuate. EONIA (Euro Overnight Index Average) is the reference overnight market rate. Normally rates set by ECB are so unfavorable to banks compared to money market rates, they don't utilize standing facilities except as a last resort. (ECB 2011, 99, 108, Micossi 2015, 4-5)

Use of standing facilities remained below one billion euro, before August 2007. That's why standing facilities don't have effect on liquidity except on exceptional circumstances. Figure 2 shows the average use of standing facilities before the financial crisis. During the financial crisis use of standing facilities, more closely deposit facility arose, as banks preferred to deposit additional reserves instead of lending to other institutions, because of counterparty risk. In Ocotober 2008, Eurosystem provided all liquidity requested by individual banks, meaning banks had all the money they asked from European Central Bank. (ECB 2011, 108-110)

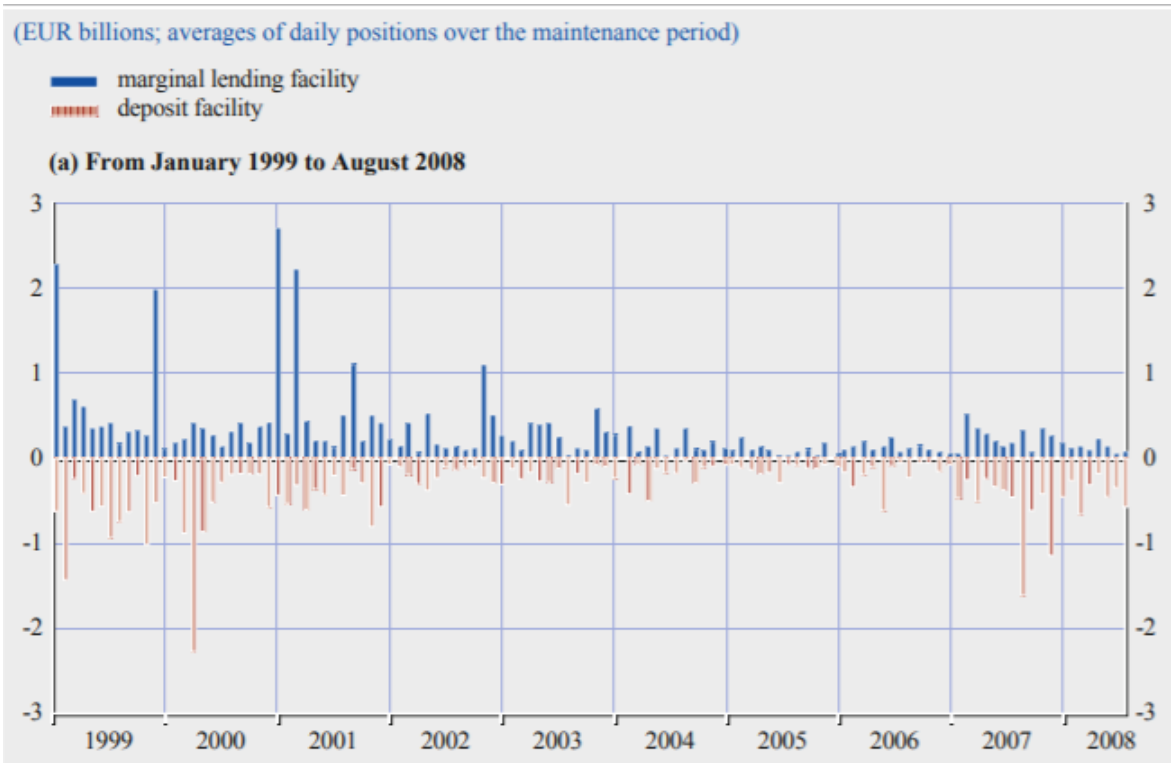

Figure 2. Recource to standing facilities (ECB 2011, 109).

3 Capital structure theories

The most common use of capital is using both equity and debt, combined. Firms have a change to also fund their activity fully by equity or debt. Capital structure choices differ with different industries. Some industries, such as software and retails own equity as their primary funding. (Berk et.al. 2015, 511) It is also profitable to use debt as a main source of capital, because it lowers the cost of capital in the company (Titman & Wessels 1988).

In the literary, no optimal debt-equity ratio has been chosen, as there is no need, or consensus for that. Companies balance with equity and debt, as optimizing capital structure firm can reach good value, and to minimize costs of capital (Korteweg 2010). Main capital structure theories are static tradeoff theory, pecking order theory and agency theory. Recently the firms have started to time the market, in terms of capital structure. Myers (2001) stated, that these theories are not perfect, but conditional.

3.1 Static tradeoff theory

Modigliani and Miller (1958) were one of the first ones to develop theory considering capital structure. In 1958 they stated, in their proposition I: “in the perfect market with no taxes, firms’ capital structure has no effect on the value of the firm.” By this theory, firm with no leverage has the same exact value than firm with leverage. Firm cannot change its value based on capital structure. As perfect market does not exist, meaning companies can affect its value by adjusting capital structure.

Modigliani and Miller (1963) executed another study, correcting errors on the first paper. In the second paper they took taxes into account, and they stated, that financing firm with debt can lead to a greater value, because taking debt can decrease taxes due to tax-deductible interests. Firms can’t increase their debts forever, as equity holders increase their expected return of equity as leverage ratio rises.

Tradeoff theory is about choosing the optimal amount of debt, balancing between additional tax advantages from additional debt, against costs of potential financial distress. Administrative costs of bankruptcy, moral hazard, monitoring and contracting

costs are all part of financial distress. As seen in Figure 3, the more leverage firm has, financial distress increases to a certain point. Financial distress may turn down, but optimal capital structure is way below that amount of debt. (Myers 1984)

In other words, tradeoff theory is a choice between costs and benefits of debt. Tradeoff theory splits to two different schools, dynamic tradeoff theory, and static tradeoff theory. Difference between these two is the time frame. Dynamic tradeoff theory suggests, that firms take time into account, making capital structure decisions. Static tradeoff suggests, that firms use the same capital structure all the time, not making changes in example within market circulation. (Frank & Goyal, 2005, Frank & Goyal, 2009)

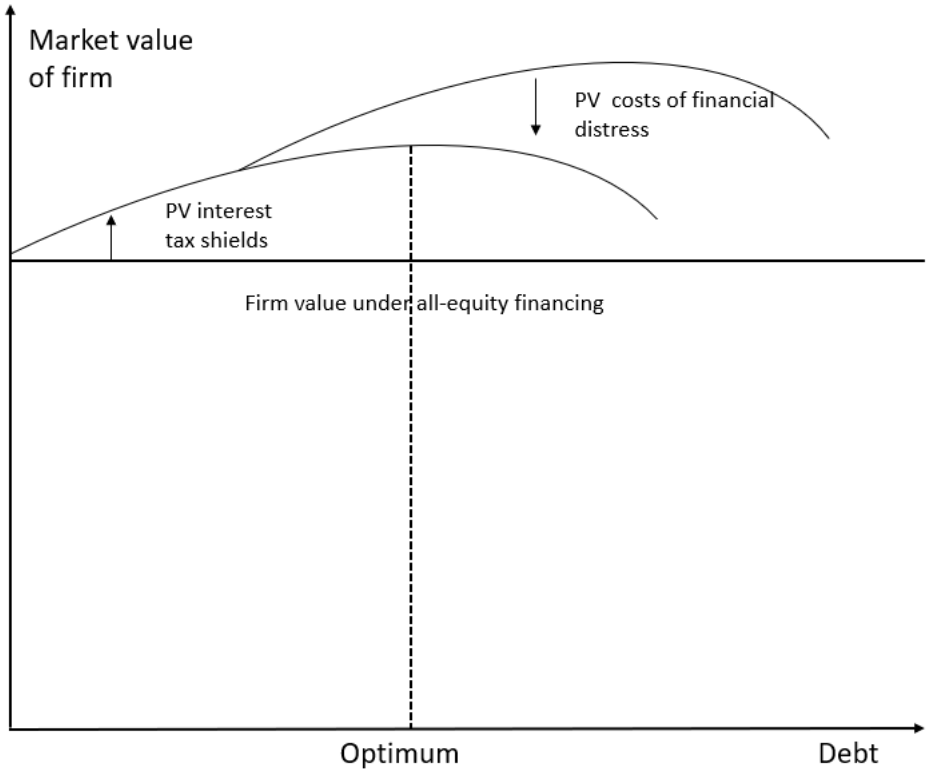

Figure 3. The static-tradeoff theory of capital structure (Myers 1984)

Myers (1984) assured capital structure averages vary between industries, due to specific risks of certain industry, asset types and industry specific external fund requirements. All of these variables can decrease firms' valuation, even though financial difficulties are yet to be seen. According to Myers (2001), firms' use debt to the point, where marginal value of tax shield from increased debt will offset possible financial distress costs.

3.2 Pecking order theory

Myers (1984) and Myers and Majluf (1984) assured, that pecking order theory is based on presumption, that firms have a hierarchy in terms of ways to finance their operations. In pecking order theory firms prefer internal financing, accumulated earnings, instead of external. If internal financing is not enough, firms use the safest possible finance, which is debt. Equity is the last resort, after mezzanine financing. The name of the model is based on fact, that internal and external equities are two of a kind, the former is top at the top, and the latter is at the bottom of the pecking order.

Pecking order theory is based on adverse selection, and it's developed by Myers and Majluf (1984). By the theory, firm's managers have more information than investors, which leads to investors analysing every movement corporate management makes, to estimate value of firm. That will lead to a situation, where management avoids position of passing up investments with positive net present value, in case of investors estimating firm's value wrong, so now they can't value it at all. Due to asymmetric information, managers know value of a firm better than investors. Company will get valued either over or under-priced at the markets. Myers and Majluf (1984) assured, that emission of stocks will lead to fall of stock price. Emission has a danger of getting so underpriced, that only new stockholders get all the benefits from new investment opportunities, while old stockholders have no benefits. That's why managers prefer internal financing to external. (Copeland et.al. 2004)

Shyam-Sunder and Myers (1999) tested aspects of pecking order theory. They found out that firms finance their financial deficit by debt, like pecking order theory assumes, while testing relationship between net debt and financial deficit. Booth et al. (2001) studied capital structures of developing countries and found out, that firms with lower debt ratio, the more profitable the firm is. Empirical results of testing pecking order theory have showed conflicted proof.

3.3 The Agency theory

Jensen and Meckling (1976) represented their first theory of capital structure decisions, based on relationship between principal and agent. Both parties try to maximize their

wealth, leading to a situation where decisions of agent will not act the optimal way of principal. In agency theory conflicting interests cause agency costs. Agency costs are due to both equity and debt, as agency theory is about optimal use of resources. As company pays dividends to shareholders, it reduces managers' power of the company due to lower level of resources, causing higher probability of company needing additional external financing. Principals can limit agency conflicts by generating incentives for the agent, but it's not guaranteed agent doesn't do any harmful in terms of principal. (Jensen 1986)

There are many sources of conflict in agency theory. Dividend payment occurs, as stockholders decide to pay dividends from firms' assets, heading debtors to a worse situation. In claim dilution conflict firm takes new debt, with same or higher priority than old debtor had. Asset substitution problem can occur, when take debt with low interest rate to a low risk investment, but after getting money firm invests with a higher risk. In asset substitution problem equity holders' rate of return increases, within costs of bondholders. An underinvestment problem occurs, when firm rejects investment opportunities which would benefit bondholders, but not stockholders. (Smith & Warner 1979)

One way to reduce bondholder -stockholder conflict of interests, are covenants. Covenants are provisions, or limitations of firms' actions. They can restrict payments of dividends or selling assets. With covenants debtholders can have a permit to intervene with management. (Smith & Warner 1979)

4 Empirical research

In this chapter the research methodology is being displayed. Later, the data is introduced, following the empirical study. Correlations analysis and linear regression are being used to quantitative analysis.

4.1 Research methodology

This study is based on three Germany's manufacturing industries. There were some limitations, considering companies used in this study. Companies had to be listed in the Deutsche Börse, and those firms had to be active from whole time span used in this thesis. This excludes the chance, that company had taken extremely much debt, and went bankrupt during the time span. Industries studied in this paper are automotive and parts, chemicals, and electronics & electrical parts. All the data used in this thesis is gathered from Thomson Reuters Datastream, and it has been analysed with SAS EG 6.1- program.

The macroeconomic factors used are monetary policy determinants, performing the actions of European Central Bank. Monetary determinants used are long-term interest rate (IR 10Y), which is 10-year government bond of Germany, short-term interest rate (IR 1Y), one-year government bond of Germany. Inflation (Inflation) is measured by consumer price index, growth rate of money supply for M2 (M2growth), which includes currency in circulation, overnight deposits, deposits with an agreed maturity up to two years and deposits redeemable at notice of up to three months. Gross domestic product is also included in this study as a factor, as economic growth is ECB's minor mission. GDP growth (GDPgrowth) expresses macroeconomic development and stability. All of these variables are average percentage per annum. Statistics of monetary policy variables can be seen in Table 1.

Table 1. Monetary policy variables

Year	Interest rate 1-Year (%)	Interest rate 10-Year (%)	Inflation (%)	GDP growth (%)	M2 growth (%)
2009	1,78	2,944	0,24	-5,62	-0,57
2010	0,767	3,388	1,15	4,08	4,39
2011	0,606	2,92	2,48	3,66	6,83
2012	-0,073	1,901	2,14	0,49	7,66
2013	0,011	1,305	1,56	0,49	2,92
2014	0,143	1,941	0,81	1,93	5
2015	-0,079	0,541	0,12	1,74	8,64
2016	-0,374	0,634	0,38	1,94	5,77
2017	-0,801	0,185	1,7	2,22	4,55

Capital structure is being measured by three ratios, to represent structure of leverage. Total debt ratio is the average ratio for each of the three industry, and it's the sum of both long-term debt and short-term debt. Long-term debts are liabilities, which have maturity over a year. Short-term debts are liabilities, which come due within a year.

$$TD = total\ debt\ /\ total\ assets \quad (1)$$

$$LTD = long\text{-}term\ debt\ /\ total\ assets \quad (2)$$

$$STD = short\text{-}term\ debt\ /\ total\ assets \quad (3)$$

At first, Pearson correlation analysis is being made, to get a view how monetary determinants affect capital structures.

4.2 Correlation analysis

The first step of analysing this sample, is Pearson correlation analysis, to examine, how different macroeconomic factors influence capital structure ratios. "The Pearson correlation coefficient provides a measure of the strength of linear association between two variables", as stated by Newbold et al. Correlation can get values between -1 and 1. The further away from zero, the stronger correlation is. Negative value means, that relationship between variables is, when other variable increases, as the other decreases. In positive correlation both variables stir the same way. (Newbold et al. 2010,

482-483) Independent variables shouldn't correlate too strongly, and only variables having over .70 correlations are short- and long-term interest rates.

Table 2. Correlations between variables of Automotive

	IR 1Y	IR 10Y	Inflation	GDPgrowth	M2growth
TDAuto	0.93299	0.73055	-0.24448	-0.60101	-0.50794
	(0.0002) ***	(0.0254) **	(0.5261)	(0.0869) *	(0.1627)
LTDAuto	0.80994	0.54684	-0.56643	-0.51170	-0.54317
	(0.0081) ***	(0.1276)	(0.1118)	(0.1591)	(0.1307)
STDAuto	0.47725	0.53665	0.53562	-0.32615	-0.06911
	(0.1939)	(0.1363)	(0.1372)	(0.3917)	(0.8598)

** Significance at 10% risk level, ** Significance at 5% risk level, *** significance at 1% risk level*

Examining automotive industry, short-term interest rates have a positive and strong correlation with total, and long-term debt. Both- short and long-term interest rates have positive correlations with all capital structure ratios. It seems like, that short-term interest rate has stronger correlation with debt ratios, than long-term interest rate. Both interest rates stir to the same direction, but it seems like shorter interest rates have more effects on debts. Inflation, GDP growth rate and money supply growth rates all have negative correlation with capital structures, except for inflation and short-term debt ratio. In automotive industry growth of money supply has a negative correlation. This is expected, as money supply grows, interest rates decrease, so correlations of these variables should be opposite, as they are. When ECB supplies more money to the Eurosystem, it's cheaper to borrow money.

Table 3. Correlations between variables of Electronics.

	IR 1Y	IR 10Y	Inflation	GDPgrowth	M2growth
TDElectronics	0.75764	0.45341	-0.32582	-0.91597	-0.64926
	(0.0003) ***	(0.2203)	(0.3922)	(0.0005) ***	(0.0585) *
LTDElectron-	0.58703	0.33769	-0.35135	-0.78988	-0.67392
ics	(0.0965) *	(0.3741)	(0.3538)	(0.0113) **	(0.0465) **
STDElectron-	0.73268	0.44754	-0.24932	-0.83250	-0.51427
ics	(0.0247) **	(0.2271)	(0.5177)	(0.0054) ***	(0.1566)

** significance at 10% risk level ** significance at 5% risk level ***significance at 1% risk level*

In electronics industry, short-term interest rate has positive, strong and statistically significant correlations with all debt ratios. Long-term interest rate has positive, but not strong correlations with debt, same as in automotive industry. Inflation, GDP growth rate and money supply growth all have negative relationships with debts. GDP growth and money supply growth have also strong negative correlations. From electronics industry, short-term interest rate and GDP growth have the most power to explain changes in firm leverages.

Table 4. Correlations between variables of Chemicals

	IR 1Y	IR 10Y	Inflation	GDPgrowth	M2growth
TDChemicals	0.24852	0.12451	-0.17059	-0.20095	-0.01784
	(0.5191)	(0.7496)	(0.6608)	(0.6042)	(0.9637)
LTDChemicals	0.43227	0.45753	-0.28352	-0.19016	-0.44940
	(0.2452)	(0.2156)	(0.4597)	(0.6241)	(0.2249)
STDChemicals	-0.11927	-0.25318	0.07127	-0.03419	0.34439
	(0.7599)	(0.5110)	(0.8554)	(0.9359)	(0.3641)

** significance at 10% risk level ** significance at 5% risk level *** significance at 1% risk level*

In chemicals industry macroeconomic factors don't have a single strong correlation. In short-term debts correlations have the biggest differences comparing to other sub-industries. Short-term debt ratio has negative, but not strong correlations with both interest rates. In chemicals all debt ratios have so much volatility, these variables can't explain changes.

Overall on all sub-industries, similar pattern can be seen. As ECB tries to revive economy of the Eurozone, and interest rates are decreased, this situation allows companies to get rid of their debt. On a long run, interest rates and capital structures have a positive correlation. At least in these industries it seems like companies haven't taken debt even though borrowing money has been cheap. As interest rates have decreased, companies have strengthened their balance sheet by decreasing debt ratios and increasing equity ratios.

Inflation does not have significant correlation with capital structure, although inflation is a monetary phenomenon, so it is dependent on other variables. At other studies inflation had significant results, as it was the only monetary variable.

GDP growth and growth of money supply have negative correlation between total debts and long-term debts, but positive between short-term debt.

As ECB revives economy, it lowers the interest rates, feeds money to the system, which leads to economic growth, which comes up with growth of gross domestic product. From the correlation matrices and diagrams of debt can be seen, that firms have taken the shot, provided by the reviving monetary policy. As interest rates have decreased all the way from financial crisis, inflation has been a little over 1% per year, so all three sub-industries have decreased their total debt ratio. Except from short-term debt, GDP growth has strong negative correlation with leverage. As Graham, Leary and Roberts (2014) stated, during economic downturns, opportunities to invest are rare, and the need for external capital is weak, which leads to reduce leverage ratios.

4.3 Linear regression

Linear regression is statistical method, which is used to estimate how one or more explanatory variables, also called independent explain impacts on dependent variable. (Hill et al. 2012, 40)

In this part linear regression is made. Linear regression model can be stated as such:

$$y = \beta_1 + \beta_2 x_1 + \beta_3 x_2 + e \quad (4)$$

Where y is a dependant variable. β_t is a regression parameter, expressing the slope of the regression function, x_t is an independent variable, and e is an error term.

Linear regression model used in this thesis is OLS-estimator. In linear regression model long-term interest rate was excluded, because short-term interest rate had stronger correlations with debt ratios. In models of linear regression in this study has to be understood, that sample size is very small, due to annual data. Results from linear regression are only to be given in-depth outlook to how macroeconomic factors affect capital structures. Due to small sample size, standard errors are relatively big

with respect to coefficiency statistics, as coefficient digit could change its direction from negative to positive within variation of standard error. In this section models which aren't statistically significant, won't be written to equation.

Table 5. Linear regression results for automotive

Independent variables	Total Debt			Long-term debt			Short-term debt		
	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability
Intercept	25.545	0.935	<.0001	17.576	1.045	<.0001	7.969	0.456	<.0001
IR 1Y	2.321	0.519	0.0111	1.637	0.580	0.0477	0.684	0.253	0.0541
Inflation	-0.042	0.388	0.9181	-0.864	0.433	0.1168	0.822	0.189	0.0122
GDPgrowth	-0.136	0.159	0.4401	0.079	0.178	0.6797	-0.215	0.078	0.0502
M2growth	0.126	0.161	0.4778	-0.050	0.180	0.7956	0.176	0.079	0.0889
R-squared	0.8965			0.8314			0.8882		
Adj. R-squared	0.7931			0.6628			0.7763		
F-statistic	8.66			4.93			7.94		
Probability (F)	0.0299			0.0757			0.0347		
Durbin-Watson stat	2.451			2.908			2.752		
n	9			9			9		

In automotive industry all three models (Table 5) are statistically significant, and in automotive each variable is significant at least in one model. In total debt model for automotive, p-value is 0.0299, as adjusted r-square is 0.7931. only interest rate has a significant p-value, 0.011. As interest rate has a decrease of one unit, total debt ratio decreases by 2.32 units. In long-term model only interest rate has statistically significant p-value, as coefficient is 1.64. In short-term model, all independent values are significant within 10% risk level.

TDAuto = 25.55 + 2.32*IR1Y -0.042*Inflation – 0.14*GDPgrowth + 0.13*M2growth + e

LTDAuto =17.58 + 1.64*IR1Y – 0.86*Inflation +0.08*GDPgrowth – 0.05*M2growth + e

STDAuto = 7.97 + 0.68*IR1Y + 0.82*Inflation – 0.22*GDPgrowth + 0.18*M2growth + e

Table 6. Linear regression results for electronics

Independent variables	Total Debt			Long-term debt			Short-term debt		
	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability
Intercept	21.137	1.487	<.0001	14.728	1.496	0.0006	6.409	1.551	0.0145
IR 1Y	1.988	0.825	0.0737	0.353	0.830	0.6927	1.635	0.861	0.1304
Inflation	0.179	0.616	0.7858	-0.104	0.620	0.8744	0.284	0.643	0.6818
GDPgrowth	-1.056	0.253	0.0140	-0.331	0.255	0.2638	-0.726	0.264	0.0515
M2growth	0.154	0.256	0.5803	-0.120	0.258	0.6667	0.274	0.268	0.3638
R-squared	0.9354			0.6751			0.8456		
Adj. R-squared	0.8708			0.3502			0.6913		
F-statistic	14.48			2.08			5.48		
Probability (F)	0.0120			0.2481			0.0641		
Durbin-Watson stat	3.794			1.786			2.225		
n	9			9			9		

The linear regression was estimated with electronics (Table 6). Model where total debt was estimated, was statistically significant in 5% risk. Adjusted R-squared was 0.87, so that model estimated a lot of volatility in total debt ratio. Independent variables short-term interest rate and GDP growth rate were statistically significant. As interest rate increases (decreases) one unit, total debt ratio increases (decreases) 1.988 units. As GDP growths one unit, total debt ratio decreases 1.056 units.

In short-term model, adjusted r-square is 0.6913, and model is statistically significant, 0.0641. In this model, only GDP growth is significant, having value of -0.726.

TDElectronics = 21.14 + 1.99*IR1Y + 0.18*Inflation – 1.06*GDPgrowth + 0.15*M2growth + e

STDElectronics = 6.41 + 1.64*IR1Y + 0.28*Inflation – 0.73*GDPgrowth + 0.27*M2growth + e

Table 7. Linear regression results for chemicals

Independent variables	Total Debt			Long-term debt			Short-term debt		
	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability	Coefficient	Std. Error	Probability
Intercept	25.206	8.576	0.0424	19.350	1.670	0.0003	2.242	8.629	0.8078
IR 1Y	2.428	4.76	0.6368	2.420	0.943	0.0623	0.116	4.790	0.9818
Inflation	-0.737	3.55	0.8459	-0.369	0.704	0.6278	0.882	3.577	0.8174
GDPgrowth	-0.466	1.460	0.7655	0.345	0.289	0.2992	-1.245	1.469	0.4442
M2growth	0.740	1.479	0.6431	-0.674	0.293	0.0830	1.645	1.488	0.3310
R-squared	0.1322			0.8621			0.2623		
Adj. R-squared	-0.7355			0.7243			-0.4754		
F-statistic	0.15			6.25			0.36		
Probability (F)	0.9522			0.0518			0.8297		
Durbin-Watson stat	1.357			3.149			3.116		
n	9			9			9		

In chemical industry's linear regression model (Table 7) only long-term debt model is statistically significant, although Chemicals didn't have a single significant correlation. In chemicals industry standard errors are very high, so it's not reasonable to examine total and short-time debt models. In long-term model intercept, short-term interest rate and growth of money supply are significant within 10% risk level. As short-term model is statistically significant, but correlations were not, it can be assumed, that these independent variables together have some significance in this model.

LTDChemicals = 19.35 + 2.42*IR1Y – 0.369*Inflation + 0.35*GDPgrowth – 0.67*M2growth + e

5 Conclusions

This thesis was supposed to study, how ECB's monetary policy has affected capital structures of certain manufacturing industries in Germany, after financial crisis. Time frame for the study was from 2009 to 2017. Along with main research question, two other sub-questions were prepared to get answers, what has been ECB's monetary policy strategy and how capital structures have changed after 2009. To get better understanding of the topics, first ECB and its monetary policy strategy were introduced, followed by main theories of capital structures.

Thesis started with a literature review, which showed three most popular opinions and results about how monetary policy affects capital structures. Still, no study had been made considering only few industries explained by monetary factors, as most capital structures of certain countries has been researched.

Research was made by studying three sub-manufacturing industries from Germany, automotive and parts, chemicals, & electronics. From all subjects three measures of capital structure were calculated, total debt ratio, long-term debt ratio, and short-term debt ratio. Those three ratios were examined using macroeconomic data, which reflects monetary policy decisions, along with state of economy. Macroeconomic factors were short-term interest rate, long-term interest rate, inflation per annum, gross domestic product growth rate per annum, and growth of the money supply (M2).

At first in the study, correlations of all variables were calculated with SAS EG 6.1-program. Pearson correlation analysis was used to get known, how monetary factors influence capital structures of industries. Results were, that short-term interest rate, in this paper one-year government bond, had strong positive correlation with all three leverage ratios. This means, that as interest rates decrease, leverage ratios also decrease. Long-term interest rates, 10-year government bond, had also positive correlations, but not very strong, meaning that companies rather monitor shorter interest rates than longer ones.

First sub-question for this thesis was:

"What has been ECB's monetary policy from 2009 to 2017?"

ECB has executed expansionary monetary policy after the financial crisis. Mission of the ECB has been price stability, but also supporting economic growth. As of results from this thesis, ECB has a successful monetary policy strategy, as companies are more equity-based, and economies all over Europe have recovered from financial crisis. As ECB has added liquidity to the economy, companies have more possibilities to fund their actions.

Expansionary monetary policy means low interest rates and strong money supply, in terms of reviving economy. Expansionary monetary policy has worked, as it could be discussed if economy has reached boom, as economic ratios suggest recession is coming within next few years. ECB faces challenges, such as finishing expansionary monetary policy by increasing interest rates and ending liquidity-providing open market operations, but at the moment it's a challenge because multiple concerns i.e. Italy's economy.

Second sub-question for this thesis was:

"How capital structures have changed from 2009 to 2017 in the manufacturing industry?"

In times of economic recovery, all three industries addressed in this study have decreased their total debt ratios, as they had change to strengthen their equity ratio (Appendix 1). Firms of all industries have lowered their long-term debt, as short-term debt has been more stable. It seems like companies prefer internal, and equity-based finance instead of debt financing. This weakly indicates to firms' executing pecking order theory, as it seems like debt is not the primary source of finance. It is still not clear, how much these companies have funds from internal financing, comparing to equity financing, gotten from emissions.

There is also a possibility for both tradeoff theory, and agency theory execution. From tradeoff point of view, short-term debt ratios have been kind of stable, suggesting companies are aware of their optimal amount of short-term debt. As they have had a change, they have decreased total debt ratios through long-term debt. As in static tradeoff theory companies try to balance between costs and benefits of debt. As companies have not increased their ratio of short-term debt in the time of low interest rates, it's possible they don't vary debts in terms of tradeoff theories.

From results this thesis gave, it's not clear what capital structure theory firms use in certain industries. It could be either pecking order or tradeoff theory. Also, as agency theory is about balancing between equity and debt, due to stockholder-bondholder conflict, it seems like companies have increased protection of the debtor after financial crisis. It can't be generalized how companies alter capital structures, but fact is, they have decreased total debt ratios, and none of these three capital structure theories can't be ruled out.

Primary question for this thesis was:

"How European Central Bank's monetary policy has affected companies' capital structures after financial crisis?"

Inflation rate had scattered results. Only in automotive industry inflation had strong correlations, negative with long-term leverage, and positive with short-term leverage. Overall, inflation didn't have effects on capital structures, at least for industries used in this paper. Gross domestic product had many negative correlations with leverage ratios. When economy recovers, leverage ratios decrease. Also, money supply growth rate had negative correlations, along with few significant results. This was expected, because as money supply growths, it decreases interest rates, so direction with money supply and interest rates has to be opposites.

After correlation analysis, linear regression model was used, to give in-depth information about effects of macroeconomic factors. Linear regression was made, and only statistically significant models were given equation. Although standard errors for inde-

pendent variables were high, some results were possible to analyze. Some independent had both positive and negative values. As firms have decreased their leverages through long-term debt ratio, it is clear that values had opposite directions.

From the correlation analysis and linear regression models, it seems like monetary policy has affected capital structures of these industries. It is probably possible, that these macroeconomic factors alone don't have as direct effects as statistics of this study suggest. All factors used to describe changes of capital structures are related to each other. As a part of economic cycle, in phase of recovery when interest rates are at a low level and ECB supplies money to economy, Gross domestic products tend to grow. It would be silly and inefficient for firms not to adapt with economic cycle.

This study examined only how monetary policy affects capital structures. As data for capital structure ratios was annual, sample size was small. For the next researches the data should be panel data, so results of the study would be much more reliable. When panel data is used in this kind of research, it would be wise to calculate capital structures for each company alone. Therefore, independent variables have to be also company specific, which is why variables used in this thesis cannot be used alone.

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Appendix

APPENDIX 1: Capital structure ratios

	2009	2010	2011	2012	2013	2014	2015	2016	2017
TDAuto	30,46	28,13	26,71	26,55	25,62	24,98	26,47	25,02	24,32
LTDAuto	19,98	18,89	15,67	15,66	15,81	16,14	17,50	15,77	15,46
STDAuto	10,49	9,24	11,04	10,90	9,81	8,84	8,97	9,24	8,86
TDChemicals	29,01	25,91	26,46	27,17	35,11	34,00	35,11	18,61	20,84
LTDChemicals	22,09	20,98	14,97	14,81	16,03	16,06	13,70	14,56	15,14
STDChemicals	6,92	4,93	11,49	12,35	19,08	4,54	21,41	4,04	5,70
TDElectronics	30,53	19,48	19,32	23,10	20,18	21,92	19,25	19,73	17,98
LTDElectronics	16,75	12,75	12,30	14,00	15,09	14,79	12,25	13,87	11,33
STDElectronics	13,79	6,74	7,01	9,10	5,09	7,13	7,00	5,86	6,65

APPENDIX 2: Pearson correlation coefficients

Pearson Correlation Coefficients, N = 9 Prob > |r| under H0: Rho=0								
	TDAuto	**LTDAuto**	**STDAuto**	**IR GVT 1Y**	**IR GVT 10Y**	**INFL**	**GDPg**	**M2growth**
TDAuto	1.00000	0.88307 0.0016	0.48362 0.1872	0.93299 0.0002	0.73055 0.0254	-0.24448 0.5261	-0.60101 0.0869	-0.50794 0.1627
LTDAuto	0.88307 0.0016	1.00000	0.01637 0.9667	0.80994 0.0081	0.54684 0.1276	-0.56643 0.1118	-0.51170 0.1591	-0.54317 0.1307
STDAuto	0.48362 0.1872	0.01637 0.9667	1.00000	0.47725 0.1939	0.53665 0.1363	0.53562 0.1372	-0.32615 0.3917	-0.06911 0.8598
IR GVT 1Y	0.93299 0.0002	0.80994 0.0081	0.47725 0.1939	1.00000	0.83781 0.0048	-0.20568 0.5955	-0.55591 0.1201	-0.59215 0.0930
IR GVT 10Y	0.73055 0.0254	0.54684 0.1276	0.53665 0.1363	0.83781 0.0048	1.00000	0.20304 0.6003	-0.12376 0.7511	-0.34126 0.3688
INFL	-0.24448 0.5261	-0.56643 0.1118	0.53562 0.1372	-0.20568 0.5955	0.20304 0.6003	1.00000	0.39673 0.2904	0.25071 0.5153
GDPg	-0.60101 0.0869	-0.51170 0.1591	-0.32615 0.3917	-0.55591 0.1201	-0.12376 0.7511	0.39673 0.2904	1.00000	0.68159 0.0432
M2growth	-0.50794 0.1627	-0.54317 0.1307	-0.06911 0.8598	-0.59215 0.0930	-0.34126 0.3688	0.25071 0.5153	0.68159 0.0432	1.00000

Pearson Correlation Coefficients, N = 9 Prob > |r| under H0: Rho=0								
	TDElectronics	LTDElectronics	STDElectronics	IR GVT 1Y	IR GVT 10Y	INFL	GDPg	M2growth
TDElectronics	1.00000	0.83157 0.0055	0.92936 0.0003	0.75764 0.0180	0.45341 0.2203	-0.32582 0.3922	-0.91597 0.0005	-0.64926 0.0585
LTDElectronics	0.83157 0.0055	1.00000	0.56777 0.1108	0.58703 0.0965	0.33769 0.3741	-0.35135 0.3538	-0.78988 0.0113	-0.67392 0.0465
STDElectronics	0.92936 0.0003	0.56777 0.1108	1.00000	0.73268 0.0247	0.44754 0.2271	-0.24932 0.5177	-0.83250 0.0054	-0.51427 0.1566
IR GVT 1Y	0.75764 0.0180	0.58703 0.0965	0.73268 0.0247	1.00000	0.83781 0.0048	-0.20568 0.5955	-0.55591 0.1201	-0.59215 0.0930
IR GVT 10Y	0.45341 0.2203	0.33769 0.3741	0.44754 0.2271	0.83781 0.0048	1.00000	0.20304 0.6003	-0.12376 0.7511	-0.34126 0.3688
INFL	-0.32582 0.3922	-0.35135 0.3538	-0.24932 0.5177	-0.20568 0.5955	0.20304 0.6003	1.00000	0.39673 0.2904	0.25071 0.5153
GDPg	-0.91597 0.0005	-0.78988 0.0113	-0.83250 0.0054	-0.55591 0.1201	-0.12376 0.7511	0.39673 0.2904	1.00000	0.68159 0.0432
M2growth	-0.64926 0.0585	-0.67392 0.0465	-0.51427 0.1566	-0.59215 0.0930	-0.34126 0.3688	0.25071 0.5153	0.68159 0.0432	1.00000

Pearson Correlation Coefficients, N = 9 Prob > |r| under H0: Rho=0								
	TD Chemicals	LTDChemicals	STDChemicals	IR GVT 1Y	IR GVT 10Y	INFL	GDPg	M2growth
TD Chemicals	1.00000	0.01485 0.9698	0.65222 0.0569	0.24852 0.5191	0.12451 0.7496	-0.17059 0.6608	-0.20095 0.6042	-0.01784 0.9637
LTDChemicals	0.01485 0.9698	1.00000	-0.40541 0.2790	0.81955 0.0069	0.71422 0.0306	-0.25747 0.5036	-0.47751 0.1936	-0.78746 0.0118
STDChemicals	0.65222 0.0569	-0.40541 0.2790	1.00000	-0.11927 0.7599	-0.25318 0.5110	0.07127 0.8554	-0.03149 0.9359	0.34439 0.3641
IR GVT 1Y	0.24852 0.5191	0.81955 0.0069	-0.11927 0.7599	1.00000	0.83781 0.0048	-0.20568 0.5955	-0.55591 0.1201	-0.59215 0.0930
IR GVT 10Y	0.12451 0.7496	0.71422 0.0306	-0.25318 0.5110	0.83781 0.0048	1.00000	0.20304 0.6003	-0.12376 0.7511	-0.34126 0.3688
INFL	-0.17059 0.6608	-0.25747 0.5036	0.07127 0.8554	-0.20568 0.5955	0.20304 0.6003	1.00000	0.39673 0.2904	0.25071 0.5153
GDPg	-0.20095 0.6042	-0.47751 0.1936	-0.03149 0.9359	-0.55591 0.1201	-0.12376 0.7511	0.39673 0.2904	1.00000	0.68159 0.0432
M2growth	-0.01784 0.9637	-0.78746 0.0118	0.34439 0.3641	-0.59215 0.0930	-0.34126 0.3688	0.25071 0.5153	0.68159 0.0432	1.00000

APPENDIX 3: Parameter estimate tolerances of independent variables

Parameter Estimates						
Variable	DF	Squared Partial Corr Type II	Tolerance	Variance Inflation	95% Confidence Limits	
Intercept	1	.	.	0	10.57444	18.88070
IR GVT 1Y	1	0.04321	0.60598	1.65023	-1.95238	2.65822
INFL	1	0.00705	0.84180	1.18793	-1.82602	1.61705
GDPg	1	0.29661	0.45131	2.21579	-1.03765	0.37626
M2growth	1	0.05111	0.46935	2.13059	-0.83616	0.59662