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**THE IMPACT OF THE ECB'S ASSET PURCHASE PROGRAMS ON  
CORPORATE BOND ISSUANCE IN DIFFERENT INDUSTRIES IN EUROPE**

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**ABSTRACT**

The purpose of this thesis is to investigate if and how the European Central Bank's asset purchase programs have impacted on corporate bond issuance in different industries in Europe. The asset purchase programs started in 2009 after the global financial crisis when the ECB launched its first covered bond purchase program to stimulate the economic activity in Europe. Since then the ECB has launched several asset purchase programs.

The bond issuance data are collected from the Thomson Reuters DataStream database and the data contains 4149 debt securities from Europe. The bonds are aggregated into a nine major industry groups according to the Standard Industrial Classification codes (SIC-codes). The investigated sample period is between 2006 and 2016.

The regression analysis contains several explanatory variables that aim to control the impacts of industry shocks and market conditions. The results reveal that the ECB's asset holdings have a significant positive impact on corporate bond issuance in eight out of nine investigated industries. The impact is statistically significant in all eight industries at 1% confidence level. The results are tested with different econometric techniques, which confirm the robustness of the results.

From a theoretical point of view, the obtained results can be supported with the gap filling and portfolio rebalancing theories. These theories suggest that the ECB's asset purchases create a gap in the market for a certain types of securities that were purchased away by the ECB. At the same time, investors are forced to seek new investments to replace the securities that were acquired away. The increased demand, improved liquidity and the gap in the market encourage firms to increase their bond issuance.

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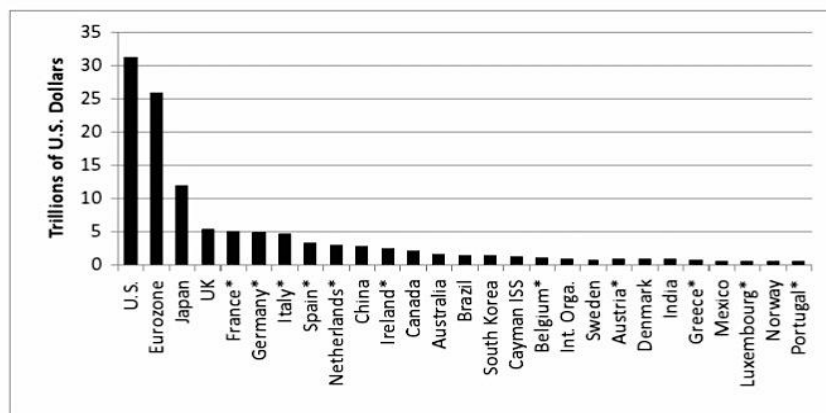
**KEYWORDS:** Asset purchase program, Corporate bond, Central bank, Industry



## 1. INTRODUCTION

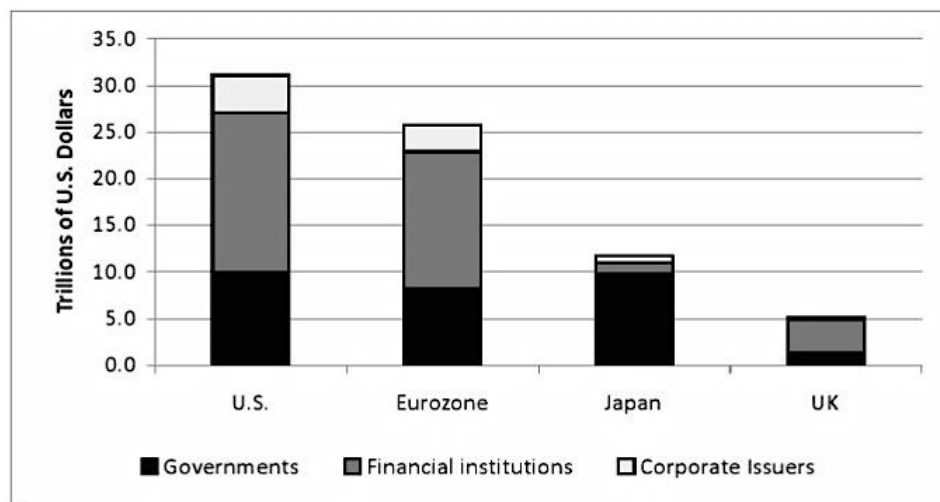
The European bond markets are the second biggest bond market in the world. However, the development of the European bond markets has been significantly slower compared to the U.S. bond markets. The European Monetary Union (EMU) has been one of the most important policy establishments of the international financial system since the end of Bretton-Woods system. The creation of the EMU has successfully erased key obstacles to financial integration and improved the functioning of the market by eliminating exchange rate risks and market segmentation in the euro area. This has accelerated the integration of the European public bond markets and also increased significantly the issuance activity in the private bond market. As a result, European firms have received an easier and cheaper access to the bond markets. (Pagano & Thadden 2004: 531 – 532.)

The analysis of the European fixed income markets is not unambiguous because the market comprises of many individual countries, which can be grouped in several ways. The grouping can be made based on political issues (countries in the European Union), currencies (countries using Euro), the intersection of these two (Eurozone), or by other subdivisions (e.g. the Benelux countries). In any case, the largest fixed income markets are located in the United States, Eurozone, Japan and in the United Kingdom. (Tuckman & Serrat 2011.)



**Figure 1.** Issued debt securities by the residence of the issuer in March 2010 (Tuckman & Serrat 2011)

Figure 2 below presents a rough description of how the issued debt securities are divided between the issuers in the four biggest bond markets. The issuers are divided into governments, financial institutions and corporations. The main observation from the figure is that in the United States and Europe the issuers seem to be quite similarly divided, while in Japan the government is dominating the debt market and in the United Kingdom the financial institutions are the dominating issuers. In the United States and the Eurozone the financial institutions are also the biggest issuers and are followed by governments but the statistics have shown that the corporate issuers are constantly growing their share of the debt markets. In this thesis, the focus is on investigating the corporate issuers in Europe while financial institutions and governments are excluded from the research. (Tuckman & Serrat 2011: 3.)



**Figure 2.** Debt securities by the residence of issuer and sector in March 2010 (Tuckman & Serrat 2011: 3)

After the global financial crisis started in 2007 the central banks have taken a bigger and bigger role in the bond markets with their non-conventional monetary policy actions. When the main monetary policy tools were not enough to stimulate the economy, exceptional market operations were launched in different regions by different central banks. In the United States these operations started in 2009 with the Federal Reserve System's, known as the Fed, quantitative easing program (QE). In the quantitative easing program the Fed started to

acquire Treasury bonds and mortgage-backed securities from the market to enhance liquidity on the market. (Fed 2017.)

The negative side of the financial markets integration was witnessed when the financial crisis started. The financial crisis started in the U.S. but it had global spillovers that quickly led to a dramatic decrease in the European economic activity as well. In order to revitalize the financial market in Europe, special actions were required from the European Central Bank (ECB). The ECB started its first asset purchase program also in 2009. This program is called the First Cover Bond Purchase Program (CBPP). The second operation, called the Securities Markets Program (SMP), was launched already in the following year. The first two programs along with the Second Covered Bond Purchase Program (CBPP2), launched in 2011, have all already terminated and the academic literature suggests that these first programs managed to calm down the market sentiment and reduced the uncertainty by lowering the volatilities. (ECB 2017.)

The ECB's latest group of the open market operation, known as the Expanded Asset Purchase Program, includes four different programs: The Third Covered Bond Purchase Program (CBPP3), Asset-Backed Securities Purchase Program (ABSPP), Public Sector Purchase Program (PSPP) and Corporate Sector Purchase Program (CSPP). The Public Sector Purchase Program that was launched in March 2015 is significantly the largest program measured by purchase volumes. The program was extended in June 2016 to include also high quality corporate sector bonds. Currently the monthly purchase target of the latest programs together is approximately 60 billion euros per month according to the ECB. (ECB 2017.)

The academic research has shown a great deal of interest in examining the effects of these exceptional monetary policy actions on the financial markets. In the U.S. the investigations are already further since the U.S. economy is in a more stable condition and the Fed has already terminated the largest asset purchase programs. The Fed's current open market operation, called the Monetary Policy Normalization, concentrates on the overnight reverse repurchase agreements in order to keep the federal funds rate in their target zone. In contrast, the ECB's largest programs are still running. So far, researchers have studied more intensively the impacts of the already terminated programs and only few studies have investigated the effects of the ECB's latest asset purchase programs.

Unlike in the most of the previous studies, the interest in this thesis is to investigate the corporate bond issuance behavior developments in Europe in response to the ECB's asset purchases. In addition, the objective is to compare the responses between different industries and to reveal possible differences. The underlying prediction is that the ECB's actions have increased firms' willingness to issued bonds. The assumption bases on the findings of Lo Duca, Nicoletti and Martinez (2016) who showed that the global corporate bond issuance have increased significantly due to the spillovers of the QE actions by the Fed. At the time of writing this thesis there are no existing empirical studies examining and comparing how the bond issuance activity has developed in different industries in response to the central bank asset purchase programs.

### 1.1 Purpose of the study

The purpose of this thesis is to investigate the relationship between the ECB's asset purchase programs and corporate bond issuance activity in different industries in Europe. The impacts of the central bank's asset purchase programs are distinguished into two different transmission channels. The chosen transmission channels are the impact of the ECB's new debt purchase transactions and the impact of the ECB's debt holdings. The use of these balance sheet channels follows the framework of Duca et al. (2016). The investigated industry groups are formed according to the standard industrial classification codes (SIC-codes). The main interest is to reveal how the asset purchase programs have impacted on corporate bond issuance and to find out if there are differences in the reactions between the industries.

This thesis is the first study that tries to reveal possible differences in bond issuance behavior between different industries in response to central bank's asset purchases. Besides being the first study to address this issue, an additional contribution to the existing research is made by using European data and extremely recent sample period. In addition, the few studies investigating the ECB's asset purchase programs have not included the corporate bond purchase program into the investigation so the thesis provides also new information from the corporate sector purchases.

## 1.2 Research hypotheses

The research hypotheses of this study provide answers whether the ECB's asset purchase programs have impacted on corporate bond issuance activity and if there occurs significant differences in the reactions between the investigated industries. The first two hypotheses concentrate on confirming or rejecting the correlation between the ECB's asset purchases and corporate bond issuance in general:

$H_{10}$ : ECB's asset purchases do not affect the corporate bond issuance in Europe.

$H_{11}$ : ECB's asset purchases have an impact on the corporate bond issuance in Europe.

In case the null hypothesis is rejected, additional hypotheses are formed to find out if the responses to these asset purchase programs have been different among the investigated industries.

$H_{20}$ : Majority of the industries react similarly to the ECB's asset purchase programs.

$H_{21}$ : The ECB's asset purchase programs have significantly different impacts on bond issuance between the investigated industries.

## 1.3 Structure of the study

The structure of this thesis is as follows: The second chapter concentrates in providing theoretical understanding on corporate bond pricing, risks and other important bond characteristics, introduces corporate capital structure theories and explains some key determinants behind firm's debt financing decisions. Chapter three goes through previous studies investigating the impacts of central bank's asset purchase programs in the U.S. and in Europe. The fourth chapter presents the data and methodology utilized in this thesis. The empirical analysis and results are discussed in chapter five. Chapter 6 summarizes the main findings and concludes the study.

## 2. CORPORATE BONDS AND FINANCING DECISIONS THEORY

The main purpose of the corporate bond issuance is to gather funding for firm's operations and investments from the public. Examples of these operations could be a building project of a new factory, acquisition of other business or the gathered capital could be used to refinance firm's current debts. The motives behind the refinancing of firm's debts, on the other hand, could be for example getting rid of restricting covenants of the previous debts, extending firm's debt maturity structure or firm's willingness to exercise a call option to repurchase callable bond with an attractive price. Alternatively, firm might simply have better and more profitable plans for its current cash holdings than paying back its debts. (Tuckman & Serrat 2011: 5.)

The corporate bond issuance process is highly technical and complicated and requires a lot of knowledge on the capital markets and regulations. Therefore, the issuing company normally hires an investment bank to do the required arrangements. The chosen investment bank then acts as an intermediary between the investors and the bond issuer and often underwrites the debt as well. The lead underwriter first starts to determine the characteristics of the new issue including maturity, interest rate and pricing. After getting the initial offer ready, the investment bank prepares the required legal documents and delivers them to the Securities Exchange Commission (SEC). The next step is to gather other investment firms to join the deal. In this stage, the lead underwriter forms a syndicate, which is a group of other firms who are interested in acquiring a part of the debt. After completing the syndication, the lead underwriter tries to get an idea of the demand in the market for the bond to achieve the correct pricing and right maturity for the debt. In order to obtain this information, the investment bank creates offering proposals to the institutional investors. When the details of the bond are agreed, the debt is ready to be released to the market and after the bonds are sold the underwriter distributes the funds to the issuer. (Altunbas, Kara & Ibanez 2009: 9.)

After a brief introduction to the main purposes of corporate bonds and their issuance process, the next and necessary step is to go through the key fundamentals of corporate bonds and the main determinants behind firm's financing decision. After the theory review, it is easier to understand the possible drivers behind the results of the previous findings concerning the impacts of the asset purchase programs. This chapter covers the key matters in corporate

bonds and discusses about the corporate financing decisions issues while the previous findings related to the asset purchase programs will be presented in the chapter three.

## 2.1 Bond characteristics

The following subchapters present important information on corporate bond fundamentals and issuance decisions. The aim of the chapter is to provide knowledge on corporate bond pricing and yields, bond risks and firms capital source and capital structure decisions in order to make it easier to understand the possible determinants behind bond issuance and to get more familiar with the corporate bond environment.

### 2.1.1 Corporate bond price and yield

The value of a corporate bond bases mainly on three key determinants: the required rate of return on a risk free debt, the bond specific characteristics (maturity, seniority in default situation, coupon rate, call terms etc.) and the bonds probability of default (Merton 1974: 449). The price of a bond is derived from its future cash flows that are discounted by the selected discount rate. Bond's cash flows consist of the interest payment that the bondholder receives, known as *coupon payments*, and the final principal payment at the end of bond's maturity. Using coupons ( $C$ ), par value ( $PV$ ) and discount rate ( $r$ ) we can form the bond price ( $P_0$ ) equation where ( $t$ ) refers to the numbers of periods to maturity: (Fabozzi 2013: 30 – 31.)

$$(1) \quad P_0 = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^t} + \frac{PV}{(1+r)^T}$$

The timing of the purchase must be noted in the bond price as well. If the bond is purchased between its coupon payments, the buyer will have to pay *accrued interest* to the seller. In other words, the buyer will pay for a part of the upcoming coupon to the seller that belongs to the seller based on the holding period after the latest coupon payment. For example, if a bond pays coupons semiannually and eight weeks has passed since the last coupon the seller will receive accrued interest payment worth 56/182 of the semiannual coupon. The bond price would be in this case “flat price” plus the accrued interest. The accrued interest can be calculated with the following equation: (Bodie et al. 2014: 447)

$$(2) \quad \text{Accrued interest} = \frac{\text{Annual coupon}}{2} * \frac{\text{Days since the last coupon payment}}{\text{Days separating coupon payments}}$$

Besides the price, investors are interested in the rate of return they receive from their bond investment. The rate of return from a bond is called the *yield*. The yield can vary during the maturity of the bond and, therefore, it differs from the discount rate used in the bond price equation. The price of a corporate bond and its yield are negatively correlated. This means that when the price of a bond increases its current yield decreases. Current yield of a bond can be easily calculated with the following equation: (Fabozzi 2013: 48.)

$$(3) \quad \text{Current Yield} = \frac{\text{coupon}}{\text{market price}}$$

A better measure to do a comparison between bonds with different coupons and maturities is the bond's *yield to maturity* (YTM). The YTM takes into account the current market price, par value, coupon and the maturity of the bond. The yield to maturity indicates the total return received from the bond if it is held till the maturity date. One underlying assumption behind the YTM measure is that the coupons are reinvested at bonds' current yield. When the investor buys a bond at its face value, the interest rate and the yield are equal. However, the negative correlation between bond price and interest rate leads to the fact that if interest rates will increase also yield to maturity increases while the price of the bond falls. (Myers et al. 2011: 50.)

The yield to maturity is the interest rate level that makes the bond's present value and price equal. Therefore, the YTM does better in explaining the bond price and normally replaces the discount rate  $r$  in the bond pricing equation. In order to calculate the exact yield to maturity it is necessary to use the *trial and error* approach by testing different rates into the price ( $P_0$ ) formula. If after trying some example YTM rate the calculated price result is bigger than the actual price in the market it means that the YTM rate used is too low and it has to be increased until the calculated price matches the actual price of the bond. The calculation method to obtain an approximate yield to maturity rate is presented in equation 4. (Myers et al. 2011, Fabozzi 2013.)

$$(4) \quad \text{Yield To Maturity} = \frac{C + \frac{PV - P_0}{\text{Number of years to maturity}}}{\frac{PV + P_0}{2}}$$

In conclusion, it is important to understand that the coupon rate, the required yield and the bond price are in a close relationship. When coupon rate and yield are equal the price of a bond will be equal to its par value. If yields in the market increase above the coupon rate, the price of a bond will need to adjust to become attractive investment from the investors' perspective, otherwise the lack of demand will decrease the price below its par value. When the price is below the par value it means that the bond is selling at a *discount*. If opposite is true, meaning that the coupon rate is above the market yield, the bond is selling at a *premium* (above its par value). In this case the investors would start to acquire the bond and the bids would increase the price to a level where the bond yield would match to the market yield. (Fabozzi 2013:35 – 36.)

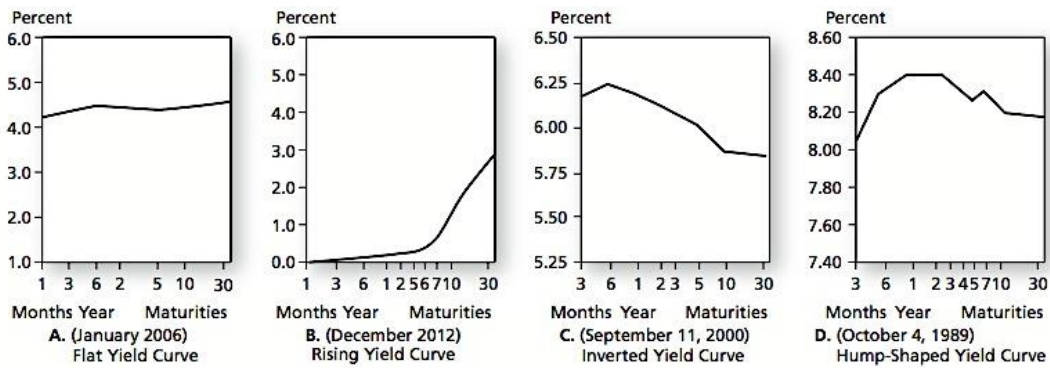
### 2.1.2 Term structure of interest rates

When discussing the yields and fixed-income investing theory, it is necessary to talk about one key concern called the *term structure of interest rates*. A common way to measure the term structure of interest rates is by comparing how the yields on the U.S Treasuries differ with term to maturity. The main reason for using the U.S. Treasuries is because they are considered as a default free debt securities and, therefore, the credit quality factor is not affecting the yields. In addition, the Treasury market is the largest and most active bond market which erases the possible illiquidity concerns. The term structure of interest rates is illustrated with the *yield curve*, which presents graphically the relationship between yield and maturity. (Cox, Ingersoll & Ross 1985: 385, Fabozzi 2013: 109.)

In a perfectly certain world the *forward rates* and the future *spot rates* (rate today for a given maturity) are in match. The match between these rates has been the starting point of many theories examining the term structure of interest rates. The four most recognized theories of the term structure of interest rates in the financial literature are the *expectations hypothesis*, *the liquidity preference hypothesis*, *the market segmentation hypothesis* and *the preferred habitat theory*. The first in the list, the expectations hypothesis, assumes that bond pricing is done based on the idea that the implied forward rates are equal to the expected spot rates meaning that holding a long-term bond to the expiration date provides the same expected returns as the strategy of investing in series of short-term bonds. The liquidity preference hypothesis highlights the riskiness of the long-term debt securities. The market participant

preferences and risk aversion affect to the forward rates and pushes them higher than the expected spot rates when maturity increases. Investors, therefore, require a term premium if they decide to invest in a longer-term debt. The market segmentation hypothesis presents that individual investors have strong maturity preferences and that the demand and the supply of the particular maturity bonds is affected by the price of a bond with different maturity. The preferred habitat theory suggests that investors are willing to switch their preferred maturity length only if they receive a risk premium from the maturity switch. (Cox et al. 1985: 385 – 386.)

The investigations of the yield curve have revealed that the slope of the yield curve has successfully predicted the future inflation and the real economic activity and that the monetary policy actions have a significant impact on the yield curve. The yield curve has been used as a predictor tool already from the 1980s predicting monetary policy actions, consumption and investments for example. The steepness of the yield curve is determined by the spread between the long- and short-term government bond rates. The most common shape of the yield curve is the *upward-sloping* curve where the long-term rates are higher than the short-term rates because investors require higher yield from the long-term bonds to compensate the increased risk of their investment. If the short-term rates are higher than the long-term rates we are talking about inverted or *downward sloping* yield curve. Previous literature suggests that increase in the short-term rates causes yield curve to flatten and also slows the real growth in the near future. Flat or inverted yield curve occurs when investors are expecting decline in the future interest rates or the market sentiment is significantly uncertain. The yield curve form where the rates are first rising and then shortly after falling is called the *hump-shaped*. Figure 1 below presents all these four forms of the yield curve. (Mishkin & Estrella 1996, Estrella 2005.)



**Figure 3.** Treasury yield curve shapes. (Bodie, Kane & Marcus 2014: 488)

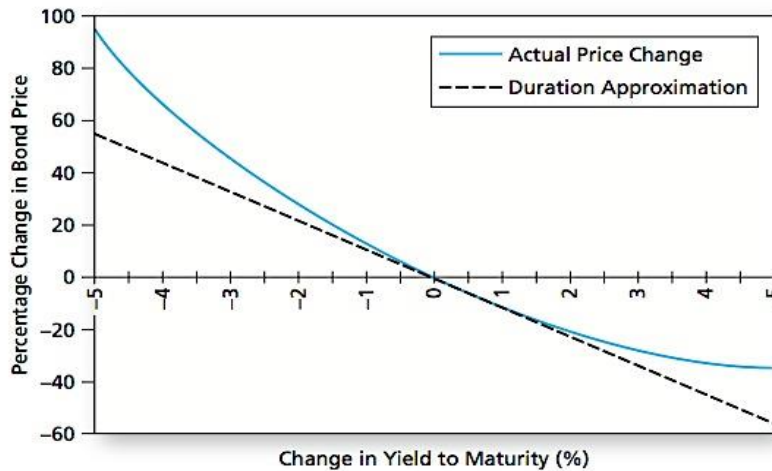
### 2.1.3 Risks involved in corporate bonds

The U.S treasuries are considered as the most risk-free debt instruments that exist. However, corporate bonds are not risk-free instruments. Contrarily, there are several widely accepted risk factors associated in bonds that have significant impact on bond yields. These risks can be for example: interest rate risk, call and prepayment risk, reinvestment risk, credit risk, downgrade risk, liquidity risk, exchange-rate risk, volatility risk, inflation risk, event risk or sovereign risk (Fabozzi 2007:17). This subchapter provides information on these risks and their impact on corporate bonds. At first, the chapter covers the interest rate, credit and liquidity risks in more detail and then proceeds to deal with the other risks which will be discussed more briefly.

In the previous subchapter, this thesis explained the negative correlation between interest rates and bond prices. Corporate bonds exposure to the *interest rate risk* depends on how much the bond price changes when the interest rates changes. This sensitivity depends on many bond characteristics such as the coupon rate, maturity and the options attached to the debt security. The longer the maturity of the debt issue and the lower the coupon rate, the greater the bond's price sensitivity to interest rates is. If there are options attached to the bond the relation is not as straightforward as just presented. A common measure for the interest rate sensitivity is called the *duration*. The duration measures the percentage change in the value of a bond when the yield changes by 100 basis points. Another popular interest rate sensitivity measurement method is the *DV01* (dollar value of an 01) or *dollar duration* also known as *the price value of a basis point* (PVBP). This measure tells how the dollar value of

a bond changes if the interest rates changes by 100 basis points. (Tuckman & Serrat 2011:130, Bodie et al. 2014:526, Fabozzi 2013:72.)

To avoid the negative effects deriving from the interest rate changes, risk managers calculate the volatilities of the fixed income portfolios and hedge against the possible increase in interest rates with interest rate swaps. The term *convexity* occurs often in the yield and price relationship theories and refers to the previous findings suggesting that decrease in the yield causes bigger change in the price than increase in the yield. Figure 4 below presents the bond price convexity -effect in a graphical form with an example bond. The convexity is a desirable characteristic for the bond investors because bonds with a greater convexity will experience a bigger increase in price if yields decrease in contrast to what the investors will lose if the yields increase. (Tuckman & Serrat 2011:130, Bodie et al. 2014:526.)



**Figure 4.** The bond price convexity. 30-year maturity, 8% coupon, initial YTM=8%. (Bodie et al. 2014: 526.)

*Credit risk* is usually categorized into three different classes which are the default risk, the credit spread risk and the downgrade risk. The default risk of a bond refers to a situation where issuer firm is not capable of paying back its loan obligation according to the original agreement. A percentage of bonds are actually expected to default and the expectation is measured with the default rate. However, if a default happens it does not necessarily mean that the whole investment is lost. In the case of a default, the investor might be able to recover

a certain percentage of the investment. The recovered percentage is called the *recovery rate*. These two rates together form the *default loss rate*, which is an important measure when evaluating the default risk of a corporate bond. The definition for default loss rate is as follows: (Fabozzi 2013: 173 – 174.)

$$(5) \quad \text{Default loss rate} = \text{Default rate} * (100\% - \text{Recovery rate})$$

The recovery rate is in a close correlation with the debt's security type. As the history has shown, the better the credit quality and the better the seniority of the debt, the higher the recovery. The seniority of the debt refers to a priority structure between the creditors. Table 1 exhibits historical average of recovery rates by debt type and seniority. The secured debt means that the debt agreement contains a pledge commitment of a specified collateral while the unsecured debt does not contain any collateral agreement. In addition, the senior debt ranks before the junior debt and the subordination within a debt rank means that the subordinated debt has priority to the claim after the other creditors within the rank. This means that the senior subordinated debt comes after the senior debt. (Fabozzi 2013: 153 – 154)

**Table 1.** Discounted ultimate recovery rate by debt type. (Fabozzi 2013: 175)

Debt type / Seniority	Average Recovery Rate %
Bank Loan	82
Senior Secured Debt	65
Senior Unsecured Debt	38
Senior Subordinated Debt	29
Subordinated Bond	27
Junior Subordinated Bond	15
All Bonds	37

A common way to hedge against the default risk is to buy insurance against the default. These insurances are often derivatives known as the *credit default swaps (CDS)*, which had a significant role in the recent global financial crisis. The credit default swap is a contract where buyer agrees to pay annual premiums for seller and in return seller agrees to pay buyers loss in default situation. (Bodie et al. 2014:475, Fabozzi 2007: 28.)

As presented earlier in this chapter, the corporate bond yield consists of two components that were the risk-free rate and the risk premium. The existing literature defines the *risk-free rate* to be the rate required from the U.S. Treasury bonds. The U.S. treasuries are also considered to be the most liquid and most default free bonds. The suggested European counterpart to the U.S. Treasury is the German 10y Bund. Because corporate bonds are riskier than these securities, investors require risk premium (*default premium*) to compensate the risk they are taking when they decide to invest to the corporate bond. The risk premium leads to a difference between government and corporate bond yields and this difference is known as the *yield spread*. Another term that often occurs is the *credit spread*, which is linked to the risk premium and credit quality and is defined to be the difference between U.S. Treasury bond and debt security with same maturity but weaker quality and bigger default risk. If the credit spread increases then market price of a bond will decrease, which is known as the credit spread risk. The credit quality and the downgrade risk issues are discussed in the following subchapter focusing on credit ratings. (Fabozzi 2007:29.)

*The liquidity* of the debt instrument is important when investor wants to sell the bond before the maturity date. If the plan is to hold the bond until its maturity then liquidity is not a concern for the investor. The price that investor receives from selling the bond is the price that broker is willing to pay which is called the *bid price* and it can differ from the indicated value of the bond. Current bid prices can be observed from the recent transaction history of the security. The risk for investor is that the bond might have to be sold below the indicated value. After buying the debt broker will sell it forward with a certain price known as the *ask price*. The difference between bid and ask price is called the *bid-ask spread* and it measures the *liquidity risk* of the debt security. The spread can change over time and the wider the spread the greater the liquidity risk and liquidity premium. Unexpected change in market interest rates or new types of bonds can widen the bid-ask spread for example. (Fabozzi 2007:32)

Another important factor behind the bond liquidity risk is the bond's issue date. If the bond is recently issued it said to be "on-the-run" issue while the older issues are known as "off-the-run issues". Previous findings have provided evidence that even in the most liquid Treasury markets on-the-run issues have greater liquidity and are traded more actively

compared to the older off-the-run issues. The liquidity spread between on-the-run and off-the-run issues is even wider in less liquid corporate bond markets. (Fabozzi 2013: 108.)

*The inflation risk* is present when the value of the security's cash flows decreases due to the inflation. If for example the coupon rate is 6% and inflation rate has increased to 3% the investors purchasing power has not increased with a same amount anymore. The *exchange rate risk* is present when the coupon payments are paid in other than domestic currency. If the currency in which the payments are made depreciates relative to the domestic currency the bond investor will receive less domestic currency due to the negative change in the exchange rate. The *volatility risk* in corporate bonds is related to the options embedded to the bonds. Volatility affects strongly to the option prices and therefore to the bonds where options are attached. Volatility affects often positively to bonds without options because investors tend to allocate their investment to bonds during times of high volatility. Investor faces *call risk* if the bond is callable and the bond can be called back for example due to a significant decrease in interest rates and investors has to find other security which probably provides lower rate. The *reinvestment risk* deals with the same matter, the interest payments investor receives has to be invested often with a lower rate than the initial investment. In the Eurozone Greece has been excellent example of the *sovereign risk* in the recent history while the *event risks* can be anything from regulatory changes to mergers and acquisitions. (Fabozzi 2007:12.)

#### 2.1.4 Credit quality

The main concern for a lender is if the borrower is capable to pay back the loan. For an individual lender the collecting process of all necessary information on borrower is a challenging and time consuming project. This is why the credit rating agencies exist, they help to gather the necessary information and reduce information asymmetries by giving credit ratings to the issued debt securities. The previous chapter mentioned the downgrade risk, which relates to weakening of the credit ratings received from credit rating agencies. When the credit rating of the debt is downgraded it will normally lead to a decline in the market value of the debt. The same return with the increased risk level doesn't look as attractive anymore from the investors' perspective and therefore the price needs to adjust.

The most famous credit rating agencies are the “Big three”, Standard & Poor’s, Fitch and Moody’s. Their credit ratings are letters, which signals the riskiness of the firm’s debt security. The best and the safest grade is AAA and the scale lowers first towards two-letter AA grades and then proceeds towards one-letter A grades. Corporate bonds are divided into *investment grade* and *speculative grade* (high yield) bonds based on the ratings the bond has received from the ratings agency. The bond is considered to be investment grade if its rating is the best B rating or better. If the rating is lower, the bond is defined as speculative grade or a high yield bond. These ratings play a critical role in the pricing of a debt issue because investors will require higher return from debt securities with lower ratings where the name high yield bond also stems from. (White 2010: 213.)

**Table 2.** Credit ratings. (Brealey, Myers & Allen 2011: 65)

	Moody's	Standard & Poor's	Fitch
Investment grade	Aaa	AAA	AAA
	Aa	AA	AA
	A	A	A
	Baa	BBB	BBB
Speculative grade	Ba	BB	BB
	B	B	B
	Caa	CCC	CCC
	Ca	CC	CC
	C	C	C

The ratings received from the rating agencies are based on the issuer’s key financial ratios and their developments. Examples of commonly used measures are *coverage ratios*, *leverage ratio* or *debt-to-equity ratio*, *liquidity ratios*, *profitability ratios* and *cash flow-to debt ratios*. The coverage ratio compares firm’s earnings to its fixed costs, leverage ratio compares liabilities to company’s assets while liquidity ratios measures the firm’s survival capability from current liabilities by comparing them to the firm’s current assets. Profitability ratios measure returns on firm’s assets or equity while cash flow-to-debt ratio measures if firm’s cash flows are enough to cover firm’s debt payments. (Bodie et al. 2014: 470.)

## 2.2 Decision to issue public debt

After getting more familiar with the corporate bond characteristics, it is beneficial to shortly investigate the previous findings on why firms decide to issue bonds instead of private debt. According to the existing results the main drivers behind the debt source decisions are related to the issuers characteristics such as size, credit quality, profitability, leverage and age. Part of the previous research strongly suggests that the private bank debt issuance is better because it is argued to be easier to renegotiate, the risk of information asymmetry is smaller and the monitoring of the debt is more efficient. This chapter however focuses on examining the main benefits and determinants behind the decision to issue public debt. In order to even think about issuing public debt firm should have access to the public debt market. The existing research has revealed that firms with credit ratings and access to public bond markets have significantly more leverage. According to the results by Faulkender and Petersen (2006), who investigated the relation between the capital source and the capital structure in publicly traded companies, even after controlling the firm specific characteristics and possible endogeneity problems, firms with access to the public bond markets have 35% more debt. (Faulkender & Petersen 2006: 45 – 46.)

One of the most common explanations behind debt decisions has been the relationship between cost effectiveness and the size of the debt needed. The issuance of public debt includes substantial issuance costs and, therefore, it is seen to be cost effective to issue public debt only in the cases of large debt issues in order to benefit from the economies of scale. The significant issuance cost may even be a barrier to some companies to issue public debt. This explanation supports the earlier findings suggesting that the public debt financing is positively correlated with the firm size. This means that the larger firms with larger issues aim to achieve the economies of scale with public debt issuance (Krishnaswami, Spindt & Subramaniam 1998:409). In addition, if the debt maturity structure of these larger firms is more heavily leaned towards short-term debts and the firms are having promising growth opportunities, then based on earlier findings firms will more often choose bond financing. (Altunbas, Kara & Marqués-Ibanez 2010.)

Another widely supported theory is that firm's credit quality is the key driver of the financing source decision. Firms with the highest credit quality borrow typically from the public debt market, while medium quality borrowers seek funds from the banks. Firms with the weakest

credit quality tend to borrow from non-bank private lenders. It has been shown, that the non-bank private financing is economically important debt form serving companies with low credit quality and bigger financial distress. (Denis & Mihov 2002: 26 – 27.)

Firm's financial flexibility and growth opportunities have also been offered as an explanation for the firm's decision to issue public debt. The previous literature has revealed that firm's restructuring motives could drive the issuance of high yield bonds. In other words, firms tend to replace their private bank loans with speculative grade bonds. The rationale, why firms do the switch, is that high yield bonds enable firms to maintain rapid growth more effectively compared to the private bank loans and that the switch from private to public debt increases managerial flexibility. Bank debt is normally shorter maturity, contains tighter monitoring and debt covenant restrictions and is also less scattered making it more effective in a manager constraining sense. Greater constraining has been seen as a negative and value-reducing feature by distracting managers to execute projects that could provide positive net present value figures and boost the future growth. (Gilson & Warner 1998.)

Shirasu and Xu (2007) investigated how regulatory changes affected to debt issuance decision in Japanese markets. The research revealed that after the deregulation in 1993 firms with a higher quality moved from private bank loans to the public bond market while lower quality firms choose to switch back to private bank lending. Previous literature presents evidence that the external debt decisions impacts on firm's future performance and different sources of debt might be therefore unequally valuable for a company. Cantillo and Wright (2000) suggested that public debt is a better option for firms that are generating bigger and stable cash flows, are more profitable and are having low level of real interest rates. They also suggested that firms with valuable assets and good past performance tend to rely on public debt. (Davydov, Nikkinen & Vähämaa 2014: 137.)

### 2.3 Debt as a part of firm's capital structure

The previous subchapter focused on explaining how firm-specific characteristics may drive firm's debt financing decisions and especially corporate bond issuance. In order to get a broader understanding on other aspects influencing on firm's debt issuance decisions, it is necessary to discuss about the corporate capital structure theories. At first, this subchapter

presents the key concepts of capital structures and then proceeds to introducing the most popular capital structure theories.

The term capital structure refers to a firm's capital allocation between debt and equity and it has been actively investigated through out the history of financial research. The capital structure study area has devoted in defining the perfect debt-equity ratio. Modigliani and Miller's research in 1958 is probably the most famous and cited research among the study area. Modigliani and Miller suggested that in the perfect capital markets the market value and the average cost of capital to any company are independent on the company's capital structure. In other words, the argument states that firms' financing decisions does not matter and that capital structure planning is irrelevant. (Myers 2001)

Modigliani' and Miller's capital structure irrelevance argument has been widely challenged due to its unreal assumption and alternative corporate financing theories have been developed to prove that financing decisions matter. One major counter argument has been that the use of debt plays an important role in a firm's financial planning because if the financial managers would not pay any attention to the firm's capital structures it would lead to explosions in debt ratios that could have disastrous consequences. The debt ratios would also vary randomly throughout the industries and firms. Tax matters, transaction costs, financial distress and bankruptcy costs, conflicts of interest between firm's shareholders and information asymmetries have all been suggested to prove the importance of debt financing policies. (Brealey, Myers & Allen 2010: 468.)

Like mentioned earlier, the academic literature concerning the capital structures has been strongly interested in defining an optimal capital structure. In the 1970's most of the studies suggested that optimal capital structure was achieved by comparing firm's present value of bankruptcy costs to its tax benefits of debt financing. However, it has been shown that the personal debt tax disadvantages can dispose the firm's tax advantage from debt financing. Another popular definition for optimal capital structure presents that it is a trade-off between the benefits of debt financing and leverage-related costs. Leverage-related costs can be for example agency costs of debt, loss of non-debt tax shields, and bankruptcy costs (Bradley, Jarrell & Kim 1984).

Before moving to briefly investigating the existing capital structure theories, the conclusion

at this point is that before firm decides to issue a bond it goes through careful analyzing of all possible capital options. Again, these options could be to issue equity instead of debt, and if debt is chosen then the next question is should firm borrow from private sector or issue public debt. In any case, the key objective in corporate financial planning is to find the best possible combination of capital sources that are used to finance firm's operation and projects that generates the best possible returns. Keeping in mind the different characteristics of debt and equity, it is widely accepted that the best possible capital structure for a firm is a structure that minimizes firm's cost of capital (Brealey et al. 2011).

### 2.3.1 Pecking order theory

The pecking order theory refers to a firm's preferences in which order firm seeks financing to its operations. According to the traditional pecking order theory, the first choice for a firm to finance its capital expenditures is by using internal cash flows. Managers want to release as little information as possible outside the company and the decisions to use external financing would require this. If the internal funds are not sufficient, the firm will seek external financing and preferably as safe as possible. The second option is to issue safe debt and only after the debt capacity has exceeded and the cost of financial distress is getting heavy, firms will use the third option and issue equity. Firm's debt capacity is the only debt ratio under interest in this theory because pecking order theory does not contain any target ratio for debt-to-equity. The driving idea behind the ranking order of external financing is related to adverse selection idea. If the external funds are required firm prefers debt because of its cheaper information cost compared to equity. In conclusion, it can be stated that the key determinant in financing decisions according to the pecking order theory bases on information asymmetries. (Myers & Maljuf 1984:575-576.)

Frank and Goya (2002) presented that in the publicly traded American firms the internal financing does not cover as big portion of the firms' financing decisions as the previous studies have suggested. Their findings also challenged the order structure of the external financing suggesting that the net equity issues often exceeded the net debt issues (2002: 218). Leary and Roberts (2010) presented even stronger argument against the pecking order theory suggesting that even after controlling firm's debt capacity, pecking order theory is not able to explain even half of the firm's financing decisions. Jong, Verbeek, and Vewijmeren (2011) presented that the pecking order theory manages to explain only firms' new debt issuances

until the debt capacity of the firm (measured by debt to assets ratio) is reached, but is not able to explain any kind of debt repurchase transactions. It is safe to conclude that the pecking order theory by itself is not able fully explain the corporate the bond issuance activity today but it gives an idea how the traditional theories have explained the debt and equity issuance decisions.

### 2.3.2 Trade-off theory

Another traditional way to define firm's debt decision is to see it as a trade-off between the debt's *interest tax shield* and the costs caused by the *financial distress* and *agency costs*. The agency costs mean conflicts of interest between the shareholders and the managers. In addition, the agency costs can derive from shareholders and debt holders conflicts. Debt holders want firm to invest only to safe projects with smaller risk because they are only interested about the repayment of the debt while equity holders prefer riskier investments with bigger possible returns (Harris & Raviv 1991: 304). The interest tax shield highlights that firms with bigger portions of tax-deductible debt pay smaller income taxes. The financial distress costs relates to bankruptcy costs that rises along with the increasing debt amount. The debt-equity trade-off theory assumes that different firms have different target debt ratios. In addition, the trade-off theory suggests that profitable firms with tangible assets tend to have higher debt ratio targets while risky firms with intangible assets tend to prefer equity as their financing source. The theory challenges the argument made by Modigliani & Miller, who suggested that firms do not need to restrict their debt policies and should rather take as much debt as they can. The trade-off theory supports the idea of decent debt ratios. Today many firms are aiming to get good credit ratings which to some extent controls significant increases in the debt ratios. (Brealey et al. 2011: 458.)

This thesis aims to distinct the development of the bond issuance in different industries and the trade-off theory suggests that capital structures vary in different industries. Schwartz and Aronson already in 1967 presented evidence that industry strongly impacts on firms' debt ratios. The underlying rationale is that in firms that are highly dependent on the firm's industry, the firm's assets determines the capital structure. For example, a fast growing IT company often has intangible and risky assets, while airlines have tangible and relatively safe assets. However, the criticism is that trade-off theory fails to explain why so many successful

companies have so low debt ratios even though they operate with safe and tangible assets and are having best possible credit ratings. (Brealey et al. 2011: 459.)

Hackbarth and Hennesey (2007) presented another investigation closely related to the research problem. The research suggested that the trade-off theory explains the decision between private bank debt and public debt. According to the research, the firm's debt market decision bases on the firm's financial conditions. The trade-off theory suggests that weaker firms optimize their debt structure by relying on bank debt while strong firms exploits both public debt and private debt. (Hackbarth & Hennesey: 2007:1423)

The theories presented above are also known as the static trade-off theories. Another direction of the research area is known as the dynamic trade-off theories, which focuses on investigating why firms switch their debt structures in different time periods. The driving idea behind these studies is that the optimal capital structure is depending on the economic conditions also known as the business cycles. The next chapter introduces the *market timing* theories of capital structure, providing interesting evidence on how market conditions might affect to corporate bond issuance.

### 2.3.3 Market timing theories

The equity market timing in corporate finance bases on the firms' willingness to benefit from the market fluctuations by issuing equity when share prices are high and buying them back when the prices are lower. Researchers have found that firms also tend to issue equity when the cost of equity is low and repurchase them when the cost is relatively high. Again, another perspective to market timing is to exploit the positive earnings forecasts concerning equity issues. It is presented that firms have a tendency to use equity financing when the markets are forecasted to be in good condition and investors are trying to make profits with positive earnings forecasts. Probably the most impressive statement supporting the use of market timing in firm's financing decisions is the anonymous surveys that have provided evidence that CFOs really do try to time the market. (Baker & Wurgler 2002: 1 – 2.)

Baker and Wurgler (2002) presented that, firms with low leverage levels issued equity when the market values were high, while corporations with bigger leverage ratios did the opposite and issued equity when market values were low. The market values were measured with the

market-to-book ratios. Their regression results suggested that leverage has an economically significant negative correlation with the historical market valuations and is statistically robust. In addition, the results suggested that the changes in the market values had long-term effects on capital structures and that capital structures are actually outcomes of firms' previous attempts to time the market. This means that there is not any definition for optimal capital structure in the market timing theory. (Baker & Wurgler 2002: 29.)

Like always, also these findings have been criticized. Leary and Roberts (2005) agreed that firms react to the equity price changes but do it by adjusting the firm's debts during the next four years and that the adjustments are only temporary. Alti (2006) investigated the market timing behavior in the initial public offerings (IPO) and suggested that the IPOs occurred more often during the "hot-market" cycles compared to "cold-market" cycles. However, the effect of the market timing was witnessed to vanish quickly. During the IPO year leverage decreases more heavily but immediately after firms start to issue more debt and less equity and by the end of the second year the hot-market effect on leverage completely disappears.

#### 2.3.4 Gap-filling theory and corporate debt maturity structure

A significant part of the existing literature investigating firm's debt maturity decision has devoted to identify a relation between firm level characteristics and debt maturity choice and only smaller portion of the research area has tried to find external evidence for the changes in the corporate debt maturity structure. The most commonly suggested determinant for firms' maturity decision is that firms should aim to match the maturities of their debts and assets. However, the historical data have shown remarkable variation in debt maturities in successive years, which have not been followed by similar changes in assets. (Greenwood 2010: 993.)

A smaller part of the empirical literature concerning the variation in the corporate debt maturity structure, have offered market conditions as an answer for the variation. Baker, Greenwood and Wurgler (2003) presented that firms decide their debt maturities based on the bond market returns and choose the bond maturity that has the smallest expected return. Faulkender (2005) suggested that firm's debt maturity structure derives from the firm's willingness to minimize interest rate costs by borrowing long when yield curve is downward sloping and short when it is upward sloping. Greenwood, Hanson and Stein (2010) introduced

different approach to the market timing behavior called *gap-filling theory* of debt maturity decision. Gap-filling theory suggests that the firm's maturity structure is related to the liquidity of the bond markets. The gap-filling theory assumes that corporate bonds are the closest alternatives to government bonds.

According to the gap-filling theory, the bond markets are segmented into different investor groups that are interested to invest in different maturities. In addition, the underlying assumption is that the supply and the availability of different maturity bonds can change dramatically and that bond returns are to some extent predictable. The gap filling theory predicts that the increased amount of long-term government debt creates a gap to the shorter maturity debt and due to the costs and lack of the short-term capital arbitrageurs cannot fill the gap. Corporates with a strong balance sheet should react and fill the gap by issuing shorter maturity debt or if the government increases short-term debt then corporate should issue long-term. Greenwood et al. revealed strong negative relationship between corporate and government debt maturities by estimating 30-40% gap filling behavior by corporate sector in response to a change in the government debt maturity. (Greenwood et al. 2010: 995-996.)

In a recent study, Badoer and James (2016) supported the existence of the gap filling theory among the long-term corporate bonds. The research revealed a strong negative correlation between the outstanding Treasury debt and the corporate debt issues among bonds with maturity over 20 years. The offered explanation for this finding was that the arbitrage costs are higher among the long-term bonds and therefore the correlation is not as significant among short-term securities. The impact was strongest with debt securities that were highly rated, had fixed interest payments and were non-callable, in other words, were the closest substitutes to the long-term Treasuries. (Badoer & James 2016: 460 – 461.)

The Gap-filling theory supports the idea that the central bank asset purchases have an impact on corporate bond issuance. According to the theory, asset purchases by the central banks should encourage firms to issue more bonds to replace the debt securities that were purchased away from the market and act as liquidity providers to investors who lost their holdings on government debt securities.

### 2.3.5 Portfolio rebalancing theory

The portfolio rebalancing is an important concept for this thesis since the asset purchases by the ECB have impacted on the securities available for investors. The ECB's asset purchases have crowded out investors from the market segments where the central bank actions have taken place. Investors have been forced to think about other securities to replace the ones that were purchased away by the ECB. The portfolio rebalancing theory tries to answer why the asset allocations of individual investors vary across time and how investors adjust their risk in response to their portfolio returns. It is logical to assume that, if a low risk debt security is purchased away by the central bank, investors want to replace this security with the closest possible substitute. The substituting debt security could be chosen example based on the security's duration, default, pre-payment or liquidity risk characteristics. (Fawley & Neely 2013: 53 – 55.)

Before moving to the next chapter a brief concluding summary should be drawn to understand how the key theories presented in this chapter support the purpose of this thesis. At first, the chapter introduced key fundamentals of corporate bonds in order to assure that the reader understands why firms use bonds and borrow from the public, what affects bond prices, what risks are involved and how firms balance between equity and debt. As will be presented in the next chapter, the previous findings suggest that the ECB's asset purchases have improved the conditions in financial markets by providing liquidity to the market and by reducing the volatility levels but also lowered the yields of debt securities. The increased market condition and lowered yields have encouraged firms to try to time the market. At the same time, when the central bank has purchased securities away from the market it has created a gap for a certain type of securities. According to the theory, firms aim to fill the gap in the market and to exploit the investors' portfolio rebalancing effect by offering substituting investment securities for investors to replace the ones that were purchased away. In the next chapter this thesis focuses more on presenting the existing findings on how the asset purchase programs by the Fed and the ECB have affected financial markets.

### 3. PREVIOUS RESEARCH

This chapter examines previous studies investigating the non-conventional monetary policy actions executed by the central banks of the U.S. and Europe and their impacts on the financial markets. In order to get a better understanding where the European Central Bank's monetary policy actions are deriving from, it is beneficial to go through the key aspects that have led to these exceptional actions. The impacts of these non-conventional monetary policy actions have been actively investigated since the global financial crisis and they still are an extremely current discussion topic.

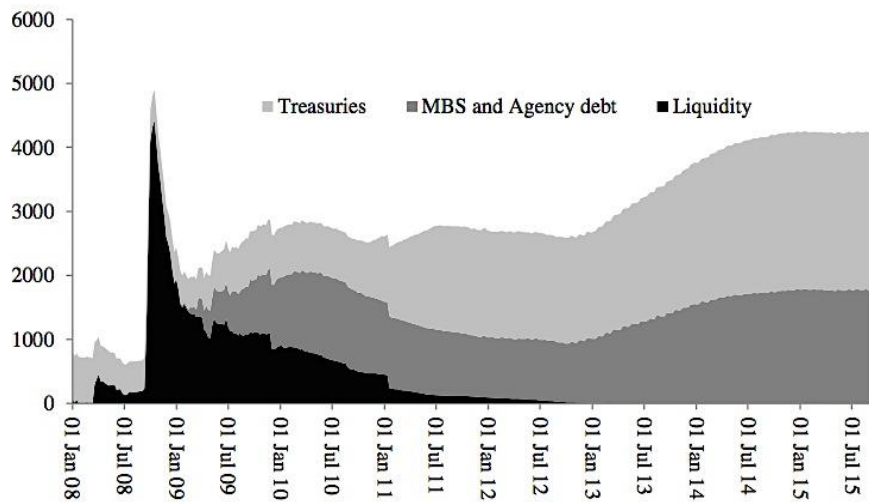
A greater part of the empirical literature has focused on investigating the actions executed by the central bank of the U.S. known as the *Federal Reserve* (Fed). In addition, the empirical research has concentrated more on examining the impacts of these actions on asset prices, interest rates, bond yields and for example on exchange rates while bond issuance developments has received less attention. The existing research on the U.S. data provides an excellent theoretical framework for the purpose of this thesis and recently more studies with European data have emerged. The chapter proceeds as follows: at first the chapter walks through the existing findings from the U.S. and then proceeds to introducing findings from Europe. At the end of this chapter, earlier findings considering how industry might impact on corporate debt financing decisions will be discussed.

#### 3.1 Previous evidence from the U.S.

The global financial crisis that started in 2007 changed the market environment dramatically and put central banks around the world in a situation where exceptional actions were required. As a first response, central banks' key rates were decreased to zero levels and when this was not enough the central banks launched several so-called non-conventional monetary policy programs in order to stimulate the economy after the crisis. The Fed executed various actions between 2007 and 2013 and these actions can be categorized into two different classes: the ones that aimed to provide liquidity to the financial industry and to the *Large-Scale Asset Purchase* programs (LSAPs), broadly known as the *Quantitative Easing* (QE) programs. (Fratzscher, Lo Duca & Straub 2016: 8.)

The Fed's first non-conventional monetary policy program took place between the end of 2007 and at the beginning of 2008. The objective of these actions was to provide direct funding to the firms in the financial sector. Many firms in the financial sector were suffering from a lack of shorter maturity credit, which these firms especially needed to fund their daily operations. As an example, the collapse of Lehman Brothers led to a situation where the Fed was required to aggressively inject liquidity to these crucial credit markets to avoid bigger crashes. The Fed's objective was to strengthen the balance sheets of the firms in the financial industry by acting as a "lender of last resort". The second wave of the Fed's non-conventional monetary actions started with the first quantitative easing program (QE1) which was announced in November 2008. The Fed's plan was to acquire *Government Sponsored Enterprise* (GSE) debt securities with 200 billion dollars and *mortgage-backed securities* (MBS) with over 1000 billion dollars. The first round of the LSAP program ended in 2010. The main goal of these actions was to increase the economic activity by decreasing interest rates and increasing investing by accelerating asset prices. (Fratzscher et al. 2016: 7 – 9.)

In 2010 The Fed started to reinvest the principal payments of GSEs and MBSs into long-term debt and acquired Treasuries with 600 billion dollars. These actions are called the second round of the QE (QE2). The Fed launched another operation in September 2011 where the plan was to buy treasuries with six- to ten-year maturities left and to sell a same amount of the same securities that had three years or even shorter maturities left. This maturity structure switching operation of the Fed is often called as the Maturity Extension Program (MEP) but it is also widely known as "*Operation Twist*". At the end of 2012 Fed begun the QE3 program where the strategy was to execute scheduled acquiring of mortgage backed securities with 40 billion dollars per month and treasuries with 45 billion per month. This purchasing program started to slowdown in 2013 and ended in 2014. The executed purchase programs caused long lasting change into the Fed's balance sheet, which can be observed from the figure 5 on the next page. In December 2015 the Federal Open Market Committee (FOMC) decided that the U.S. economy had reached stable enough conditions that the Fed could start the monetary policy normalization process. (Fratzscher et al. 2016; Federal Reserve 2017.)



**Figure 5.** Main Items of Interest in the Balance Sheet of the Fed in USD billions. (Fratzcher et al. 2016)

From a positive perspective, the financial crisis has offered an extremely interesting possibility for economists and central banks to test the effectiveness of different economic theories and monetary policy actions. The Fed's actions have been widely examined in empirical studies. Many of the studies have focused on measuring how the QE programs have managed to lower the interest rates and bond yields and resolving how these actions by the Fed have transmitted to the economy. One example research was made by Neely (2010) and provided evidence that the LSAP announcements decreased the real bond yields not only in the U.S but also in foreign countries. In addition, the LSAP announcements were witnessed to have lowering impact on the spot value of the dollar as well. The suggested explanation for these findings was that the LSAP announcements were interpreted as a bad news in the market and therefore led to a *flight-to-safety* effect. As a result, the yields in the U.S. declined even more compared to yields in other countries. The evidence presented that this portfolio rebalancing effect had a strong impact on bond yields by increasing the demand and price for safer assets. (Neely 2010: 28 – 29.)

Another study examining the interest rate and bond yield reactions to the LSAP transactions was made by Gagnon, Raskin, Remache and Sack (2011) who suggested that the Fed's purchases caused a significant and long lasting decrease in many securities, including securities that were not involved in the purchase program. Gagnon et al. suggested that the LSAP had an impact on the risk premiums of the assets that were purchased away by lowering

their yields and increasing their prices. The reduced supply of debt securities with a long maturity after Fed's purchases was shown to decrease the term premium of the U.S. Treasuries from 30 to 100 basis points. In addition, Gagnon et al. suggested that the LSAP actions improved the market liquidity and removed a significant part of the MBS securities with a high prepayment risk from the market. The increased liquidity and reduced risk in the market led to a significant decline in interest rates and yields and in that sense proved the success of the large-scale asset purchase program. (Gagnon et al. 2011: 38 – 39.)

So far the introduced studies have suggested that the Fed's actions have had an impact on the interest rates. The transmission channels of the monetary policy actions to interest rates were given a bigger emphasis in the research by Krishnamurthy and Jorgensen (2011) who examined the impacts of QE1 and QE2 on interest rates as well. The research was made with an event study method using intraday data around the monetary policy action announcements. The results revealed six different transmission channels how the announcements of the QE programs transmitted to interest rates. Three of the channels were present in both QE programs. These channels are presented first in the list below while the last three were present only in QE1. The last three transmission channels were evidenced to have a strong correlation with the MBS purchases that were more aggressively executed in the QE1. The suggested transmission channels were following: (Krishnamurthy & Jorgensen 2011: 2 – 3.)

- *Signaling channel*: According to the expectation hypothesis, the decreased Fed funds rate is a signal of future decline in all other rates as well. The decline proved to be biggest among medium-term bonds.
- *Safety channel*: The yields of medium- and long-term bonds fell due to the increased demand for safer assets. Fed's purchases reduced the supply of safe bonds and increased the demand for safer assets, which led to an increase in price and decrease in yields.
- *Inflation channel*: Inflation expectation increased and caused a fall in real interest rates. The increase in expected inflation was evidenced with the increased inflation swap rates.
- *Liquidity channel*: Liquidity channel predicts that the QE increases yields more among liquid bonds compared to the less liquid bonds with a same durations as liquid bonds.
- *Default risk channel*: Low-grade bonds carry higher default risk than Treasuries and QE1 proved to reduce credit risk and lower the yields of low-grade corporate bonds especially.

- *Risk premium channel*: The yields of mortgage-backed securities decreased more than the yields of other debt securities in QE1 but not in Q2. This suggested that another important channel for QE was to have an impact on the mortgage risk.

Bauer and Rudebusch (2013) concentrated on investigating the signaling effects of the Fed's first LSAP program and presented that the signaling effects have decreasing impact on all expected future rates in all fixed income markets. Compared to previous examinations from the study area, their results were economically and statistically more significant. The expectations of the future monetary policy actions changed among the market participants due to the signaling effect of the Fed's LSAP announcement. The changed expectation had an impact on the short- and long-term rates. The underlying assumption was that by announcing and executing the LSAP transactions the market interpreted that the FOMC's signal was that the time of a looser monetary policy line would stand for a longer time period than was originally expected. The result was that all fixed income rates decreased because all interest rates move together with the expected future policy rates. (Bauer & Rudebusch 2013: 271 – 271.)

An interesting and an comprehensive paper serving the purposes of this thesis extremely well is written by D'Amigo and King (2013) who investigated how the U.S. Treasury yield curve reacted to a dramatic change in supply of the U.S. treasuries. Authors introduced a so- called "local-supply" effect stating that the yield of a specific debt security decreased after a purchase of a debt security with a similar maturity structure. The researchers suggested two different operating channels for the asset purchases known as the "*stock effect*" and the "*flow effect*". Stock effect is defined by calculating cumulative changes in yields of Treasuries as a function of the total treasuries held by the Fed. The flow effect is determined by comparing the price change of the issue during the purchase day as a function of the debt securities that were purchased by the Fed. The results from the local-supply channel suggested that the Fed's first LSAP actions caused on average 30 basis points decline in yields during the whole program (stock effect) and even 3 to 4 basis point bigger decline in yields on the purchase day in the sectors where the purchases occurred (flow effect). Both stock and flow effect were statistically and economically significant. The effects showed to be stronger among the less liquid off-the-run bonds. (D'Amigo & King 2013: 425 – 426.)

From the bond issuance activity perspective, the existing research has provided evidence that the U.S. monetary policy actions and the low cost of credit have accelerated growth in the U.S. dollar denominated debt issuance outside of the U.S. bond markets. After the global financial crisis the dollar denominated leverage has been growing the fastest in the emerging markets and in the advanced economies that have suffered the least from financial crisis and have had high domestic interest rates. In addition, non-bank investors have acquired an exceptionally large portion of the dollar denominated since the crisis from the international bond markets since the crisis while at the same time the bondholder role of bank have decreased. The Fed's bond purchase operations led to a decrease in the term premia and therefore caused a significant increase in the U.S. dollar denominated borrowing from global bond markets, which reflects the fact that the impacts of monetary policy actions have transmitted globally. Because the Fed's bond purchases led to a decline in bond yields, investors started to seek bonds outside the U.S. in search for a higher returns. The increased demand among investors and firms' access to cheaper dollar denominated credit encouraged non-financial firms outside the U.S. to issue more dollar denominated bonds. The U.S. dollar denominated debt has increased from 6 trillion dollars to 9 trillion dollars outside the U.S. after the financial crisis. (McCauley, McGuire & Sushko 2015: 187, 214 – 216.)

Fratzcher, Lo Duca and Straub (2016) analyzed the Fed's QE programs impacts on global portfolio flows and compared the effectiveness of the Fed's QE expansionary news and the actual market operations. The research investigated daily portfolio flows into bonds and equities in 52 countries. The research extended the previous literature, which had mainly concentrated on the two large-scale asset purchase programs, by evaluating the effects of three different rounds of the QE. The investigation revealed interesting results showing that the first QE round lead to a rebalancing effect towards more risky domestic assets while the second and third round of the QE caused rebalancing towards assets outside of the U.S. and especially towards emerging markets. The portfolio flows outside of the U.S were observed to be strongest during the announcement times when the macroeconomic uncertainty was low and when the future of the domestic economy looked promising. The results supported the previous findings of D'Amigo and King (2013) on QE effects on prices and suggested that the portfolio flows and asset prices were more affected by the actual purchases than the announcements. (Fratzcher et al. 2016: 26 – 27.)

The most relevant study for this thesis is the research made by Lo Duca, Nicoletti and Martinez (2016) who investigated the effects of the U.S. quantitative easing on global corporate bond issuance. They found that the Fed's purchases and holdings of the U.S Treasuries and mortgage-backed securities had a significant and global impact on corporate bond issuance. The results were supported with the gap-filling theory, which suggests that central bank creates a gap for similar types of securities than it purchases away from the market. The underlying assumption in the gap-filling theory is that companies try to exploit the gap by issuing similar kinds of bonds to provide alternative debt securities for the assets that were purchased away by the Fed. (Duca et al. 2016: 142 – 144.)

The impacts of the QE on bond issuance was witnessed to be especially strong in the emerging markets where the current bond issuance amounts would have been half less without the positive spill-over-effects of the Fed's quantitative easing. One main attempt of the study was to find out which of the two investigated balance sheet channels of the Fed had a bigger impact on bond issuance. The results revealed that the flow effect was the more influencing channel of the QE. In this context, the flow effect measured the impact of the Fed's additional debt security purchase transactions on bond issuance. The stock effect refers to the cumulative quantity of security holding in the Fed's balance sheet, which was found to be a remarkable activation channel of bond issuance in the emerging markets. (Duca et al. 2016: 142 – 144.)

Duca et al. (2016) offered several possible explanations for the QE's increasing impact on corporate bond issuance. In addition to the already presented gap-filling theory explanation, one suggested explanation was that firms wanted to benefit from the investors' search for a higher returns. The QE had pressed down the yields of the government securities and therefore investors started to see corporate bonds as more attractive investment with their higher yields. Another presented reason was that the QE improved the general financial conditions and enhanced the bond issuance environment. The research also suggested that the Fed's asset holdings and asset purchases triggered the portfolio rebalancing effect towards corporate bonds. In other words, the availability of similar types of securities that were purchased away from the market by the Fed was reduced and investors were forced to re-allocate their investments. (Duca et al. 2016: 142 – 144.)

The QE's impact can be also related to the market-timing theory presented in the chapter two. According to the theory firms aim to time their debt issuance when the debt market

conditions are looking attractive and investors' appetite for debt securities is high. In addition, the theory assumes that firms are willing to benefit from the low interest rate environment by issuing new long-term debt and buying back the short-term liabilities which could also explain the increased bond issuance. Finally, the authors suggest that there is also a possibility that non-financial firms tried to make carry trade profits by issuing bonds in a foreign currency and depositing the proceedings in domestic banks because the QE had affected also to the exchange rates. (Duca et al. 2016: 142 – 144.)

The research by Duca et al. contained bond issuance data from 38 developed and emerging economies between Q1 2000 and Q1 2013 and excluded the financial industry. The investigation separated the possible transmission channels to the Fed's holdings of Treasuries and mortgage-backed securities and the purchases of the same securities. The reason for this separation was to find out if the markets were segmented. The possible credit market segmentation would mean that the effects of the Fed's actions would be different between the credit instruments. The regression results revealed that the both credit instrument purchases affected to global bond issuance, while the purchases of the mortgage-backed securities had a slightly stronger impact. In the emerging markets the flow effect had a stronger impact on bond issuance but also stock effect was significantly present. In addition, the flow effect was shown to have a stronger impact in advanced economies as well while stock effect didn't have significant impact in advanced economies. When the results were pooled together flow effect remained significant while stock effect lost its significance. The results could be confirmed also after several robustness tests. The results were controlled with various variables that could impact to bond issuance along with the asset purchase programs. The utilized methods and variables will be discussed in more detail in the next chapter. (Duca et al. 2016: 142 – 144.)

### 3.2 Previous studies from Europe

The global financial crisis in 2007 led to significant increases in the fiscal deficit levels in European countries that triggered the sovereign debt crisis in Europe in 2010. In order to survive from the economic downturn, several exceptional monetary policy actions were required also from the European Central Bank. The traditional ways for ECB to control the economic conditions in Europe are by adjusting the supply of bank reserves with the

overnight or one week repo agreements and by steering the interest rates with the ECB key interest rate. After the financial crisis ECB's role changed dramatically. One extraordinary situation was witnessed in June 2014 when the ECB key interest rate was decreased below zero level for the first time. ECB's non-conventional monetary policies are divided into three categories, which are: Long-Term Refinancing Operations (LTROs), Targeted Long-Term Refinancing Operations (TLTROs) and the Asset Purchases Programs (APP). The objective of the first two operations is to provide long-term funding to credit institutions in order the increase private bank lending to the real economy. The focus in this thesis is on the asset purchase programs which will be described more specifically next. (ECB 2017.)

The ECB's currently on going asset purchase programs are known as *the expanded asset purchase programme*. According to the ECB, it consists from four different programs which are: The third Covered Bond Purchase Programme (CBPP3), Asset-Backed Securities Programme (ABSPP), Public Sector Purchase Programme (PSPP) and Corporate Sector Purchase Programme (CSPP). The already terminated asset purchase programs are called the Securities Market Programme (SMP) and the Covered Bond Purchase Programs one and two. The largest of these asset purchase programs so far is the PSPP, which was announced in January 22<sup>nd</sup> 2015. (Fratzscher et al. 2015).

The ECB's monthly asset purchase volume was 60 billion euros between March 2015 and March 2016 and then the purchases were increased to 80 billion euros. The programs started to slow down in the beginning of April 2017 when the monthly purchase volume was decreased back to 60 billion. The purchases will continue with that level on average to the end of 2017 and beyond if necessary. Currently the PSPP covers still 85% of the monthly purchases while CSPP covers almost 10% leaving only 5% to ABSPP and CBPP3. Table 3 in the next page presents the time frame of ECB's open market operations. (ECB 2017.)

**Table 3.** The ECB's open market operations. (ECB 2017)

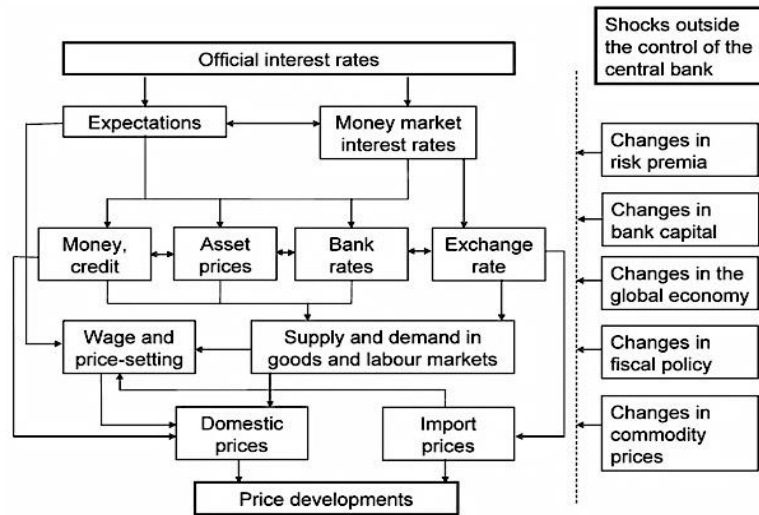
Year	Date	ECB's open market operations and recent announcements
2009	July 2nd	The first Covered Bond Purchase Program (CBPP1) was launched. Program terminated in 2010 and reached 60 bn €
2010	May 10th	Securities Market Program (SMP) to provide funding to specific market segments. Program terminated 6.9.2012
2011	November 3rd	The CBPP2 executed directed purchases from the primary and secondary markets. Program terminated 31.10.2012
2014	October 20th	Eurosystem started to buy covered bonds under a third covered bond purchase programme (CBPP3)
2014	November 21st	Asset-backed securities purchase programme (ABSPP) to diversify funding and to stimulate issuance of new securities
2015	March 9th	ECB started to buy public sector securities under the public sector purchase programme (PSPP)
2015	January 22nd	ECB expands purchases to bonds issued by euro area central governments, agencies and European institutions
2015	September 23rd	ECB decided to increase the proportion of purchases by national central banks
2016	March 10th	ECB's Governing Council decides to extend asset purchases to corporate sector with 20 bn €
2016	June 8th	ECB: Corporate sector purchase program (CSPP) continue until the end of March 2017 or longer if needed
2017	January 19th	ECB confirms continuing purchases from April 2017 to December 2017 at a monthly pace of 60 bn €

As the actions prove, ECB has been very active after the global financial crisis and executed several exceptionally large open market operations. The objective of these actions has been to provide liquidity to market and to stimulate the economic activity by creating positive spillovers to the economy. Table 4 in the next page provides information on the current situation of the ECB's asset purchase program holdings. The data in the tables 3 and 4 are obtained from the ECB's website. The first impression arising from table 4 is the scale of the asset purchases started in 2015. It can be observed, that the public sector purchase program (PSPP) is nearly four times the amount of all the previous programs together and when we add the corporate sector purchase program (CSPP) to the PSPP the amount is over four times bigger than the previous programs. The CBPP3 is, at the moment, the second biggest operation by volume and the SMP is the third. However, the CSPP can be expected to be in the top three at some point in the near future. (ECB 2017.)

**Table 4.** The outstanding amount of the ECB's asset purchase programs. (ECB 2017)

Instrument	Reference date	Outstanding amount
Covered bond purchase programme	10 Feb. 2017	11,011 mn
Securities market programme	10 Feb. 2017	99,449 mn
Covered bond purchase programme 2	10 Feb. 2017	6,840 mn
Covered bond purchase programme 3	10 Feb. 2017	211,004 mn
Asset-backed securities purchase programme	10 Feb. 2017	23,294 mn
Public sector purchase programme	10 Feb. 2017	1,354,194 mn
Corporate sector purchase programme	10 Feb. 2017	62,924 mn

With the presented non-conventional monetary policy actions ECB's governing council tries to steer inflation rates back to a little below two percent level. The price stability is one of the ECB's primary objectives. As mentioned earlier, the ECB's traditional way to do this is by steering the key interest rate but after the financial crisis it was decreased below zero level already and other actions were required to recover the economy. As the history has shown, the ECB's governing council's monetary policy decisions have had broad impacts on the general economy and affected especially the price levels. However, the transmission of the monetary policies into the real economy is not an instant process. In addition, the impact of the policies can differ significantly from the central bank's original intension and the impact can vary across the markets. In other words, the intended impacts can take a long time and lead to a situation where the intended impact is not anymore recognizable or even wanted. Also, it is extremely difficult to predict precisely how the executed action will affect to the economy and prices. Figure 6 presents ECB's own illustration of the main transmission channels of their monetary policy decisions. The same channels that were presented by Krishnamurthy and Jorgensen (2011) in Fed's QE can be identified from the figure 6. (ECB 2017.)



**Figure 6.** The main transmission channels of the ECB's monetary policy decisions. (ECB)

After getting familiar with the ECB's asset purchase programs and other monetary actions and their transmission to the economy it is easier to start investigating what previous studies concerning these programs have found. The previous literature from Europe is still much more narrow compared to the amount of studies investigating the Fed's quantitative easing actions. The ECB's own research staff produces a lot of studies that play a crucial role in this thesis. However, only a few studies examine the impacts of the latest programs. The magnitude of the two latest asset purchase programs, PSPP and CSPP, makes them extremely interesting actions to investigate even when they are still running. Also, the financial distress in the market was already lower when the PSPP and CSPP were launched compared to what the market conditions were when the earlier programs were launched. The fact that the markets were in a more stable condition before the launching of the latest and biggest programs reduces, at least to some extent, the possible endogeneity concerns which suggest that the asset purchase actions were triggered due to the deteriorating market conditions (Duca et al. 2016: 114). The existing research have mainly focused on investigating the ECB's already terminated programs and their impact on asset prices, yields and exchange rates but not on corporate bond issuance activity.

One of the few studies investigating the impacts of the ECB's asset purchase program (APP) announced in January 2015 on asset prices and the transmission channels of the program is

made by Altavilla, Carboni and Motto (2015). The authors divided the channels of the APP also into stock effects and flow effects. The definitions of the effects were however different compared to the earlier presented definitions. The stock effect measured the impacts of the APP announcements while the flow effects measured the impacts of the actual implementation of the program. More focus was concentrated on measuring the stock effects and therefore it was crucial to control the possible impacts of the other macroeconomic releases in order to capture the pure impact of the APP announcements. The authors found that the effect of the ECB's APP on asset prices was significant when the program was announced and during less distressed market conditions. This was an interesting finding compared to the existing literature which suggests that the asset purchases should have significant impact only during the times of high financial distress. (Altavilla et al. 2015: 2 – 3, 40.)

Altavilla et al. used an event-study methodology with high-frequency intraday data. The results from the model suggested that asset prices responded to the changes in expectations among the market participants. The two main findings were that, firstly, APP had a powerful lowering impact on yields across the market segments and, secondly, the impact increased as the maturity and riskiness of the assets increased. When the 10-year sovereign bonds were investigated the yields were witnessed to decline from 30 to 50 basis points while for the sovereign bonds with a 20-year maturity the decline was more persistent and ranged from 30 basis points in Germany to 80 basis points in Spain. In addition, the yield spreads between corporate bonds and risk-free rates was observed to decrease by 20 basis points. (Altavilla et al. 2015: 2 – 3, 40.)

Georgiadis and Gräßl (2016) also investigated the announcement effect of the asset purchase program released in January 2015. Their findings suggested that the ECB's asset purchase program announcement led to an economically significant depreciation of the euro. The announcement had also a positive impact on equities and increased share prices especially in euro area but also globally. Interestingly, any impact on bond prices was not witnessed. In addition, unlike the QE in the U.S., the announcement of the asset purchase program did not launch significant portfolio flows to the emerging markets. (Georgiadis & Gräßl 2016: 258.)

Another analysis of the early assessment of the ECB's expanded asset purchase program (EAPP) suggests that EAPP has three main transmission channels. The channels were asset

valuation channel, signaling channel and re-anchoring channel. The asset valuation channel suggests that the EAPP increased sovereign bond prices, which increased and strengthened the valuation of the assets in balance sheets of banks. The improved balance sheet condition helped banks to survive with their capital requirements and led to an expansion in bank lending, which supported the economic recovery. The information announcements of the EAPP caused a significant asset price movement while the actual purchases did not cause significant changes. The signaling channel of the EAPP meant that the market participants interpreted the central bank actions as signals of higher future inflation and lower future short-term rate expectations. The third suggested channel was the re-anchoring channel that helped the ECB to steer the long-term inflation expectations towards the levels that would maintain price stability. (Andrade, Breckenfelder, De Fiore, Karadi & Trisani 2016: 11, 50 – 51.)

The SMP's impact on asset prices and the correlation between bond yields and bond purchases under the SMP have been investigated more compared to the PSPP that started in 2015. Eser and Schwaab (2016) investigated the impacts of the SMP purchases during 2010 and 2011 in five distressed euro countries where the sovereign debt crisis was running extremely hard: Greece, Italy, Spain, Ireland and Portugal. The authors focused on bond yield impacts and presented that the bond purchases made under the SMP had a significant impact on government bond yields in the five investigated countries. Authors suggested that the decreased liquidity risk premium, signaling effects of the decreased default risk and the decreased local supply of the government bonds were the main transmission channels and explained a big part of the SMP's impacts on bond yields. In addition, the SMP increased the liquidity in the market, which was proved from the decreased bid-ask spread figures. Also, the bond yield volatility was expressed to be lower on the purchase days of the SMP than in other days of the sample period. In other words, the SMP purchases had an important lowering impact on market uncertainty. (Eser & Schwaab 2016: 148 – 149.)

Ghysels, Idier, Manganelli and Vergote (2014) also found that the yields decreased in the countries where the SMP purchases took place. The research focused on controlling the endogeneity problem by using a high frequency data. More precisely, the authors analyzed 15-minute intervals to capture the immediate effect of the asset purchases. The results showed that purchases did not cause big changes in yields at a daily level, but a strong negative correlation was observed between yields and asset purchases at intraday frequency.

These findings suggested that the purchases managed to push down the yields only temporarily in the countries involved in the SMP. Also, the purchases were witnessed to reduce the government bond yield volatility. The authors suggested that the SMP's most important contribution to the financial markets functioning was the lowering impact on volatility. (Ghysels et al. 2014: 2.)

Fratzscher, Lo Duca and Straub (2016) investigated the ECB's unconventional monetary actions between 2007 and 2012. The purpose was to examine the effects of the ECB's operations on exchange rate returns, equity prices, bond yields, risk measure developments and capital flows across countries. The studied countries were categorized into a five different groups, which were emerging markets, advanced economies, the Eurozone core, the Eurozone periphery and the emerging EU. The method used in the research was combination of event study and panel regression with country fixed effects. (Fratzscher et al. 2016: 36.)

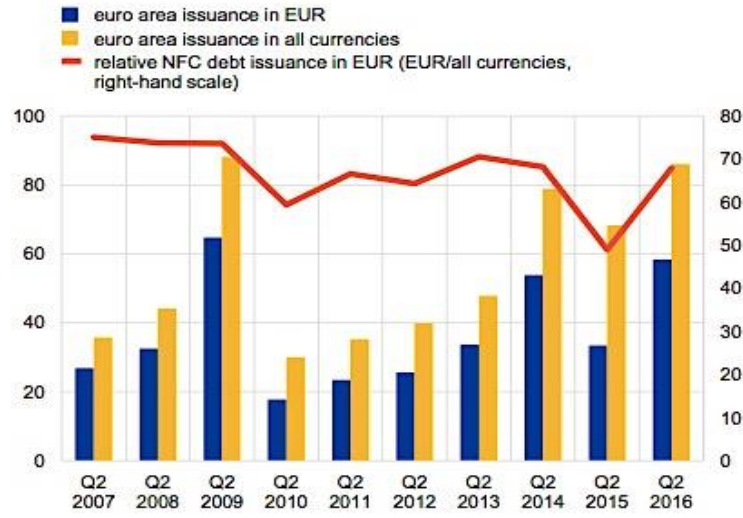
The results from the euro area revealed that the monetary action increased equity prices globally and decreased the bond market fragmentation. The outright monetary transactions and the SMP purchases were observed to have a lowering impact on the Eurozone bond yields and the program announcements had an increasing effect on the value of euro. The effects to bond markets outside the Eurozone were small and not significant. The ECB's actions proved to reduce the credit risk among bank and sovereign debt securities in the Eurozone and in the G20 countries. The main driver behind the positive spillovers from the SMP purchases to global market was suggested to be the decline in the market uncertainty that was measured with the implied equity market volatilities. However, the portfolio flows across the globe was found to be small unlike the portfolio flows in response to the Fed's monetary actions. (Fratzscher et al. 2016: 36)

From the bond issuance perspective, the existing research has provided evidence that the Covered Bond Purchase Program increased the bond issuance activity. The banks were able to create new funding instruments from the issued covered bond products, which increased the activities in the primary market and enhanced the general market liquidity in the euro area. The CBPP impact was present on the secondary markets as well by reducing the covered bond spreads. The euro area covered bond yields were witnessed to decrease 12 basis points in response to the CBPP actions. The CBPP increased the liquidity also among the private debt security market and returned the liquidity almost to the same levels as it was before the

financial crisis. (Beirne, Dalitz, Ejsing, Grothe, Manganelli, Monar, Sahel, Susec, Tapking & Vong 2011: 5 – 6.)

As witnessed, the previous studies have not focused on investigating the impacts of the ECB's asset purchases on corporate bond issuance activity. Only a few studies dealing with bond issuance have been made and these studies have been investigating the impacts of the earliest asset purchase programs. In this research, one major interest is to find out if the ECB's asset purchase programs have had a different impact in the investigated industries. It can be expected that especially the corporate sector purchase program will impact industries unequally, since the impacts can be stronger on the sectors where the ECB's transactions have taken place. In the CSPP, the ECB purchases debt securities that are issued by non-financial corporations in primary and secondary markets. The issuers of the purchased securities are required to be in a certain condition so that they can be used as a collateral for credit operations. More specifically, the securities need to be investment grade quality according to Eurosystem credit assessment, denominated in euro and the maturity can vary from 6 months to 30 years maximum. The issuing corporation must also be established in the Eurozone. (ECB 2017.)

The ECB's first own investigation of the impacts of the CSPP supports the prediction that corporate bond issuance will increase in response to CSPP. According to the ECB's own research, the euro denominated corporate bond issuance increased first slowly due to the big uncertainty in the financial markets but later started to increase more aggressively. Figure 7 presents the ECB's preliminary statistics on euro denominated corporate bond issuance till the second quarter of 2016. As can be observed, the bond issuance turned into a sharp increase in the second quarter of 2015. It is safe to assume that the announcement of the CSPP was to some extent boosting the increase. (ECB 2017)



**Figure 7.** Debt issuance by euro area non-financial corporations. (ECB 2016)

### 3.3 Industry's impact on corporate bond issuance

The clearest contribution of this thesis to existing research is that it compares the corporate bond issuance activity between different industries. To support this purpose, it is beneficial to go through previous studies on how industry might affect to firm's financing decisions. This subchapter covers key findings of industry effects on corporate financing.

Industry's importance to firms financing decision has been widely noticed in the financial literature. Harris and Raviv (1990) presented that firms within an industry are more similar to each other than firms between industries and that industries tend to maintain certain leverage ratios. According to the research, drugs, electronics, food and instruments tend to have low debt ratios while industries such as textile, paper, mill products, steel, airlines and cement tend to have high debt ratios. Almazan and Molina (2005) raised a discussion about the differences in capital structures between different industries. According to their study, firms in some industries have very similar financial structures while firms in other industries are using very different financing solutions. In order to understand this, Almazan and Molina analyzed intra-industry capital structure differences and compared them to industry characteristics. The differences proved to be biggest in industries that were more concentrated, used more leasing and had looser governance. In addition, industries that had

older firms or larger growth opportunities also had significant dispersion in their financial structures.

MacKay and Phillips (2006) presented that firm's financial decisions are related to the firm's position in its industry and that in competitive industries leverage is correlated with actions of other firms in the same industry. The position within an industry has been defined in different ways. Maksimovic and Zechner (1991) determined position of different firms in the industry by the firm's technology compared to the other firms in the same industry while Fries, Miller and Perraudin (1997) determined the position based on firm's status as an entrant, incumbent or exiting firm. MacKay and Phillips (2006) suggested that leverage is higher in concentrated industries where firms are not required to hedge against debt decisions by other firms. Their research examined the importance of the industry factors for firm's financial structure and the explanatory power of the industry equilibrium to show how firms are divided in industries. The regressions of firm specific leverage and industry median leverage revealed that the variation in firm's financing decisions explains behavior within industry but not between the industries. Results also revealed that in competitive industries firms that are close to industry median capital-labor ratios utilized less debt compared to firms that deviated longer away from the median ratio. (McKay & Phillips 2006.)

Frank and Goyal (2009) investigated publicly traded American firms between 1950 to 2003 and the most important factors explaining the use of public debt were suggested to be the industry median leverage, market-to-book ratio, asset tangibility, profitability, expected inflation and the log of assets. The rationales behind the ratios is following: When either inflation is high, firm's industry median debt ratios are higher, firm size measured in assets is high or if assets are tangible firm tends to have higher leverage while profitable firms and firms with high market-to-book ratio tend to have lower leverage ratios. Previous studies have suggested that managers use industry median leverage ratios to balance their own leverage ratios. Frank and Goyal uses industry median growth and median leverage as a industry variables since the high industry median leverage predict high debt for a firm while the high median growth predicts low debt. They add also regulations to the regression model. The logic is that regulated firms should have more leverage because they are assumed to generate stable cash flows and have a lower cost of financial distress. After testing various factors affecting capital structures the results revealed that the most important single variable was industry median leverage. (Frank & Goyal 2009: 26 – 27.)

A recent study by Leary Roberts (2014) explained corporate capital structure choices by suggesting that the firm's financing decisions are affected by the actions and characteristics of its peer firm. According to the research financing decisions of peer firms had the strongest impact on firms financing decisions and especially smaller firms with poor past performance were highly sensitive to their more profitable peers. A significant amount of CFOs have also admitted that peer firms' actions play a big role in their own financing decisions (Graham and Harvey 2001). Leary and Roberts highlighted the fact that measuring the peer effects is difficult due to the reflection problem. This refers to a special type of endogeneity problem that occurred when authors tried to capture the difference between the impacts of peer group characteristics and the impacts of the peer firm's actual financing actions. After controlling the reflection problem, the results revealed that a firm's debt issuance decisions are negatively correlated to shocks in peer firm's equity issuance. The results showed that one standard deviation increase in a peer firm's leverage ratio was followed by 10% increase in a firm's own leverage ratio. (Leary & Roberts 2014: 139.)

Leary, Roberts and Graham (2015) also presented that the aggregated leverage of firms in regulated industries have remained stable over time while leverage in firms in unregulated industries have increased significantly. This is explained with changes in the macroeconomic environment. Examples of these changes are increased corporate tax rates, reduced uncertainty and growth in financial intermediation, which have all boosted firm's willingness to issue debt and investors willingness to hold corporate bonds. More specifically, the growth of the financial sector regulation suggests that the monitoring and the gathered information by financial intermediaries have widened corporations' debt possibilities. Authors also reminded that the decrease in the supply of government debt has shifted the demand curve towards corporate bonds. (Leary et al. 2015: 678 – 679.)

## 4. DATA AND METHODOLOGY

After covering the important theoretical part of corporate bonds and getting familiar with the previous findings considering the study area, this thesis now proceeds towards the empirical part. Again, the goal of this thesis is to examine the impacts of the ECB's asset purchase programs on corporate bond issuance in Europe and to investigate how the issuance behavior has developed between different industries since the beginning of the programs. In order to provide evidence for this purpose, various types of data is employed in different econometric models. This chapter describes the data sample utilized in this thesis and introduces the methodologies behind the obtained results.

### 4.1 Data

The corporate bond issuance data are collected from Thomson Reuters DataStream and they consist of non-financial corporate bond issues from Europe between January 1, 2006 and December 31, 2016. The issued bond amounts are expressed in gross issuances per industry per quarter. This data setting follows the framework used in the benchmark study by Duca et al. (2016) where the bond issuance data is aggregated by country and by quarter. The original data contained the issued volumes in different currencies but the amounts are converted to euros with a current exchange rate. The use of constant and current exchange rates distorts the earlier issued amounts slightly but is not a concern in this thesis.

The utilized data is formed in to a panel data setting in which the key characteristic is that the same cross-sectional units are measured over a specific time period (Wooldridge 2012: 10). In their own benchmark model Duca et al. (2016) expresses the issued bond amounts per country as a percentage of the country's GDP. Since this thesis doesn't compare the issuance activity between countries it is not beneficial to measure the issued bond amounts as a percentage of the GDP. The bond issuance volumes in this thesis are expressed in billions of euros, which still follow's the guidance of Duca et al. since in their robustness checks Duca et al. switch the expression of the dependent variable to billions of dollars.

A great deal of the existing literature uses Standard Industrial Classification (SIC) codes to determine firm's industry class. The SIC-codes are two to four digit codes that classify firms' to specific sectors. By using only the two-digit SIC-codes, it results 83 different industries and the number of different industries gets much bigger when three- or four-digit approach is used to classify the industry. As an example, Moskowitz and Grinblat (1999) formed 20 different industries by using the two-digit SIC-codes while Fama and French (1988) used SIC-codes and formed 17 different industries. The defining criterion for industry classes in these two researches was that firms in the industry classes should contain similar activities and that the industries should contain enough firms to enable the forming of enough diversified industry portfolios.

In this thesis the widest SIC-code grouping is used to classify the industries. The two-digit SIC-codes are normally categorized under 10 different main industries, which can be observed from the table 5 in the next page. The financial industry is excluded from this study, which leaves nine industries to investigate. The right hand side of the table exhibits the amount of debt securities issued in the industry during the sample. All bond issues obtained from the Thomson Reuters DataStream database contained the SIC-codes so therefore the amount of non-classifiable bonds is zero. As can be observed from the table, manufacturing and transportation and public utilities sectors are by far the most active industries in bond markets according to the data sample. Also, construction and services sectors seem to be equally active in the bond markets but the issued amount of debt securities is 50% smaller compare to the two biggest sectors. Public administration, forestry and wholesale trade firms seem to be the three least active industries in the bond markets while retail trade and mining sectors are between the last three and construction and services sectors.

**Table 5.** SIC-code classification and the number of debt issues per industry. (siccode.com 2017)

SIC-codes	Industry	Amount of issued securities
0100-0999	Agriculture, Forestry and Fishing	53
1000-1499	Mining	207
1500-1799	Construction	503
1800-1999	Not in use	
2000-3999	Manufacturing	1121
4000-4999	Transportation and public utilities	1374
5000-5199	Wholesale trade	95
5200-5999	Retail trade	232
6000-6799	Finance, insurance, real estate	
7000-8999	Services	533
9100-9729	Public administration	31
9900-9999	Non classifiable	
	Total amount issued	4149

The main explanatory variables are the ECB's asset holdings and asset purchases, which aim to capture the impact of stock and flow effects. The same separation of the transmission channels were also done in the benchmark study by Duca et al. (2016), who again followed the framework of D'Amico and King (2013). The data of the ECB's securities holdings is hand collected from the ECB's website monthly balance sheet reports. Noteworthy, since the third quarter of 2009, when the first holdings of the CBPP can be observed in the ECB's balance sheet, the holdings have been divided into a other security holdings and holdings for monetary purposes. Before this the balance sheet only presented ECB's debt security holdings in the euro area. The data dealing with the ECB's asset purchases is collected from Thomson Reuters DataStream database and the ECB's website. The asset purchase and asset holdings variables are expressed as a percentage of the total gross debt in Europe. Duca et al. used the same method and expressed the Fed's purchases and holdings as a percentage of the total U.S. gross debt.

In order to capture the impact of the ECB's asset purchases on corporate bond issuance it is necessary to take other things into account that might affect to bond issuance activity in different industries. Duca et al. (2016) exploit several macroeconomic variables to control the possible impacts of market conditions on corporate bond issuance. The chosen market

variables in their research are VIX, U.S. 10-year benchmark bond yield and the Fed's real policy rate. The same variables are utilized in this thesis but the U.S. data is replaced by European data. The chosen market variables will be discussed in more detail at the end of this subchapter.

In addition to the central bank's monetary policy actions and market factors, the third explanatory variable in the benchmark study aims to control the impact of country specific conditions. The researchers use local equity returns and realized volatilities of the country's equity index to serve this purpose. In this thesis the country specific variables are replaced with industry variable, since the focus is to investigate the difference between industries instead of countries. Leary and Roberts (2015) investigated the impact of peer firms financing decision on corporate capital structures and controlled the possible industry impacts with industry equity return shocks. In this thesis the possible industry shocks are controlled with equity returns from different industry indices. The industry index returns are obtained from the Thomson Reuters DataStream database and the utilized industry indices are the closest possible matches to the industry groups formed with the SIC-codes. The descriptive statistics of the utilized industry indices can be observed from the table 6 below. Appropriate industry index to control shocks in the public administration industry was not obtained but due to the small amount of the issued debt securities in the public administration industry this is not a big concern in this thesis.

**Table 6.** Average quarterly closing prices per industry index between 2006 and 2016. (DataStream 2017)

Industry	Index	Mean	Std dev	Min	Max
Forestry	MSCI Europe Paper and Forestry Products	145,79	45,56	60,67	239,48
Mining	MSCI Europe Metals and Mining	323,62	97,79	150,95	554,31
Construction	MSCI Europe Construction and Engineering	327,81	74,74	202,01	490,04
Manufacturing	MSCI Europe Industrials	161,03	32,46	85,74	211,29
Transportation	MSCI Europe Transportation	116,42	27,91	61,31	158,44
Communication	MSCI Europe Communications Equipment	48,59	24,56	22,32	106,07
Electric	MSCI Europe Electric Utilities	117,29	26,63	76,53	186,09
Gas	MSCI Europe Gas Utilities	185,63	34,86	139,15	241,61
Wholesale trade	MSCI Europe Trading Companies and Distributors	94,25	34,84	32,40	142,13
Retail trade	MSCI Europe Retailing	122,59	37,40	54,07	194,86
Services	MSCI Europe Commercial Services and Supplies	76,60	13,65	44,86	103,08

Before proceeding to the methodology part, it is beneficial to discuss about the chosen market variables and the data behind them. Again, the aim of the selected market variables is to capture the possible impact of the financial market conditions and the alternative investments on corporate bond issuance. Table 7 below presents the descriptive statistics of all explanatory variables utilized in this thesis. The industry and the central bank asset purchase variables were already explained and the explanation for the chosen market variables will be discussed in more detail after the table 7.

**Table 7.** The descriptive statistics of the explanatory variables between 2006 and 2016.

Variable	Description	Mean	Std Dev	Min	Max
ECB purchases of debt securities (€)	Amount of debt securities purchased during the quarter. Source: Datastream and ECB	32,95	65,23	0,00	255,51
ECB debt security holdings (€)	Total amount of debt securities held by the ECB. Source: Datastream and ECB	363,94	428,34	25,09	1982,34
10-year benchmark bond yield	10-year government bond benchmark for Eurozone. Source: ECB	3,67	1,24	0,66	5,62
ECB key interest rate (real)	ECB interest rate for deposit facility minus expected year ahead inflation. Source: ECB	3,67	1,24	0,66	5,62
VIX	Average difference in monthly closing price of S&P500 implied volatility per quarter. Source: Yahoo Finance	22,07	8,51	11,41	58,35
EuroStoxx50	EuroStoxx50 index monthly closing price on average per quarter. Source: Yahoo Finance	3223,21	751,75	2094,78	5216,73
VSTOXX	Average difference in monthly closing price of EuroStoxx50 implied volatility per quarter. Source: Investing.com	26,70	9,45	13,12	57,60
Equity returns per industry	Industry indices' average quarterly closing prices. Source: Datastream	156,31	40,95	22,32	554,31

*The ECB key interest rate:* The aim of the ECB's main refinancing operations (MRO) is to provide liquidity to the banking system in the Eurozone. ECB provides deposit and lending facilities for banks across Eurosystem in which these can make overnight deposits and receive overnight credits. The ECB controls the lending and deposit activity by defining rate for deposits and rate on the marginal lending with the key interest rate. The governing council of the ECB is responsible for setting the key interest rate. An exceptional situation was witnessed in 2014 when the deposit facility rate was decreased below zero. In March 2016 the rate was set at the current -0,4 percent level. According to the theory, the negative rate increases banks willingness to lend money to the market due to the poor deposit conditions. (ECB 2017.)

*Euro area 10-year government benchmark bond yield:* As the previous studies section presented, many empirical research have provided evidence that the QE and the APP have lowered bond yields. According to the market timing theory by Baker and Wurgler (2002) financial managers prefer to issue debt when interest rates are low. Based on these existing evidences the underlying prediction is that the ECB's asset purchase program lowers corporate bond yields and therefore leads to an increase in corporate bond issuance. Euro area 10-year government benchmark bond yield reflects the average yield of 10-year government debt issued in the Eurozone. The average yield between 2000 and 2016 is 3,67 but, as can be observed from the figure 8 below, yield started to decline significantly after 2012. (ECB 2017).



**Figure 8.** The euro area 10-year government benchmark bond yield. (ECB 2017.)

*VIX*: VIX index measures the average implied volatility on the S&P500 index and it is widely recognized indicator of the global uncertainty in the financial markets. Existing literature suggests that during the times of high volatility investors are interested to shift their investment allocation from riskier assets to safer assets (Rey 2015). Although the relationship between bond issuance and high volatility is not unambiguous, the financial literature suggests that bonds can be considered as safe heavens to equity investors at least to some extent. Previous research has shown that not only European volatility but also the U.S. bond market volatility explains significant part of the European bond market volatilities. (Skintzi & Refenes 2006: 24.)

*Euro Stoxx 50*: Euro Stoxx 50 is a stock index that covers the 50 largest and most liquid stocks from the Eurozone. Therefore, Euro Stoxx 50 is the best possible indicator of the stock market conditions in Eurozone. Also, it is beneficial to contain this variable into the equation since stocks are normally considered as the main alternative investment for bonds. In addition, equity returns are at the same time a good indicator of a current market sentiment and also a good reflector of the future economic expectations among market participants. (Duca et al. 2016).

*VSTOXX*: Measure that reflects economic uncertainty especially in the Eurozone. The VSTOXX measures the 30-day implied volatility of the Euro Stoxx 50 index. Besides the continental coverage, the underlying rationale behind using this variable is the same than is with the VIX.

## 4.2 Methodology

The methodology used in this thesis follows the guidance of Duca et al. (2016). Duca et al. uses the Tobit equation with random effects in their research. They base the decision to use this estimation technique on the fact that the dependent variable cannot be negative. In the robustness section they test other econometric models. The Tobit equation is utilized in this thesis also along with the least squares estimation.

The effect of the ECB's asset purchase programs on corporate bond issuance across different industries in Europe is estimated by utilizing the following setting:

$$(6) \quad y_{it} = \beta_1 APP_t + \beta_2 Market_t + \beta_3 Industry_t + \varepsilon_{it}$$

The dependent variable in the model  $y_{it}$  measures corporate bond issuance in industry  $i$  at quarter  $t$ . As already mentioned, the issuance volumes are denoted in gross issued euros in billions per industry per quarter. The term  $\varepsilon_{it}$  is the error term.

The explanatory variables in the research are grouped into three sets following the method used in Duca et al. paper. The main explanatory variable  $APP_t$  is the first explanatory variable in the equation 6 and it aims to capture the impacts of ECB's asset purchases on corporate bond issuance. Along with the work of D'Amico and King (2013) and Duca et al. this variable is divided into two different channels, stock effect and flow effect. *Stock effect* measures the impact of the ECB debt holdings at the end of quarter  $t$  while *flow effect* measures the impact of the additional purchase transactions during quarter  $t$ . Noteworthy, the stock effect operates over the entire time period of the asset purchase programs while flow effect is present only in the periods when the purchases take place.

In contrast to the benchmark study, this thesis doesn't distinguish the acquired debt instruments into different debt products like Duca et al. where the impact of purchases between Treasuries and MBSs were separated in order to reveal possible segmentations in the market. As an example, the difference between the impacts of corporate and public sector bonds purchases could be interesting to compare if the CSPP would have been running for a longer time period. Currently the difference between the magnitudes of the PSPP and the CSPP is so big that it is not a relevant research area at least yet. Depending on how these programs develop this could be an interesting idea for the future research.

The second explanatory variable  $Market_t$  aims to control and capture the possible impacts of market conditions on bond issuance. The market variable includes the ECB key interest rate, the 10-year government benchmark bond yield in the euro area, the Eurozone benchmark stock index and the benchmark volatility indices for the Eurozone and the U.S. The more detailed explanations of the selected market variables were covered in the previous subchapter.

The third variable of the model is the biggest difference to the benchmark model. Duca et al. compared bond issuance activity between countries and therefore controlled the country specific conditions with local equity indices and local volatilities. In this thesis the country level examining is compared with industry comparison. Therefore, the objective of the third explanatory variable  $Industry_t$  is to control the possible industry impacts on bond issuance. The utilized industry variable follows the guidance of Leary and Roberts (2015) who controlled the industry impact with equity return shocks variable. The equity return shocks are controlled in this thesis by using the industry indices presented in the previous subchapter.

Although the regression model presented in the equation 6 contains several controlling variables, it is still likely that the model suffers at least to some extent from the omitted variable problems. This means that the explanatory variables are not able to explain and capture perfectly all the possible variations in bond issuance activity. It is extremely difficult to build a model that take's all the possible factors affecting to the dependent variable into account. In addition, it is unlikely that the unobserved effects are uncorrelated with all the utilized explanatory variables in all time periods. Due to these concerns and the correlation between the explanatory variables it is more appropriate to use fixed effects estimator in the model than random effects estimator. (Woolridge 2012: 484.)

More precisely, the correlation between the explanatory variables arises an econometric concern called multicollinearity. However, the multicollinearity problem doesn't decrease the predictive power of the whole model, but it has an impact on individual predictors and it would be therefore better if the explanatory variables would not be correlated. A possible solution for the problem could be to collect more data and leave other less important correlating variables out of the model, but as the existing literature states, it is better to have multicollinearity than leave a necessary variable out of the equation. Table 8 below presents the correlation of the explanatory variables. Extremely high correlations can be witnessed between the ECB's asset holdings and asset purchase and also between the VIX and the VSTOXX. (Woolridge 2012: 95.)

**Table 8.** Correlation of the explanatory variables.

	ECB Holdings	ECB Purchases	ECB Key Rate	Benchmark 10y yield	EURO- STOXX	VSTOXX	VIX
ECB Holdings	<b>1,000</b>	0,817	-0,636	-0,835	-0,279	-0,079	-0,251
ECB Purchases	0,817	<b>1,000</b>	-0,334	-0,700	-0,116	0,168	0,028
ECB Key Rate	-0,636	-0,334	<b>1,000</b>	0,558	0,721	-0,010	0,167
Benchmark 10y yield	-0,835	-0,700	0,558	<b>1,000</b>	0,063	0,219	0,378
EUROSTOXX	-0,279	-0,116	0,721	0,063	<b>1,000</b>	-0,555	-0,430
VSTOXX	-0,079	0,168	-0,010	0,219	-0,555	<b>1,000</b>	0,947
VIX	-0,251	0,028	0,167	0,378	-0,430	0,947	<b>1,000</b>

Turning the causality of the explanatory variables other way around, previous studies have been more worried about the possible endogeneity problem stating that the market conditions are the driving factor behind the asset purchases. This indeed is true, since the APP operations were originally launched to stimulate the economy after the financial crisis. Duca et al. (2016) tackled this issue by suggesting that the Fed's QE actions were predetermined with respect to current market environment. In addition, they backed this explanation with their findings from the emerging market by suggesting that the Fed didn't plan their monetary actions based on the financial condition in the emerging markets. In Europe this explanation won't hold but it is suggested in the recent research that at time when the latest and the largest APP programs were launched the market in Europe was not anymore deteriorating and were actually in a much better condition compared to times when the SMP operations took place (Fratzscher et al. 2016: 38). This makes the endogeneity concern to some extent smaller in the ECB's asset purchases programs at least.

## 5. EMPIRICAL RESULTS

This chapter presents the results from the empirical analysis. Different econometric techniques will be utilized in this chapter to confirm the robustness of the results. The chapter first presents the results from the least squares estimations and then proceeds to test the results with another econometric technique. Lastly, before heading to the conclusions and summary, the results from the modified model will be discussed.

### 5.1 Ordinary least squares estimation

The first regression results are presented in two different tables. Table 9 present results from manufacturing, forestry, construction and mining industries while results from transportation and public utilities, wholesale trade, retail trade, services and public administration are presented in table 10. The variables used in the empirical model follow the framework by Duca et al. (2016). The main differences compared to their model are that the local equity indices are replaced with the MSCI industry indices, the local equity volatilities are replaced with the VSTOXX and the Euro Stoxx index is added to the market variable to control the possible impacts of stock market conditions in the Eurozone. The estimation method used to obtain the results in tables 9 and 10 is least squares. Duca et al. used Tobit equation in their research and the results from the Tobit equation estimations in this study are presented in the robustness check section.

The results from the first four industries, presented in table 9 on the next page, suggest that the ECB's asset purchase program has a significant impact on corporate bond issuance in Europe. The results are quite similar for the manufacturing, construction and mining industries, while the results obtained from the forestry regression are significantly different. In the forestry industry the impact of the ECB's asset holdings on bond issuance is positive but insignificant while the asset purchase variable measuring flow effect seem to have a significant negative impact at 10% confidence level. According to the results, one unit increase in flow effect declines bond issuance by 0,01 billions in forestry industry. Another emerging observation from the forestry results is that the 10-year benchmark bond yield seems to have a significant negative impact as well at 10% confidence level. However, the

results obtained from the forestry industry should be questioned due to the small explanatory power of the model measured by the R-squared. The possible explanation behind the low R-square figure could be the small amount of issued bond securities in forestry industry in the data sample.

**Table 9.** Least squares estimation results for manufacturing, forestry, construction and mining.

	Manufacturing	Forestry	Construction	Mining
Constant	-0,0073 * (-1,7029)	0,0003 * (1,8525)	-0,0097 ** (-2,1916)	-0,0036 * (-0,6159)
ECB holdings	0,3089 *** (7,3347)	0,0003 (0,2258)	0,3076 *** (7,0561)	0,2725 *** (5,0302)
ECB purchases	-0,1639 (-0,8378)	-0,0106 * (-1,6905)	-0,0417 (-0,2239)	-0,3298 (-1,4410)
10y benchmark yield	0,0915 (1,0683)	-0,0056 * (-1,8538)	0,1430 (1,6631)	-0,0345 (-0,2748)
ECB key rate	0,3154 *** (3,0475)	-0,0049 (-1,4165)	0,3853 *** (3,7252)	0,3488 ** (2,6236)
EUROSTOXX	0,0170 (0,7873)	0,0004 (0,7284)	0,0160 (0,9645)	0,0058 (0,3364)
VSTOXX	-0,0273 (-1,1473)	-0,0008 (-0,8759)	-0,0357 (-1,3083)	-0,0459 (-1,2986)
VIX	0,0240 (0,9721)	0,0008 (1,0064)	0,0270 (1,1246)	0,0478 (1,5298)
Industry returns	-0,0107 (-0,5649)	-0,0004 (-1,1939)	-0,0109 (-0,7983)	0,0018 (0,2201)
R-squared	0,8186	0,3000	0,8162	0,6491
S.E. of regression	0,0037	0,0001	0,0037	0,0048

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. The *t*-statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

In manufacturing and construction industry the results suggest that one unit increase in the ECB's asset holdings increases corporate bond issuance with over 0,3 billion euros. The results are significant at 1% confidence level and the explanatory power of the model measured with the R-square is close to 0,82, which suggests that the model manages to

explain the dependent variable very well. Surprisingly, the results reveal that the flow effect is insignificant and has a negative coefficient in all three industries. In addition to stock effect, the ECB key rate has a positive correlation with corporate bond issuance and is statistically significant at 1% confidence level in manufacturing and construction industries.

The results from mining industry are quite similar, increase in the ECB's asset holdings increases corporate bond issuance with little below 0,3 billion euros and the impact is statistically significant at 1% confidence level. The impact of the asset purchase variable is again slightly negative and insignificant. The ECB key rate has also a positive coefficient in mining industry and is statistically significant at 5% confidence level. The explanatory power of the model in mining industry seems to be a little lower compared to the R-square figures in construction and manufacturing industries. The amount of issued debt securities in mining industry was notably smaller compared to the issued amounts in manufacturing and construction industries. At the same time, the amount was significantly bigger than in the forestry industry, which support the earlier presented interpretation of the R-square figures suggesting that the R-square is at least to some extent correlated to a number of observations.

Results from the rest five industries are presented in table 10 on the next page. The transportation and public utilities industry contained the biggest number of issued debt securities in the data sample, which can be partly explained by the broad number of firms that fall under this industry group. The broad industry grouping makes it challenging to control the industry shocks and to define the best benchmark industry index. After controlling the possible industry shocks with average returns from different industry indices as MSCI transportation, communication, electric and gas it occurs that the industry variable has a positive and significant impact on corporate bond issuance only in transportation and public utilities industry. In addition, the results suggest that the Euro Stoxx and the VIX have a significant and positive impact on corporate bond issuance with 1% and 5% confidence levels respectively while the VSTOXX has a significant negative impact at 1% confidence level in transportation and public utilities industry. Also, the explanatory power of the model is highest in transportation and public utilities industry as well.

Despite the foregoing, the most significant variable in transportation and public utilities industry is still the ECB's asset holdings. The asset holdings variable has a positive correlation to bond issuance while the impact of flow effect is again slightly negative and

insignificant. One unit increase in asset holdings is followed by 0,24 billion euros increase in bond issuance. According to the results, we can assume that when the markets are looking attractive and the investor sentiment is high firms are willing to issue more debt. This assumption is based on the dependent variable's positive correlation with the Euro Stoxx and negative correlation with the VSTOXX. Also, it seems that the uncertainty in the U.S. measured with the VIX encourages firms to issue more debt in Europe to attract global investors.

**Table 10.** Least squares estimation results for transportation and public utilities, retail trade, wholesale trade services and public administration.

	Transportation & public utilities	Retail trade	Wholesale trade	Services	Public administration
Constant	0,0043 (0,9515)	-0,0108 ** (-2,3700)	-0,0076 (-1,5312)	-0,0085 ** (-1,9454)	-0,0091 * (-1,8325)
ECB holdings	0,2408 *** (6,4374)	0,3469 *** (7,1042)	0,2367 *** (5,4588)	0,3081 *** (7,2856)	0,2009 *** (4,2947)
ECB purchases	-0,1561 (-1,0682)	-0,1969 (-0,9814)	-0,2230 (-1,2050)	-0,1131 (-0,6369)	-0,1649 (-0,8381)
10y benchmark yield	0,0162 (0,2192)	0,1376 (1,5057)	0,0930 (1,0056)	0,1026 (1,1504)	0,1329 (1,3362)
ECB key rate	0,1497 (1,6850)	0,4923 *** (3,8307)	0,2737 ** (2,5006)	0,3872 *** (3,7003)	0,2463 ** (2,1276)
EUROSTOXX	0,0269 *** (3,0170)	-0,0044 (-0,2685)	-6,88E-05 (-0,0047)	0,0082 (0,6909)	0,0080 (0,7201)
VSTOXX	-0,0759 *** (-2,8609)	-0,0379 (-1,3149)	-0,0307 (-0,9366)	-0,0352 (-1,2374)	-0,0291 (-0,9253)
VIX	0,0474 ** (2,2317)	0,0314 (1,2422)	0,0275 (0,9736)	0,0285 (1,1092)	0,0297 (1,0715)
Industry returns	0,0766 *** (3,7535)	0,0116 (0,8649)	-0,0017 (-0,1740)	-0,0056 (-0,4724)	
R-squared	0,8635	0,8004	0,6277	0,8130	0,4611
S.E. of regression	0,8323	0,0038	0,0039	0,0037	0,0043

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. The *t*-statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

The results from the other four industries in table 10 are looking quite similar to each other. The ECB's stock effect can be observed to have a significant positive impact on bond issuance at 1% confidence level in all four industries as well. The impact seems to be strongest in retail trade industry from the nine investigated industries. One unit increase in ECB's asset holdings increases corporate bond issuance by 0,35 billion euros in the retail trade industry. The results indicate that the stock effect is the second smallest in public administration industry while the smallest impact was witnessed in the forestry industry. Noteworthy, the amount of issued debt securities was smallest in public administration industry in the data sample. The ECB key rate has a significant and positive coefficient in all four industries. The impact is significant at 1% confidence level in retail trade and services industries and at 5% level in the wholesale trade and the public administration industries. The effect is again strongest in the retail trade industry and smallest in the public administration industry.

Based on the obtained regression results, the null hypothesis presented in the chapter one suggesting that the ECB asset purchase programs don't impact on corporate bond issuance can be now rejected. The results indicate that the ECB stock effect is positively present and statistically significant at 1% confidence level in all industries except the forestry industry. Therefore, the hypothesis  $H_{11}$  presenting that the ECB asset purchase programs have an impact on the corporate bond issuance in Europe can be accepted. As we have learned, the flow effect however seem to have an insignificant and negative impact on bond issuance, which is surprising.

One possible theory behind the positive impact of the ECB's asset purchase program is the gap filling theory by Greenwood et al. (2010) presented in chapter two. As we learned, the gap filling theory suggests that firms aim to fill in the gap for debt securities that were acquired away from the market by the central bank by issuing bonds. In addition to the gap filling theory, when the ECB acquires debt securities to its balance sheet from public it forces investors to seek other investments to replace the ones that were purchased away from them. This leads to an increase in demand for corporate debt securities among investors. The increased demand among investors encourages firms to issue more debt securities. This phenomenon refers to the portfolio rebalancing theory, which was also presented in chapter two. According to the portfolio rebalancing theory investors seek to replace the purchased securities with the closest possible substitutes (Fawley & Neely 2013: 53 – 55).

Two main observations considering the other explanatory variables emerge from the results. Firstly, the ECB key rate seems to be positively and statistically significant in all industries except the transportation and the public utilities and the forestry. Secondly, other explanatory variables, besides the ECB key rate, are insignificant in all industries except the transportation and public utilities industry. The results from transportation and public utilities industry suggest that the industry variable has a positive significant impact on bond issuance. In addition, there is a significant positive correlation between the bond issuance activity and the Euro Stoxx and a negative correlation between the dependent variable and the VSTOXX. Also, the positive and significant coefficient with the VIX is a little surprise and suggests that when uncertainty increases in the S&P500 index it causes an increase in corporate bond issuance among firms in European transportation and public utilities industry.

Another interesting theory regarding the observations just presented is the market timing theory that was discussed in chapter two. According to the market timing theory firms aim to issue equity when equity prices are looking attractive and issue debt when the debt markets are looking attractive. The results are telling the opposite since the ECB key rate seem to have a strong positive impact on bond issuance suggesting that when the key rate decreases bond issuance decreases as well. In addition, as we saw the results from transportation and public utilities industry present that the stock market returns have a positive impact on bond issuance while the VSTOXX has a negative impact on bond issuance, which are both against the market timing theory. The conclusion from these findings is that ECB's asset purchase program has managed to stimulate the entire market, which has increased stock prices and led to a increase in firms' investment activity and therefore impacted positively also to firms borrowing behavior.

## 5.2 Robustness tests

The results presented in the previous subchapter will be tested next. The benchmark study by Duca et al. (2016) utilizes the Tobit equation technique in their empirical investigation and it will be used next to test the robustness of the results in this thesis. Tables 11 and 12 presents the regression results from the Tobit equation. Besides the different econometric technique, there are no differences to the previous model. In other words, the variables conducted into

the Tobit equation model are the same that were used in the least squares estimation. After first discussing the results from the Tobit equation, small modification will be made to the model in order to provide a further analysis.

**Table 11.** Tobit equation estimation results for manufacturing, forestry, construction and mining industries.

	Manufacturing	Forestry	Construction	Mining
Constant	-0,0073 * (-1,9094)	0,000203 (0,9801)	-0,01069 *** (-2,6120)	-0,0069 (-1,1714)
ECB holdings	0,3088 *** (8,2241)	0,0028 (1,0929)	0,3211 *** (8,0180)	0,3658 *** (5,2057)
ECB purchases	-0,1639 (-0,9393)	-0,0240 * (-1,8388)	-0,0605 (-0,3602)	-0,8832 ** (-2,4910)
10Y benchmark yield	0,0977 (1,1979)	-0,0096 ** (-2,1198)	0,1349 * (1,7622)	-0,1078 (-0,8452)
ECB key rate	0,3154 *** (3,4170)	-0,0040 (-0,6087)	0,3603 *** (3,8212)	0,4573 ** (2,5649)
EUROSTOXX	0,0170 (0,8827)	0,0011 (1,2546)	0,0210 (1,4173)	0,0150 (0,8672)
VSTOXX	-0,0313 (-1,2863)	-0,0008 (-0,5065)	-0,0422 * (-1,7222)	-0,0013 (-0,0345)
VIX	0,0240 (1,0900)	0,0011 (0,8206)	0,0351 (1,6044)	0,0074 (-0,2172)
Industry returns	-0,0107 (-0,6334)	-0,0006 (-1,3745)	-0,0169 (-1,3547)	0,0030 (0,3510)
SE of regression	0,0035	0,0001	0,0032	0,0042

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. On the left-hand side the central bank asset purchase variables are expressed first, then followed by the controlling market variables and lastly the industry return shocks are expressed. The z-statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

The main conclusion from the Tobit equation regressions is that the results suggest similar relationships between the variables than did the least squares estimations. The results in table 11 above suggest that the ECB's asset holdings remain significant in the manufacturing, construction and mining industries while the impact in the forestry industry remains insignificant. The coefficients seem to increase slightly in the construction and mining industries while the impact in the manufacturing industry stays the same. Also, the ECB key

rate remains significant in these industries. In the construction industry the benchmark bond yield and the VSTOXX seem to become significant at 10% confidence level while in the mining industry the negative impact of the ECB's flow effect gets stronger and is now significant at 5% confidence level. The results from the Tobit equation estimations from the rest five industries are presented in table 12.

**Table 12.** Tobit equation estimation results for transportation and public utilities, retail trade, wholesale trade, services and public administration industries.

	Transportation & public utilities	Retail trade	Wholesale trade	Services	Public administration
Constant	0,0043 (1,0669)	-0,0156 *** (-3,6657)	-0,0091 (-1,5874)	-0,0099 ** (-2,5338)	-0,0248 *** (-3,0144)
ECB holdings	0,2407 *** (7,2180)	0,4294 *** (8,3108)	0,3090 *** (4,9001)	0,3169 *** (8,4427)	0,3426 *** (3,7529)
ECB purchases	-0,1561 (-1,1977)	-0,5506 ** (-2,1060)	-0,6153 * (-1,8421)	-0,1336 (-0,8527)	-0,6200 (-1,2461)
10Y benchmark yield	0,0162 (0,2457)	0,1194 (1,3795)	0,0476 (0,4380)	0,1151 (1,4611)	0,0257 (0,161827)
ECB key rate	0,1497 * (1,8893)	0,5502 *** (4,2915)	0,2695 (1,5095)	0,3902 *** (4,2382)	0,7230 *** (2,9442)
EUROSTOXX	0,0269 *** (3,3828)	0,0117 (0,7778)	-0,0107 (-0,5667)	0,0098 (0,9334)	0,0439 ** (2,5205)
VSTOXX	-0,0759 *** (-3,2078)	-0,0191 (-0,6753)	-0,0064 (-0,1623)	-0,0293 (-1,1616)	0,0541 (0,9018)
VIX	0,0474 ** (2,5023)	0,0189 (0,7604)	-0,0063 (-0,1815)	0,0245 (1,0782)	-0,0048 (-0,0949)
Industry returns	0,0765 *** (4,2086)	0,0043 (0,3556)	0,0029 (-0,2384)	-0,0098 (-0,9136)	
SE of regression	0,0031	0,0031	0,0036	0,0034	0,0038

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. On the left-hand side the central bank asset purchase variables are expressed first, then followed by the controlling market variables and lastly the industry return shocks are expressed. The z-statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

The results obtained with the Tobit equation confirm the significant impact of the ECB's asset holdings in the rest five industries as well. Consistent with the least squares estimation

the stock effect is significant at 1% confidence level in all five industries. Overall the results are in accordance with the results obtained from the least squares estimation. The ECB key rate remains significant in most of the industries and the transportation and public utilities industry still differs significantly from other industries. More specifically, the results suggest that industry returns, the VSTOXX and the Euro Stoxx are all statistically significant at 1% confidence level and also the VIX is significant at 5% confidence level in transportation and public utilities industry, which were observed in the least squares estimation results.

Before further testing, the key concerns arising from the results should be discussed. The ECB asset holdings seem to be the most significant variable impacting corporate bond issuance even after controlling various other factors that might impact on bond issuance. However, the opposite and negative impact of the asset purchase variable is still a mystery. The flow effect variable is constructed on the asset purchase information obtained from the ECB's balance sheet reports and from the Datastream database. Noteworthy, the first covered bond purchase program started in Q3 2009 and before this the ECB balance sheet contained a small amount of other debt securities. The amount of these other debt securities in the ECB's balance sheet changes during the asset purchase programs. The flow effect variable is calculated from the changes in the ECB's debt security holdings between quarters, which mean that the variation among the other debt securities in the ECB's balance sheet is taken into account in the flow effect calculations.

The sample period contains a period when any asset purchase program transactions didn't take place. This period happened between the end of second bond purchase program and the beginning of the third covered bond purchase program, in other words, between Q2 2012 and Q3 2014. In some quarters of this period the debt securities in the ECB's balance sheet have been decreasing. The reasons behind the decreasing are related to possible loan repayments or to changes in these other securities held in the ECB's balance sheet for example. During the negative quarters the flow effect variable is however expressed as zero in the data sample.

The results will be next tested with a modified model. Firstly, the test regressions reveal that after deducting the ECB's asset holdings variable from the equation the asset purchase variable becomes positive and significant variable at 1% confidence level. Interestingly, the flow effect coefficient is actually bigger than the stock effect when variables are used separately in the regression model. However as we have learned, when both variables are

conducted into the equation the asset holdings variable has positive and significant impact while the impact of the asset purchase variable is negative and insignificant.

The results from the correlation analysis of the explanatory variables presented in the table 8 in chapter four proved that the asset holdings and the asset purchase variables are highly correlated as was expected. This was also the case with the VIX and the VSTOXX. As we saw, these two variables exhibited a very high correlation and had also an opposite impacts to bond issuance in the regression results as did the stock effect and flow effect. The results from previous estimations offered a negative coefficient for the VSTOXX for example in the manufacturing industry but when the VIX is dropped out from the equation the coefficient for the VSTOXX actually turns to a positive. These observations suggest that the opposite coefficients of these highly correlated variables can be explained with the multicollinearity problem.

Due to the observations just presented, couple of modifications is made to the regression model. In the next estimation the possible impact of time periods when asset purchases have been zero will be controlled with a dummy variable. The dummy variable excludes the periods when the asset purchases were zero in the data sample by taking value of zero in these quarters and value of one in other quarters. Also, the VIX is now excluded from the investigations for the multicollinearity reasons just presented. The results from the regressions including dummy variable are presented in the tables 13 and 14.

**Table 13.** Adjusted least squares model results in manufacturing, forestry, construction and mining industries.

	Manufacturing	Forestry	Construction	Mining
Constant	-0,0087 ** (-2,1561)	0,0002 (1,6662)	-0,0114 ** (-2,6765)	-0,0069 (-1,2292)
ECB holdings	0,3041 *** (7,2353)	0,0001 (0,0709)	0,3031 *** (6,8541)	0,2653 *** (4,7880)
ECB purchases	-0,0853 (-0,4118)	-0,0070 (-0,9318)	-0,0104 (-0,0505)	-0,3748 (-1,4328)
10y benchmark yield	0,1313 (1,4551)	-0,004258 (-1,3441)	0,1665 * (1,8821)	-0,0115 (-0,0895)
ECB key rate	0,3673 *** (3,0964)	-0,0028 (-0,7249)	0,4215 *** (3,6296)	0,3576 ** (2,4233)
EUROSTOXX	0,0221 (1,0450)	0,0004 (0,7247)	0,0177 (1,0477)	0,0060 -0,3367
VSTOXX	-0,0050 (-0,4303)	6,06E-05 (0,1490)	-0,0070 (-0,6164)	0,0014 (0,0912)
DUMMY	-0,0012 (-0,5853)	-5.48E-05 (-0,7507)	-0,0003 (-0,1609)	0,0017 (0,6517)
Industry returns	-0,0128 (-0,6761)	-0,0003 (-0,8619)	-0,0111 (-0,7928)	0,0009 (0,1032)
R-squared	0,8155	0,2862	0,8097	0,6302
S.E. of regression	0,0037	0,0001	0,0037	0,5456

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. The *t*-statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

The results from the adjusted model in the manufacturing, forestry, construction and mining industries in table 13 suggest similar relationships for the investigated variables. The impact of the ECB's asset holdings stays the same after deducting the VIX and introducing the dummy variable into the equation. The impact of the ECB's asset purchase variable becomes a bit more positive and even less significant in each of the four investigated industries compared to results in table 9. The 10-year benchmark bond yield becomes significant at 10% confidence level in the construction industry with a positive impact on bond issuance but remains insignificant in other industries. The rest of the variables tell the same story compared to the earlier results. The dummy variable itself is insignificant in all four industries

and has very low coefficients. The dummy variable coefficient is positive only in the mining industry.

For the other five industries the results in table 14 suggest that the asset holdings variable remains positively significant in all five industries at 1% confidence level. The asset purchase variable remains also insignificant consistently with the previous results but in the transportation and public utilities industry the coefficient turns to positive from negative. In addition, the ECB's key rate turns to be significant and, in contrast to the other industries, the dummy variable is significant at 5% confidence level in the transportation and public utilities industry. In the retail trade industry the only significant change is that the 10-year benchmark bond yield turns to significant at 10% confidence level while in the whole sale trade industry the only significant change is the decreasing significance of the ECB's key rate. In the services and the public administration industries any significant changes don't occur.

**Table 14.** Adjusted least squares model results in transportation and public utilities, retail trade, wholesale trade, services and public administration industries.

	Transportation & public utilities	Retail trade	Wholesale trade	Services	Public administration
Constant	0,0004 (0,1027)	-0,0128 *** (-2,9551)	-0,0102 ** (-2.2846)	-0,0103 ** (-2,4925)	-0,0109 ** (-2,3167)
ECB holdings	0,2423 *** (6,4146)	0,3395 *** (6,8855)	0,2356 *** (5,4031)	0,3006 *** (7,0629)	0,1963 *** (4,1542)
ECB purchases	0,0170 (0,1016)	-0,1238 (-0,5566)	-0,3106 (-1,4003)	-0,0650 (-0,3301)	-0,1186 (-0,5257)
10y benchmark yield	0,0926 (1,2392)	0,1730 * (1,8517)	0,0972 (1,0390)	0,1327 (1,4871)	0,1618 (1,5880)
ECB key rate	0,2980 *** (3,1324)	0,5416 *** (3,8074)	0,2362 * (1,8044)	0,4168 *** (3,3044)	0,2939 ** (2,2908)
EUROSTOXX	0,0326 *** (3,4258)	-0,0002 (-0,0090)	0,0050 (0,3636)	0,0119 (1,0177)	0,0102 (0,8572)
VSTOXX	-0,0184 (-1,6231)	-0,0036 (-0,3080)	-0,0022 (-0,1898)	-0,0052 (-0,4641)	0,0029 (0,2281)
DUMMY	-0,0035 ** (-2,0457)	-0,0010 (-0,4669)	0,0016 (0,7122)	-0,0004 (-0,1954)	-0,0006 (-0,2779)
Industry returns	0,0666 *** (3,3596)	0,0101 (0,7418)	-0,0081 (0,8632)	-0,0092 (-0,7531)	
R-squared	0,8608	0,7929	0,6230	0,8067	0,4451
S.E. of regression	0,0032	0,0039	0,0039	0,0038	0,0043

Notes: The dependent variable is bond issuance per industry per quarter in billions of euros and the industries are indicated at the top row of the table. The sample period is between Q1 2006 and Q4 2016. The  $t$ -statistics are expressed in parentheses and statistical significance of the explanatory variables are denoted by \*\*\*, \*\* and \* which indicate the confidence levels at 1%, 5% and 10% respectively.

Based on the obtained results from the different regressions, the answer to the additional hypotheses  $H_{20}$  and  $H_{21}$  can be provided. The  $H_{20}$  argued that the majority of the industries react similarly to the ECB's asset purchase programs. Based on the fact that eight out of nine industries have exhibited positive correlation with the ECB's asset holdings, the  $H_{20}$  can be accepted. The  $H_{21}$  argued that the ECB's asset purchase programs have significantly different impacts on bond issuance between the investigated industries. By comparing the coefficient in the investigated industries this hypothesis can be rejected especially if the

forestry industry is left out from the investigations. The manufacturing, construction, mining, services and the retail trade exhibited very similar coefficients and the transportation and public utilities, wholesale trade and public administration industries also provided very similar results. The impact of the ECB's asset purchase programs was witnessed to be biggest in the retail trade industry while, in the other end, the forestry was by far the least responsive industry to these non-conventional monetary policy actions.

## 6. SUMMARY AND CONCLUSIONS

The objective of this thesis is to examine how the ECB's asset purchase programs have affected to corporate bond issuance activity across the different industries in Europe. The chosen sample period starts from Q1 2006 and ends to Q4 2016. During the sample period global financial markets and the European economy has faced exceptional turbulence. Since the global financial crisis started in 2007 central banks have launched several so called non-conventional monetary policy programs in order to recover the financial stability of the financial markets and to stimulate the economy around the globe. The public sector purchase program (PSPP) launched by the ECB in 2015 is by far the largest of these monetary actions in Europe. The ECB's latest extension to these asset purchase programs is called the corporate sector purchase program (CSPP), which was launched in 2016. In addition to PSPP and CSPP, the two other on going programs are called the third covered bond purchase program (CBPP3) and the asset-backed securities purchase program (ABSPP). Together these programs are known as the ECB's expanded asset purchase program. The fact that these asset purchase programs by the ECB have happened in the near future and are still running makes this topic extremely current and interesting.

The existing research has revealed that the quantitative easing by the Fed and the asset purchase programs by the ECB have had a broad impact on the financial markets. Several studies suggest that these non-conventional monetary policies have affected to interest rates, bond yields, exchange rates, asset prices and volatilities for example. Previous research investigating the impacts on corporate bond issuance behavior has provided evidence that the asset purchase programs have had an increasing impact on bond issuance activity. The three most recognized transmission channels for these non-conventional monetary policies have been the signaling channel, which relates to the announcement effect of the asset purchase programs, the central banks' debt security holdings channel, also known as the stock effect, and the impact of the new debt security purchases, called the flow effect. This thesis focuses on the last two and examines how these two balance sheet channels of the ECB have affected to corporate bond issuance in different industries in Europe.

The empirical model of the thesis aims to shed light on how the ECB's asset holdings and asset purchases impact to corporate bond issuance when the market conditions and industry

specific shocks are controlled. The utilized data behind the variables in the regression models is collected from different data sources. The corporate bond issuance data is gathered from Thomson Reuters DataStream database and the data on the ECB's asset holdings and asset purchases is collected from the ECB's own website databases. The data behind the market and industry variables of the regression models is obtained from Thomson Reuters DataStream database, ECB's database, and from Yahoo Finance.

The variables, used to control the impact of the market conditions, were chosen by following the guidance of Duca et al. (2016) who investigated the impact of the Fed's quantitative easing on global bond issuance. The market variable consists of VIX, VSTOXX, Euro Stoxx, the ECB's 10-year benchmark bond yield and the ECB's real key rate. The aim of VIX and VSTOXX is to capture the impact of uncertainty on the financial markets while Euro Stoxx reflects the possible impacts of stock market trends in Europe. This means that the variables take into account also the effect of the alternative investments for bonds. In addition, the ECB's key rate and the 10-year benchmark bond yield controls the impact of fluctuations in the interest rates and fixed income markets completing the market variable in this thesis.

The data sample contains 4149 issued debt securities in Europe between 2006 and 2016. The dependent variable is constructed by aggregating the issued debt securities in gross amounts by industry and by quarter. The issued amounts denominated in other currencies than euros were converted to euros with a current official exchange rate. Again following the framework of the benchmark study by Duca et al. (2016), the issued amounts are expressed in billions of euros. The issued bonds are grouped into nine different industries by using the standard industrial classification codes. Financial industry is excluded from the investigations.

The two main explanatory variables, the ECB's asset holdings and asset purchases are expressed in a percent of the total government debt outstanding in the European union. The same methodology was also used in the benchmark study. In addition to the asset purchase program and the market variables, the industry variable is conducted into the models. Leary and Roberts (2014) investigated how peer firms financing decisions impact on firm's capital structure. The authors controlled the possible industry impacts in the research with equity return shocks. Following this approach, the possible industry shocks are controlled with the industry equity returns. The industry returns are measured with different MSCI industry index returns that are obtained from Thomson Reuters DataStream database.

The described variables are conducted into different regression models. All the regression models provide similar kind of results. The null hypothesis is rejected based on the obtained results and the ECB's asset purchase programs can be confirmed to have a significant impact on corporate bond issuance. The ECB's asset holding channel has a positive and significant impact at 1% confidence levels in eight out of nine industries. The only exception is the forestry industry where the results were mainly insignificant overall. However, the explanatory power of the model in the forestry industry was very low and the amount of the issued debt securities was also very small. Therefore, the results from the forestry industry should be questioned. In other industries the explanatory power of the models were very good.

One very interesting observation emerging from the results is that the ECB's asset holdings and asset purchase variables had an opposite impacts on bond issuance in all regression models. The first impression is that the insignificant and opposite impact of the flow effect derives from the period between the asset purchase programs when any asset purchase transactions did not take place. The modified regression model excludes this period that took place between the Q2 2012 and the Q3 by using dummy variable. However, the dummy variable has a significant impact only in one industry. The conclusion is that the opposite impacts of the asset purchase program variables relates to the multicollinearity problem. The multicollinearity problem is present when the explanatory variables are highly correlated. The high correlation can be witnessed between the ECB's asset holdings and asset purchases but also with VIX and VSTOXX. Also VIX and VSTOXX exhibited an opposite impacts to bond issuance according to the obtained results.

Another interesting result emerging from the each regression model is the positive and significant impact of the ECB's key rate. Based on the financing theories covered in the chapter two, this result is against the presented theories. In chapter two this thesis presented the market timing theory of firms financing decisions that suggests that firms tend to issue equity when equity markets are attractive and prefer debt issuance when the interest rates are decreasing. However, according to the results the opposite is true since an increase in ECB's key rate leads to an increase in debt issuance. In addition, the correlation between bond issuance and the stock market conditions seem to be slightly positive in most of the industries. The possible explanation behind these results is the fact that the ECB's monetary policy

actions were firstly designed to stimulate the economic activity overall. In other words, this means that the asset purchase programs have at the same time improved the general market conditions and accelerated investment activity, which has led to an increase in stock prices and in bond market activity. The fact that the ECB's asset purchase programs were originally designed to stop the deterioration of the financial market in Europe is in many studies recognized as a special form of the endogeneity problem. However, after the first programs the stability of the financial market has increased and the market has turned into a slow growth path, which to at least some extent reduces the endogeneity problem among the latest asset purchase programs.

Based on the obtained results from the different regression models, the conclusion is that the reactions among the investigated industries to the ECB's asset purchase programs have been quite similar. As the chapter five presented, the manufacturing, construction, mining, services, retail trade, transportation and public utilities, wholesale trade and public administration industries all exhibited very similar responses to the programs. The only exception in the results was the forestry industry. The impact of the ECB's asset purchase programs is observed to be biggest in retail trade industry and smallest in the forestry industry.

From the theory perspective, the impact of the ECB's asset purchase programs could be partly explained with the gap filling theory by Greenwood et al. (2010). The gap filling theory presents that firms want to issue similar kind of debt securities that the central bank has purchased away. The underlying rationale is that the purchase program creates a gap in the market and firms try to exploit from this gap by filling it by issuing similar kinds of debt securities that were purchased away from the market. Another theory that could explain to the witnessed results is the portfolio rebalancing theory. The underlying idea in this theory is that when ECB purchases bonds to its balance sheet from public it, at same time, crowds out investors from the securities that it purchases. Investors are forced to seek alternative investments to replace the securities that were purchased away. This leads to an increase in demand for corporate bonds among investors and the increased demand along with earlier mentioned gap encourages firms to issue more debt securities. According to the portfolio rebalancing theory investors are looking for the closest possible substituting securities (Fawley & Neely 2013: 53 – 55).

After concluding this study, some recommendations for the future research can be suggested. Firstly, the industry classification could be made with a different approach. One way to do it could be for example by using three-digit SIC-codes. This would result more detailed and fruitful distinction between the industries. However, the industries should be chosen so that they contain enough issued debt securities. One interesting direction of the future research could be to investigate how the asset purchase programs have impacted on the characteristics of the issued debt securities. For example, the credit qualities could be investigated in order to reveal if the asset purchase programs have changed the ratio between issued investment grade and high yield debt. In addition to credit quality, it would be interesting to see if the asset purchase programs have impacted on the issued debt security types. Finally, it would be tempting to do the analysis again after the termination of these non-conventional monetary policy programs in order to fully capture the impacts of these programs on bond issuance activity in different industries.

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