ERSAMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS

Shiyar Zibare
372691

Inquiry into CSPP: The effects of the corporate sector purchasing program on corporate bond issuance behavior

Dr. Eisert
Dr. Gryglewicz

This thesis analyzes the impact of the Corporate Sector Purchasing Program on the issuance behavior of corporates. Analyzing the amount issued and the maturity of the bonds issued whilst controlling for country, industry and time fixed effects does not find support for the assertion that the purchasing program altered corporate issuance behavior. However, this study does not exclude the possibility that there still might have been an increase in the number of issuances. Furthermore this study does find support that book to market has a significant sizeable effect on the amount issued by corporates.

Table of contents

1. Introduction

On the 10th of March 2016 Mario Draghi unexpectedly announced, that the asset purchasing program of the European Central Bank (ECB) would be extended to include investment grade corporate bonds from non-bank entities.[1] This program has since been dubbed the Corporate Sector Purchasing Program, henceforth CSPP. Since the start of the program in June 2016, on average 7 billion euro of corporate bonds has been bought monthly according to the ECB (Eurpean Central Bank, 2017). The aim of the program is to further facilitate the pass-through of asset purchases into better financing conditions for companies and thereby stimulating the real economy. Econometric analysis suggests that the announcement accounts for a large decline in the spreads for euro area corporate bonds (European Central Bank, 2016). This study aims to examine whether CSPP has had significant effects on the issuance structure of bonds by euro corporates. More concretely, this study examines whether CSPP affected either the total amount or the maturity of bonds issued by corporates in the euro zone.

The ECB already suggests that the program has had an impact on yield spreads, however, CSPP is only attributing to the real economy if corporates actually utilize the lower yields that are available in the market by issuing new debt. Therefore it is relevant to examine whether this has been the case, which will be done by examining whether corporates issued larger amounts or extended the maturity of their newly issued bonds after the announcement of CSPP. Thus, this study does not aim to examine the impact on the yields but rather the impact it has on the issuance behavior of corporates. There might be other reasons next to a lower yield in the market that makes a corporate decide to issue debt and these need to be controlled for.

Investigating the impact of CSPP matters firstly for the ECB. Because from the point of view of the ECB, if CSPP has a significant effect on the real economy then this would mean that the program contributes to the goal of the ECB in stimulating the real economy and thereby ultimately revamping inflation back towards its target rate of two percent. Considering that Europe is more a bank based economy rather than a market based economy and that the previous measures of the ECB focused more on facilitating lending via the bank-lending channel, the ECB is on new territory so to say with the CSPP program. Therefore knowing that

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[1] https://www.ecb.europa.eu/press/pressconf/2016/html/is160310.en.html

CSPP can effectively complement bank-lending measures, it can be more swiftly activated in the future in order to spur economic growth and inflation.

Secondly, from the point of view of investors CSPP matters because investors are on the one hand limited in the amounts of euro investment grade bonds that they can invest in and on the other hand by knowing how the issuances have been affected, they can better alter the structure of their portfolio to their particular needs. For example, if the maturity of bonds increased due to CSPP, then this means that in general the duration of newly issued bonds in the market increased and hence investors might need to re-assess their benchmarks as the overall duration in the market changed. Another effect of CSPP could be that by incentivizing corporates to extend their maturity, the European bond market becomes more mature in the sense that a wider variety of maturities becomes available. Next to that, knowing which firms are more likelier to issue bonds in case of (artificially) lower yields in the bond market, investors can better anticipate the need of corporates looking for financing.

Thirdly, for corporates CSPP matters because it increases the amount of money which is invested in the European bond market. This means that corporates could potentially rely less on bank lending for their financing and more on financing via bond issuances. In severe financial crises, having another source of financial funding next to bank lending can in theory limit the impact of financial crises for corporates.

The CSPP is not free of risks however, the financial news coverage has been following the developments regarding CSPP and it provides for interesting point of views. A report by Hermes Investments on CSPP sums up several risks arising from the purchasing program.[2] Firstly they note the mere size of the European corporate bond market versus the pace of purchases, they argue that this can become a catalyst for distorted valuations as the valuations are driven too much by technicals, in this case the supply side purchasing program, rather than justified fundamentals. Not only does this impact valuations, but this also negatively affects liquidity in the secondary market, because the central bank applies a buy and hold strategy that makes bonds that have been bought not being traded anymore. This lower liquidity then might accentuate volatility in the markets. Secondly, corporate treasurers might excessively

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[2] https://www.hermes-investment.com/blog/spectrum/the-ecb-plunges-into-european-credit-through-the-cspp/

seize the opportunity of cheap credit and hence this could lead for example to poor M&A decisions and re-leveraging of balance sheets. Another side-effect might be that corporates whom would've not been able to survive without the artificial cheap credit, are able to survive now. This might generate a decline in recovery rates after the program has ended because then those corporates will have to face higher interest rates again.

In order to empirically answer how CSPP has affected the amount issued and the maturity, data on bond issuances in 2015 and 2016 are collected. Next, for those firms that issued bonds, balance sheet information is obtained to control for company specific effects. As mentioned before, there might be other reasons for a company to issue debt. For example a firm might need to issue debt to service maturing debt, to finance a new project or to (re)leverage. Next to these company specific effects, there might also be certain industry or country specific effects that affect bond issuance. Barclay and Smith (1995) argue for example that more regulated industries issue longer dated bonds. Also, since the study covers a timespan of two years, the general economic climate might change as well, affecting the bond issuance structures and therefore this also needs to be taken into account in order to have an accurate estimate of the effects of CSPP. Then by running difference in differences regressions with the amount issued and the maturity issued as dependent variables while controlling for other effects, an attempt is made to isolate the impact of CSPP as much as possible.

During the same press conference Draghi also announced several other measures to stimulate the euro zone's economy which affect corporate financing decisions as well. The first one was the Targeted Long Term Refinancing Operation (TLTRO), which aims to facilitate banks in lending to small and medium enterprises and the second measure was a cut in the deposit facility rate. Due to the simultaneous introduction of these programs, it is not possible to give precise estimates of the CSPP program as the ECB concludes themselves (European Central Bank, 2016). But since these other measures aim to facilitate bank lending as a way to stimulate corporates to borrow money, the effect of CSPP is biased downwards. This is because if a corporate decides to borrow money from a bank rather than the bond markets due to better financing conditions at the bank, then this means that they will issue less in the bond market and therefore muting the effect of CSPP.

The results of this thesis do not find support for the notion that CSPP has altered either the total amount issued or the maturity of the bond issued. Therefore there is no support for the

main assertion that CSPP altered the behavior of corporates when issuing bonds. Knowing that there has not been a significant effect on either the amount or the maturity issued, a better decision can be made with respect to balancing the benefits and the potential drawbacks that CSPP has on the market. However, this study does not exclude the possibility that the number of issuances has risen.

The remainder of this thesis is structured as follows, first the existing theoretical literature is examined. Second, the data collection and the methodology are presented followed by the results of the regressions. Lastly, a conclusion is drawn from the results.

2. Literature Review

Unconventional monetary policy for Europe and Japan focusses primarily on how to facilitate bank lending as a means to combat a financial crisis, whereas the Anglo-Saxon countries primarily use asset purchases to alleviate financial distress (Fawley & Neely, 2013). In this respect, CSPP is unique as now the ECB is trying to give impetus to the economy via the markets instead of its 'regular' practices which aim to facilitate lending via banks. Although the ECB started to buy government bonds before as a response to the sovereign debt crisis in the EU, corporate bond purchases have not been done yet by the ECB. Next to that, since the program is still running as of third quarter 2017, research on CSPP is limited.

The ECB did, however, publish preliminary research into the effects CSPP in August 2016, two months after the purchasing program had effectively started (European Central Bank, 2016). They conclude that due to the other measures that were simultaneously introduced alongside CSPP, namely the TLTRO and the cut in the ECB deposit facility rate, a precise estimate of the effects of CSPP on yields is not possible. Nevertheless, they still provide an estimate of 11 basis points decrease in spreads for non-financial investment grade corporates in the two weeks following the announcement which can be attributed to CSPP. With respect to the total amount of issuances they note that while there was a subdued amount of issuance at the start of 2016, the total amount significantly rebounded after the announcement of CSPP. Even compared to previous years, the second quarter of 2016 had on average a higher amount of issuance by corporates. Also noteworthy is that the effects of the announcement did not limit itself to eligible bonds, but also for financial firms and high yield bonds a drop in yield was observed.

Research by the MSCI seems to confirm the notion that CSPP has sparked an increase in issuance (MSCI, 2017). In their research they use net issuances as a metric by filtering out issuances used for refinancing purposes. They find that net issuances have peaked, compared to the number of issuances since 2014, right after the announcement was made.

Greenwood, Hansen and Stein (2010) examine the variation in the maturity of corporate debt issuances. They find that whenever governments issue shorter dated debt, corporates issue longer dated debt to fill the 'gap'. This type of behavior is accentuated if the portion of

government debt relative to total debt is larger or when firms have stronger balance sheets. In this case CSPP can be interesting as it might provide another way through which the maturity of corporates is being influenced.

Research by Duca, Nicoletti and Martinez (2016) examined the impact of the Large Scale Asset Purchasing Program (LSAP) by the FED on corporate bond issuances. They find support for the before mentioned gap-filling theory in that they find that since the FED started buying mortgage backed securities and treasuries, corporates filled the resulting gap by issuing more debt. Interestingly they find that this effect extended even to emerging markets, so apparently there have been spillover effects in the US bond buying program.

Gagnon et al. (2011) research LSAP with a focus on the effects the purchases left on the financial markets. They find that the treasury purchases reduced the term premium for the treasury market as this is the most important premium of a treasury bond. Purchases such as agency debt and mortgage backed securities whom have a higher exposure to other premia, such as liquidity premia or credit premia, provided different mechanisms through which the purchasing program was able to alleviate market distress. For example, by buying agency debt in a time when the market was relatively illiquid, the purchasing program provided much needed liquidity in the market and hence reduced the liquidity premium which in the end lowers the yield.

Gilchrist and Zakrajsek (2013) examine the LSAP from a different angle. They research the effect that the LSAP has on corporate credit risk and find that the LSAP led to a significant reduction in insuring against default risk as measured by credit default swaps. Noting that while the program substantially reduced credit risk in the overall economy, it did not reduce so for financial intermediaries. This result is relevant for CSPP since if a buying program can alleviate credit risk, corporates will be induced to issue new bonds since it will be relatively cheaper to do so. It is also interesting that they do not find spillover effects to financial intermediaries with regards to the reduction in credit risk.

Research on purchasing programs in Europe is limited since the ECB is more focused on stimulating the economy via bank lending mechanisms. The type of research into bond buying programs in Europe, however, might still lend itself to provide additional input into what kind of variables might explain bond issuances for firms. For example, Acharya et al. (2016)

examine the Outright Monetary Transaction (OMT) program of the ECB. One of their main results is that banks that were recapitalized indirectly via the OMT program, used the proceeds to give out new loans only at the intensive margin. Interestingly enough companies that regained access to bank financing used the proceeds to build up cash reserves. With respect to CSPP, this study will examine if corporates that have more cash on their balance sheet are inclined to issue more debt or longer dated debt.

In a second economic bulletin that was published in June 2017, the ECB again takes a closer look at CSPP and its effects (Eurpean Central Bank, 2017). Several noteworthy conclusions are drawn. First, the annual growth rate of corporate bond issuances has generally increased. Even though this trend occurred before, right after the financial crisis when corporates replaced bank lending by bond issuances, now this trend of increased issuance has even taken place alongside a growth in bank lending. Secondly, CSPP also benefitted companies which do not rely on capital markets for their financing, the small and medium enterprises. Because if corporates increasingly finance themselves via bond issuances, this releases capacity for banks to lend out more to other market participants. So next to the spillover effects of lower yields for non-eligible bonds, as mentioned previously, there seems to be a spillover effect in the form of higher issuances for companies that do not have access to the bond market.

3. Data

In order to conduct an analysis on the determinants of bond issuances under CSPP, the data collection is separated into two parts. The first part concerns data collection on the issuances together with balance sheet data from those companies that issued bonds. The second part concerns combining these two datasets and making it suitable for analysis.

3.1.1 Issuances

The main focus of this study is to find what factors can explain the decision for companies in the European Monetary Union to issue bonds denominated in Euro before and during CSPP. Therefore the first exercise with respect to the data is to find what criteria are used by the ECB to decide if a bond is included in their purchasing program, so to be able to make a distinction between the experiment group and the control group. First off, both the experiment and the control group only contain issuances that are denominated in euro by eurozone domiciled companies. For the experiment group then, the following additional criteria for eligibility are applied[3]:

1. Bonds issued by a bank or entities that are comparable to a bank in terms of their activities are excluded. This also holds if the parent company, even if it is outside of the EMU, is classified as such. In practical terms this means excluding SIC code 6 whilst manually verifying SIC code 67 (holdings).
2. The issuance has to be rated investment grade.
3. The issue has to have a minimum remaining maturity of 6 months and a maximum remaining maturity of 30 years.

For this study the relevant point in time for whether an issue belongs to the experiment group is the announcement date of CSPP rather than the real starting date of the program. There are strong indications that there has been a significant effect on the interest rates for corporates when CSPP was announced and therefore it can be argued that corporates could have already started issuing debt more cheaply from the 10th of March onwards (European Central Bank, 2016). Furthermore, the ECB does publish which corporate bonds they have

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[3] https://www.ecb.europa.eu/mopo/implement/omt/html/cspp-qa.en.html;
https://www.ecb.europa.eu/press/pr/date/2016/html/pr160421_1.en.html

bought under the program since the bonds are being put available for the market under securities lending.[4] However since the market does not exactly know beforehand which bonds will be bought and which bonds not, let alone for how much, the lower yield in the market should apply in theory to all bonds which are potentially eligible. Hence, the additional criteria with respect to timing for inclusion in the experiment group is that the bond should have been issued after the 10th of March and not after June 2016 when the ECB actually started buying these bonds.

Since it is not possible to retrieve data from Bloomberg, the data is obtained from Thomson One instead. Excluding private placements and only including debt issued in euro for all of 2016 gives 2156 issuance observations. Since balance sheet data for the firms that issued debt are needed as well, all hits without a parent or subsidiary SEDOL are excluded. Having done so, the total observations is more than halved to 1069 observations. By excluding all non-EMU subsidiaries 553 observations remain for both the control group and the experiment group.

Taken together, for 2016 issuances the sample contains only issuances in euro by eurozone domiciled companies that were not private placements or placements by public undertakings. In addition, the experiment group contains issuances that occurred after 10th of March, are rated investment grade, have the correct maturity and are from an eligible industry. Because it is only these bonds that will in theory have access to lower yields in the bond market when issuing new debt. This amounts to a total of 165 issuances that belong to the experiment group and 388 that belong to the control group. Data on ratings, industry and maturity are all obtained from Thomson One. For those companies that have no ratings data, ratings are manually assigned by looking up the rating assigned by either S&P, Fitch or Moody's. Note that the ECB applies the same loose rating eligibility criteria as well. For those companies issuing bonds with a perpetual maturity, the maturity is equated to a 100 years maturity for the ease of doing calculations. In that regard, the second highest maturity is 60 years.

Likewise, issuance data for 2015 was obtained by using the same CUSIP codes of the 553 observations but then this time obtaining data for 2015 rather than 2016 via Thomson. This gave a total number of 415 issuance observations for 2015 for the same companies.

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[4] http://www.ecb.europa.eu/mopo/implement/omt/lending/html/index.en.html

It is perhaps useful to highlight a distinction that can be made in the analysis of issuances. When looking at the amount of issuances in this study, the euro amount is analyzed whereas it is also possible to look at the number of issuances as a proxy for the growth of issuances. Since there are limitations on retrieving bond issuance data, this study is limited to only the euro amount of respective issuances and not the number of issuances.

3.1.2 Balance Sheet Data

To obtain balance sheet data of the firms that issued debt, the SEDOL codes of the 553 observations are converted into ISIN codes via Datastream. With these ISIN codes, firm specific balance sheet data can be obtained via ORBIS. Since some companies have issued multiple times, the 553 observations do not equate to 553 different companies. This becomes clear when the balance sheet data is only showing 223 unique observations in ORBIS. See table 3.1 for an overview of the number of observations.

Number of observations	**2016**	**2015**
Issuances	553	415
Companies	223	204
Final Dataset	298	191

Table 3.1

To see what balance sheet variables can potentially explain issuance, a wide variety of variables are initially included in the analysis, see table 3.3 and 3.4. The balance sheet data to compile these variables stem from primarily 2014 and 2015, allowing for a difference in differences analysis with a levels specification. For the total assets, 2016 balance sheet data is needed as well.

3.1.3 Combining Datasets

The next exercise with respect to data is combining the issuance dataset with the balance sheet dataset. This can be done since both datasets have ISINs as identification for the observations. Since there might be a time-specific factor that can explain issuance size or maturity, a quarterly time dummy is included in the analysis. Including a quarterly time dummy makes that a company can occur a maximum of four times as an observation per year with the same balance sheet. But since balance sheet data is annual this means there is a discrepancy in the data granularity between the datasets. The quarterly dummy corrects for this discrepancy since it allows the same balance sheet observation to have a different

issuance or maturity within the same year despite having the same balance sheet data. Doing so increases the total number of observations to 513 for 2015 and 2016. Then, after deleting observations for which either no balance sheet data, no issuance data or no maturity data is available, 489 observations remain in the final dataset. See table 3.1 for an overview.

In table 3.2 an overview is given of the amount of observations before and after the announcement for both the control group and the experiment group. Note, because the announcement took place on the 10th of March 2016, some observations have issuances before the announcement date and after the announcement date, so there are observations in the same quarter that are both eligible and ineligible. But the issuance data and maturity data needs to be split into quarters in order to control for time fixed effects. This mismatch is solved by assigning an observation to the experiment group only if it is eligible for CSPP and it is issued from the 2nd quarter of 2016 onwards. Having the 2nd quarter as a breaking point rather than the 10th of March effectively means that some observations which should have been part of the experiment group, will now become part of the control group, which biases the results downwards in the end. The amount of observations per group before and after the breaking point are shown in table 3.2.

NUMBER OF OBSERVATIONS	CONTROL GROUP	EXPERIMENT GROUP	(SUB) TOTAL
Q1-Q5	182	70	252
Q6-Q8	143	94	237
(SUB) TOTAL	325	164	**489**

Table 3.2

3.2. Variables

There has been considerable research efforts to explain the debt structure of companies. For this analysis, there will be a distinction in explaining the amount issued by the companies and the maturities of the bonds issued.

Both the issuance and the maturity analysis will have the same set of control variables. First, since the observations are spread over multiple countries, country fixed effects will be used. To account for a different issuance climate over time, quarter dummies are added. Next to that, since different industries have different habits of issuances, for example research by Barclay and Smith (1995) has found that certain industries that are more regulated tend to

increase the maturity of the issuance, industry fixed effects are added as well. Lastly, since a larger firm will naturally issue more, a variable controlling for the logarithm of size will be added. Not only does size influence the amount of issuance but research by Guedes and Opler (1996) and research by Barclay and Smith (1995) find support for the notion that the size of a company also affects the maturity of the issuance. With respect to the credit rating, its influence is for a large part implicitly accounted for by separation of the experiment group from the control group since the experiment group will only have investment grade corporates whereas the control group will have both investment grade and high yield corporates.

3.2.1 Amount Issued

For the first part of the analysis, the amount issued is taken as a dependent variable per quarter per firm. Explaining the amount issued, is implicitly also explaining the debt structure of a firm. Since a higher amount of debt issuance directly affects the level of debt versus equity of a company. Hence, the literature on debt structure is used to provide guidance on which independent variables to use in explaining the amount issued.

Titman and Wessels (1998) find that past profitability and growth options affects the capital structure. Similar to their study, this research will use the market to book value of a company to proxy for growth options of a company and to proxy for past profitability, net income is used. Next to that, the amount of leverage a company has, can be seen as a determinant for the capital structure (Jensen & Meckling, 1976). A relatively highly levered firm will have a harder time finding creditors since if the firm goes bust, creditors will bear more of the burden while they do not share in the upside potential, therefore leverage will be included in the analysis as well. As previously mentioned Acharya et al. (2016) find that when corporates had better access to financing, they increased their cash holdings with the proceeds. Therefore, as an additional analysis this thesis will examine whether the level of cash has any impact on issuance size or maturity, albeit that in this study the level of cash is measured beforehand rather than after the treatment. The second way this thesis will complement previous research is by including the level of bank loans as a variable. This is because for corporates, bonds and bank loans can be considered close substitutes. As the ECB mentioned in their economic bulletin, the increase in bond issuances has been alongside an increase in bank lending in 2016 and 2017. It would therefore be worthwhile to examine what kind of impact

the amount of bank loans has on the amount issued. Summarizing, the following variables are included in the analysis of the amount of debt issued by corporates during CSPP:

Dependent Variable	Control Variables	Independent Variables
Issuance per quarter	Country Dummy	Net Income
	Industry Dummy	Market to Book Ratio
	Quarterly Time Dummy	Leverage
		Cash and equivalents
		Bank loans
		Size

Table 3.3

3.2.2 Maturity Issued

Next to analyzing the amount issued, an analysis will be performed on the maturity issued. The maturity is analyzed in two different ways. The first is by taking the average maturity of every issuance per company and weighing each maturity equally per company within a quarter. The second way is by weighing each maturity by its respective issuance size in the total issuance size of that company per quarter. So rather than weighing it equally, it is now weighed by its share in the total principal issued in that quarter.

Previous research is used to find factors that can potentially explain the maturity of the issuances. Barclay and Smith (1995) find that firms with few growth options, are large and in more regulated industries have more long term debt in their capital structure. This warrants the use market to book ratio as a proxy for growth options and having size and industry as control variables. Diamond (1991) finds that liquidity risk affects the maturity structure of a company. In order to take liquidity risk into account, the current ratio will be used as a proxy. In the same spirit as in explaining the amount issued, leverage and net income will be used a well to explain the maturity of the issuance. An overview is provided in table 3.4:

Dependent Variable	Control Variables	Independent Variables
Issuance per quarter	Country Dummy	Net Income
	Industry Dummy	Market to Book Ratio
	Quarterly Time Dummy	Leverage
		Current Ratio
		Cash and equivalents
		Size

Table 3.4

4. Methodology

4.1 Hypotheses

The main goal of CSPP for the central bank is to stimulate the economy through cheaper lending rates for corporates and thereby to ultimately revamp inflation. The focus of this study is to find out if CSPP altered the issuance behavior of companies either via the total amount they issued or via a different maturity. Therefore the main hypothesis of the thesis is:

"The Corporate Sector Purchasing Program induced corporates to alter their bond issuance structure."

Gagnon et al. (2011) examine multiple ways through which a purchasing program can affect the risk premium and hence the yields in the market. They firstly note that through buying treasuries, the term premium of treasuries is reduced as there is less duration in the market. This is because the central bank is now absorbing a portion of the duration risk and therefore there is less duration risk in aggregate in the market. The term premium can then in theory be reduced because the duration risk is now being held by those who are most willing to bear duration risk or because investors require a lower compensation for duration risk since they have smaller amounts of it in their portfolio. Another way through which the risk premium is lowered is by an improvement of liquidity. Some markets, such as the market for mortgage backed securities, were severely impaired after the financial crisis of 2008. By buying these securities, the purchasing program ignited more liquidity in the market and therefore lowered the liquidity premium demanded by investors. Taken together, having lower risk premia results in lower yields and higher prices which favors issuers of bonds in the end as they are now receiving a higher price for their bonds when issuing debt. This mechanism then provides an incentive for issuers to issue more or longer dated debt as they seek to benefit from the artificially lower yields.

The main two ways investigated in this thesis whether a company altered their issuance is altering either through issuing a larger amount or through extending the maturity structure of the issuances. In Thomson there are several options available for the principal amount, the one used in this study is the principal amount including over-allotment sold. To control for a change in economic climate through time, quarter dummies are added. Therefore, the total

issuance size needs to be included in the dataset as per company per quarter. This leads to the following sub-hypothesis with respect to amount issued:

1. *"The Corporate Sector Purchasing Program caused corporates to issue larger amounts of debt."*

As explained, the sample is split into four quarters as to control for time effects. Therefore in the analysis of the maturities, maturity is taken as the average of maturities per quarter. Since a company might have different principals for the different maturities, it is important to control for this. This is done by weighing each maturity of the issuance by its respective weight in the total issuance size for a specific quarter. Both methods will be used in this study to investigate the impact on the maturity structure. The related sub-hypothesis is:

2. *"The Corporate Sector Purchasing Program caused corporates to issue longer dated bonds."*

4.2 Difference In Differences

By using a difference in differences method (DID), I try to disentangle the effect that CSPP specifically has on the amount issued and on the maturity. This type of method is suitable when having two types of groups, in this case eligible versus non-eligible companies, over two time periods. In this study, by letting the treatment period start per the second quarter of 2016 rather than the 10th of March, a more conservative breaking point is chosen to separate the control period from the treatment period. The total sample period for the explanatory variables comprises the years 2014 and 2015. The issuance data compromises the years 2015 and 2016. Next to that, the total sample only contains bonds that are issued in euro and are issued by companies incorporated in the euro zone. The difference between the experiment and the control group is then that the control group has been ineligible for CSPP due to either being not from an eligible industry, not issuing investment grade rated bonds or not issuing an eligible maturity.

The method behind a difference in differences regression relies on the assumption that both groups would have had the same trend if there had been no treatment. To illustrate this, figure 4.1 plots the average amount issued by the experiment group and the control group before and after the announcement of CSPP. Typical for a difference in differences estimation is the inclusion of an interaction term. If assuming that CSPP is the only driver that affects the
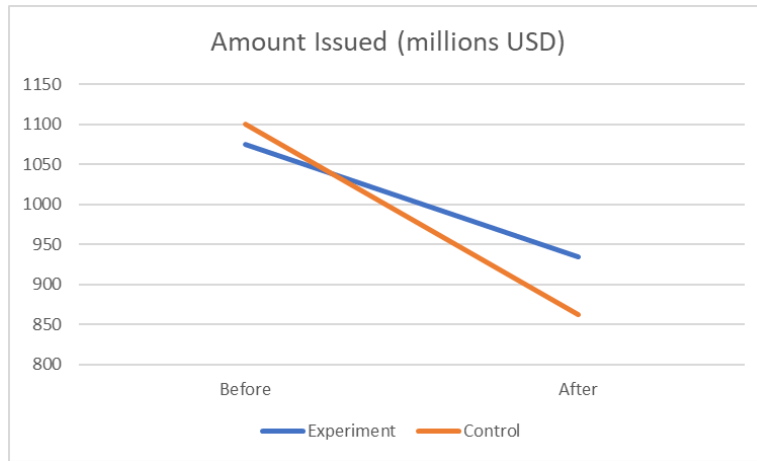
Figure 4.1

amount issued by corporates, then a difference in differences regression estimates via an interaction term whether the slope of the treatment group differs significantly from the control group after the treatment has started. If this interaction term is significant, it means that due to the treatment, the trend of the experiment group starts differing from the trend of the control group, put into other words this means that the treatment has a significant effect. This then explains the assumption that both groups should have the same trend had there been no treatment. Because if the groups would've diverged or converged in trends anyhow, the change in the slope can then not be purely attributed to the specific treatment. Also, since the introduction of CSPP is not the only reason that the experiment group might want to alter its total issuances in a different manner than the control group, other variables that can potentially explain the difference in trend need to be controlled for.

To answer the first sub-hypothesis the following regression is executed using the DID methodology:

$$(1)\ \frac{Amount\ Issued_t}{Total\ Assets_t} = \beta_0 + \delta_{Country} + \delta_{Industry} + \delta_{Quarterly} + \delta_{Group} + \delta_{Treatment*Group} + \beta' * X'_{j,\ t-1} + \varepsilon$$

Firstly, the dependent variable, total amount issued per company per quarter is scaled to the respective total assets of the company. The amount issued is scaled by the total assets of the respective year in which it is issued, highlighting the need to obtain 2016 balance sheet data for total assets.

Secondly, by using dummy variables for different countries, different industries and different quarters this model is able to control for country, industry and time fixed effects. The variable of interest is $\delta_{Treatment*Group}$, henceforth the interaction term. The group dummy is 1 for the experiment group and the treatment dummy is 1 for the treatment period which is the second

quarter of 2016 up until the third quarter of 2016. In case the interaction term is significant, it means that being part of the experiment group during the treatment period has had a significant effect on the scaled amount issued and therefore it answers the first sub-hypothesis. In a difference in differences specification, when including an interaction term, the dummies which make up the interaction term must also be added to the regression separately. Therefore the dummy group is added separately and since the quarterly dummy coincides with the treatment (as per the 2nd quarter of 2016), no separate treatment dummy is added.

Lastly the vector $X'_{j,\ t-1}$ contains the independent variables that were mentioned before. These are the log of size, to avoid outliers in size disproportionately affecting the results, the market to book ratio, leverage, net income, cash and bank loans.

$$(2)\ WA\ Mat = \beta_0 + \delta_{Country} + \delta_{Industry} + \delta_{Quarterly} + \delta_{Group} + \delta_{Treatment*Group} + \beta' * X'_{j,\ t-1} + \varepsilon$$

To answer the second sub-hypothesis regression number two is estimated, it measures the impact of CSPP on the maturity issued. The dependent variable is as explained before an equally weighted average and a weighted average of the maturity (WA Mat) issued per company per quarter, weighed by the principal of each issuance. The dummies are the same as the previous regression and also for this regression, the variable of interest is the interaction term. If the interaction term is significant, this indicates that the experiment group has had a significantly different maturity structure when issuing debt after CSPP has been announced. The vector of independent variables for the analysis of the maturity consists of the log of size, market to book, leverage, net income, current ratio and cash.

The methodology of the maturity regression is similar to Guedes and Opler (1996) in that their study also analyses issuances incrementally. In other words the focus of the study is on the incremental new issuances rather than to examine what maturity structure a company has over all its existing outstanding financial liabilities.

5. Results

5.1 Descriptive Statistics

In table 5.1 the summary statistics are reported by control group versus experiment group. Firstly, the average maturity of the control group is 11 years whereas it is 10 for the experiment group. The maximum maturity is 100 years, which are perpetual bonds, for both groups. The perpetual bonds issued in the experiment group are not during the treatment period and therefore based on maturity the summary statistics are, as expected, in line with the eligibility criteria mentioned before. Secondly, with respect to the amount issued divided by total assets, an average of 4% is observed for the control group and 5% for the experiment group. With regards to the total assets, there is a sizeable difference between the minimum and maximum amount of total assets, indicating the need to take the logarithm of total assets when including it in regressions. Lastly, the total amount of observations available varies substantially between different independent variables, especially bank loans as it only has data for one third of the total observations. This might lead to a decreased ability for those independent variables to explain variance.

Furthermore, the correlation matrix, reported in the appendix, does not show any signs of multicollinearity between the independent variables.

5.2 Amount Issued

In table 5.2 the regression output of the amount issued is shown. Two types of models are tested, an extended model and a reduced model. In the extended model I added the two independent variables through which I aim to extend previous research. As can be seen, the two added variables, bank loans and cash are not significant. Also, adding these two variables almost halves the adjusted R-squared, this might be partially caused by the lack of observations for bank loans. Therefore, given the lack of explanatory power of the two additional variables added, the further analysis of the amount issued will only focus on the reduced model.

Table 5.1 Summary Statistics

The issuance and maturity data span over 2015 and 2016. The remaining variables concern data for 2014 and 2015. Data on issuances is obtained from Thomson while the balance sheet data is obtained from ORBIS. The total sample contains bonds issued in euro by eurozone domiciled corporates. The defining characteristic of the experiment group is that these are investment grade bonds from eligible industries with maturities ranging from six months to thirty years.

Group	Statistics	Average Maturity	Weighted Average Maturity	Issuance/Assets	Total Assets	Market to Book	Leverage	Net Income	Current Ratio	Cash	Bank Loans
Control Group	N	325	325	274	274	235	85	274	86	86	69
	mean	11,02	8,42	.04	6,10E+11	0,20	0,63	5,62E+09	1,25	3,06E+10	3,23E+09
	sd	16,44	15,08	.11	1,76E+12	0,25	0,16	4,95E+10	0,74	1,85E+11	6,77E+09
	min	1,10	0,33	.00	4,49E+08	0,01	0,29	-6,77E+09	0,15	6137000	0
	max	100,00	100,00	.85	1,71E+10	1,97	0,99	7,87E+11	3,53	1,37E+12	3,91E+10
Experiment Group	N	164	164	154	154	146	147	154	153	153	91
	mean	10,02	8,72	.05	4,22E+10	0,85	0,64	1,22E+09	1,28	3,36E+09	2,57E+09
	sd	12,86	13,16	.07	5,01E+10	1,03	0,16	2,45E+09	0,74	4,60E+09	3,59E+09
	min	1,08	0,70	.00	5,76E+08	0,09	0,00	-8,78E+09	0,10	3000000	0
	max	99,99	100,00	.75	2,79E+11	11,18	1,03	1,02E+10	5,03	3,12E+10	1,57E+10
Total	N	489	489	428	428	381	232	428	239	239	160
	mean	10,68	8,52	.04	4,06E+11	0,45	0,63	4,03E+09	1,27	1,32E+10	2,85E+09
	sd	15,33	14,46	.10	1,43E+12	0,74	0,16	3,97E+10	0,74	1,12E+11	5,20E+09
	min	1,08	0,33	.00	4,49E+08	0,01	0,00	-8,78E+09	0,10	3000000	0
	max	100,00	100,00	.85	1,71E+13	11,18	1,03	7,87E+11	5,03	1,37E+12	3,91E+10

First of all, in the reduced model the interaction term is not significant. This means that the first sub-hypothesis, that CSPP caused corporates to issue larger amounts of debt cannot be confirmed. However, this does not disprove that there has been a larger number of issuances.

Secondly, market to book and net income are significant at the 1% level. The signs of these significant independent variables are as expected. A higher market to book, meaning more growth options, indicate that more debt can be issued in the year thereafter. Given that the mean market to book is 0.45% for the total sample, this translates to a 2% difference in the amount issued as a percentage of the total assets for the average corporate due to having growth options available. The mean amount issued as a percentage of total assets is 4%, which makes the 2% difference in the sizeable since it implies that the average corporates issued roughly 50% more debt due to having growth options available. Net income has a positive sign as well, which means that a higher net income leads to a more issuance in the following year. However, given the low magnitude of the coefficient of net income versus the mean of net income in the summary statistics, the effect of net income is negligible for the average corporate.

5.3 Maturity Issued

For the regressions regarding the maturity, several models are shown in table 5.3. Firstly, an extended model is tested versus a reduced model. The extended model contains the variables cash and current ratio through which this study aims to complement previous research. Similar to the analysis of the amount issued, adding these two variables does not seem to increase the R^2 nor the adjusted R^2 and since these variables are not significant as well, the reduced model will be used for further analysis. Contrasting to the amount issued models, the R^2 are a full magnitude lower for the maturity models, indicating a lack of explanatory power for these models.

Furthermore, unlike in the amount issued analysis, the interaction term appears significant at a 5% level for the reduced model. Surprisingly with a negative coefficient of roughly 9 and given that the average maturity is roughly 10 years, this is a sizeable decrease. This would effectively mean that CSPP triggered eligible companies to issue much more shorter dated bonds which would not be logical since one would expect corporates to issue longer dated debt in times of artificially lower yields. Given this result, further analysis is warranted.
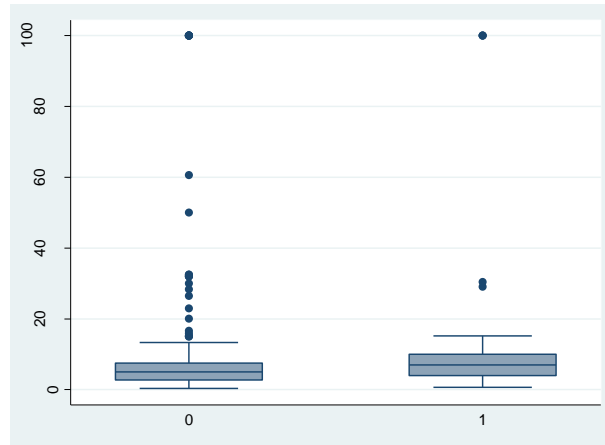
Figure 5.1 Boxplot Weighted Average Maturity

As explained before, there are several issuances with a perpetual maturity that was equated to a 100 years for the ease of doing calculations and with the second highest maturity being 60 years. However, none of these perpetual bonds belonged to the experiment group after the announcement date.

Analyzing the boxplot in figure 5.1 shows that the control group has many more outliers than the experiment group. In order to exclude whether the significance of the interaction term is driven by outliers, the extended model is rerun but then without the observations that have a perpetual maturity. The third model in table 5.3 shows the regression output without perpetual maturities. Now, the interaction term is not significant anymore which indicates that the significance of the interaction term was indeed driven by outliers in the previous regressions. This means that the second hypothesis, that CSPP caused corporates to issue longer dated bonds, cannot be confirmed. With respect to significance of the other explanatory variables, neither net income nor leverage nor market to book have significant explanatory power.

As a robustness check, the average maturity is analyzed without weighing it by principal per quarter but rather by weighing each issuance equally per quarter, see the appendix for the output. Doing so does not give a significant interaction term and neither are the other explanatory variables significant.

Furthermore, dropping observations does not lead to any changes in the analysis for the amount issued. The table is available in the appendix.

Table 5.2 Amount Issued

This table provides the output of OLS regressions on the Amount Issued/ Total Assets in the years 2015 and 2016. The specification is a difference in difference regression with the explanatory variables having data from 2014 and 2015. The interaction term is 1 for eligible issuances during the treatment period which is from the 2nd quarter up to and including the 4th quarter of 2016.

	Extended Model (1)	Reduced Model (2)
Interaction Term	-0.00613	-0.0182
	(0.0252)	(0.0202)
Group Dummy	-0.00827	-0.0293
	(0.0237)	(0.0185)
log(Total Assets)	-0.0401***	-0.0378***
	(0.00933)	(0.00442)
Market to Book	0.0132	0.0461***
	(0.00202)	(0.00679)
Leverage	0.0750	0.0280
	(0.0565)	(0.0409)
Net Income	2.29e-12	2.90e-13***
	(4.29e-12)	0
Cash and equivalents	3.07e-12	
	(2.00e-12)	
Bank Loans	-2.86e-13	
	(1.70e-12)	
Constant	0.8310***	0.7422***
	(0.2091)	(0.1214)
Observations	148	225
R-squared	0.443	0.537
Adjusted R-Squared	0.288	0.463
Time Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Table 5.3 Maturity Issued

This table provides the output of OLS regressions on the weighted average maturity in the years 2015 and 2016. The maturity is weighted by the amount of principal in the total amount of principal issued in the same quarter by the same corporate. The specification is a difference in difference regression with the explanatory variables having data from 2014 and 2015. The interaction term is 1 for eligible issuances during the treatment period which is from the 2nd quarter up to and including the 4th quarter of 2016.

	Extended Model	Reduced Model	Reduced Model without Outliers
Interaction Term	-9.692**	-8.777**	-0.372
	-4.480	-4.351	-1.825
Group Dummy	1.471	0.831	-0.671
	(-4.090)	(-3.986)	(-1.670)
log(Total Assets)	0.866	0.589	0.133
	(-1.014)	(0.951)	(0.400)
Market to Book	-1.054	0.804	0.485
	(-2.598)	(-1.461)	(0.607)
Leverage	4.249	7.918	0.959
	(-9.617)	(-8.809)	(-3.735)
Net Income	1.42e-11	-1.63e-11	-9.56e-12
	(4.33e-11)	(2.23e-11)	(9.29e-12)
Cash	-1.79e-11		
	(2.23e-11)		
Current Ratio	-1.162		
	(-1.734)		
Constant	-13.78	-10.51	1.527
	(27.78)	(26.14)	(10.91)
Observations	148	225	144
R-squared	0.172	0.165	0.125
Adjusted R-Squared	0.028	0.030	-0.031
Time Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$			

6. Conclusion

The main hypothesis of this thesis is that CSPP induced corporates to alter their bond issuance structure. To answer this question, the amount of bonds issued and their maturity is analyzed for eligible bonds after the announcement. For neither the amount nor the maturity do I find significant effects for CSPP. Therefore I do not find support for the main hypothesis of this thesis that CSPP altered the issuance behavior of corporates. However, as mentioned before, it can still be a possibility that CSPP increased the number of issuances. This would be a topic for further research, especially since the ECB mentions this as a consequence of their purchasing programs in their economic bulletins. Knowing that CSPP insofar did not have a significant impact on either the amount or the maturity of bonds issued by corporates, a better judgement call can now be made in deciding if the benefits of CSPP outweigh their supposed drawbacks. In addition, this thesis does find support for the notion that growth options impact the amount issued by corporates, as the book to market ratio is significant.

Furthermore, this research can be improved by taking into account the effect of refinancing. As many companies issue bonds simply to replace other maturing bonds, this effect needs to be corrected for since it does not increase the total amount of debt for a company. Next to that, having access to a larger database, the research can be extended to take eurozone domicile companies whom issued USD denominated bonds as a control group rather than ineligible euro denominated debt. This because there are indicators that CSPP has had spillover effects due to the hunt for yield by investors. Because ineligible euro denominated debt is more susceptible to spillover effects than USD denominated bonds, it mutes the effect of CSPP. Research on corporate bond buying programs in the US support the notion that there are spillover effects with purchasing programs. Lastly, due to time considerations this research did not check whether a changes specification would've produced the same results as the levels specification that is used in this research. So this would be another area for improvement.

A1. Appendix

A1.a Correlation Matrix

	Log (Total Assets)	Market to Book	Leverage	Net Income	Cash	Bank Loans	Current Ratio
logTA	1						
MB	-0.0828	1					
Leverage	0.0396	-0.2555	1				
NI	0.3362	0.2329	-0.1584	1			
CASH	0.6766	-0.1597	0.1971	0.2577	1		
BL	0.2699	-0.1078	0.1279	0.2066	0.0501	1	
CR	-0.0100	0.0557	-0.2538	0.0526	0.0639	0.0520	1

A1.b Average Maturity

This table provides the output of OLS regressions on the average maturity in the years 2015 and 2016. The maturity is weighted equally in case there are multiple issuances per quarter per corporate. The specification is a difference in difference regression with the explanatory variables having data from 2014 and 2015. The interaction term is 1 for eligible issuances during the treatment period which was from the 2nd quarter up to and including the 4th quarter of 2016.

	Extended Model
Interaction Term	0.117
	(-2.483)
Group Dummy	-4.364*
	(-2.273)
log(Total Assets)	1.154**
	(0.544)
Market to Book	0.678
	(0.826)
Leverage	-3.317
	(-5.082)
Net Income	-2.72e-11**
	(1.26e-11)
Constant	-16.52
	(14.84)
Observations	144
R-squared	0.1929
Adjusted R-Squared	0.0598
Time Fixed Effects	Yes
Country Fixed Effects	Yes
Industry Fixed Effects	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

A1.c Amount Issued

This table provides the output of OLS regressions on the Amount Issued/ Total Assets in the years 2015 and 2016. The specification is a difference in difference regression with the explanatory variables having data from 2014 and 2015. The interaction term is 1 for eligible issuances during the treatment period which was from the 2nd quarter up to and including the 4th quarter of 2016.

	Reduced Model
1.TimeDummy#1.ExperimentGroup	-0.0196
	(0.0207)
Group Dummy	-0.0286
	(0.0189)
logTA	-0.0378***
	(0.00453)
MB	0.0462***
	(0.00689)
Leverage	0.0321
	(0.0424)
NI	2.91e-13
	(1.05e-13)
Constant	0.739***
	(0.124)
Observations	144
R-squared	0.535
Adjusted R-Squared	0.459
Time Fixed Effects	Yes
Country Fixed Effects	Yes
Industry Fixed Effects	Yes
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

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