



CSPP: measuring the announcement impact

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Abstract

We analyze the impact of the European Central Bank (ECB) announcement regarding the start of direct corporate bond purchases through the Corporate Sector Purchase Programme (CSPP). For the Euro area the announcement led to a generalized yield decrease. Through a Difference-in-Differences (DiD) methodology, we document that the impact of the announcement on non-eligible bonds' yields was greater than on eligible ones. When controlling at credit rating and country level, the evidence that the announcement caused a partial mitigation on the decrease of eligible bonds' yields is even greater. Thus our analysis provides support for a dominance of CSPP indirect effect and evidence in support of the portfolio rebalancing theory. For the case of Portugal, the announcement had a more positive effect over CSPP-eligible securities.

Keywords: corporate, CSPP, ECB, Portugal, quantitative easing, unconventional monetary policy, yields

Preface

This dissertation represents a personal achievement. It is a long time goal that will shape both my professional career and personal life, as it will always remind me that everything is possible if we put our effort into it.

First, I would like to thank my family, especially my mother, Fátima, for always believing in me and for giving me the strength and motivation to carry through, in this dissertation as well as in life. For my sisters, Ana and Carolina, a heartfelt thank you for helping me to be better every day and never stop making me proud. A special thank you to Filipe as well for all the help and comprehension.

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1. Introduction

Almost a decade after the devastating subprime crisis that stroke the United States (U.S.), an event that many believe to be the embryo of the European Sovereign Debt Crisis, the Governing Council of the European Central Bank decided to implement one of its ultimate weapons: the Corporate Sector Purchase Programme (CSPP).

Europe was going through a period where it was completely bursting at the seams. In 2011 the Financial Crisis Inquiry Commission mentioned in their post-crisis report¹ that the U.S. had “a 21st-century financial system with 19th-century safeguards”. The same applied to Europe that had many challenges to be addressed but did not have the correct instruments to tackle them, namely: the financial fragmentation that was dominating the euro area, the interbank market that was only functioning within countries rather than across countries, the financial regulation that needed a severe recalibration or the fact that risk-free short-term nominal interest rates were really close to the zero lower bound. In addition, some peripheral countries like Portugal, Spain or Greece needed to improve their economic and financial resilience, after being in the eye of the storm, in 2012, during the euro area sovereign debt crisis. Both Portugal and Greece lost access to financial markets and other peripheral countries were in the eminence of going through the same path, which led to the establishment of the European Financial Stability Facility (EFSF) and European Stability Mechanism (ESM) financial assistance programmes. Portugal regained its capacity to raise money in the open market only in 2014.

In an effort to restore markets’ trust and the confidence on the common currency, the ECB had to resort to a broad range of non-conventional monetary policy instruments. Security Market Purchases (SMP), Longer-Term Refinancing Operations (LTROs) and Fixed-Rate Full Allotment (FRFA) policies were some of the measures implemented from late 2008 to 2011 to bring the economy and financial integration up and, equally important, push the inflation to its optimal level below, but close to, 2%. However, around mid-2012, the European Central Bank was still not achieving the desired results. Following Mario Draghi’s (President of the ECB) pledge to do “whatever it takes” to preserve the euro, it was time to bring the big guns to the table. The ECB undertook a path similar to the one already taken by its peers - the Federal Reserve (FED), Bank of England (BOE) and Bank of Japan (BOJ) - and announced enhanced quantitative easing measures: a new broad set of large-scale asset purchases², starting with the threat of Outright Monetary Transactions (OMT), to calm down the markets. By August 2014 the ECB had sliced interest rates (Deposit Facility Rate was at -0.10%), offered cheap loans to banks and was

¹ “The Financial Crisis Inquiry Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States”, February 2011.

² In 2008 the FED and BOJ were already executing asset purchase programmes; BOE started in 2009.

considering asset purchases to flush more money into the economy as inflation was around 0.40%, well below the 2% target, and the economy of European Union (EU) countries was still shaky. Pumping the economy with “fresh” cash was the ultimate attempt to attain its inflation target, alleviate financial market distress and stimulate the real economy. Between October and November of 2014 the Covered Bond Purchase Programme 3 (CBPP3) and the Asset-Backed Securities Purchase Programme (ABSPP) were launched. In January 2015 the ECB announces the Public Sector Purchase Programme (PSPP) to go live in March of the same year as the EU was “in a situation in which most indicators of actual and expected inflation in the euro area had drifted towards their historical lows” and it required “a forceful monetary policy response”³.

In March 2016 the CSPP is announced, to be executed starting June 2016. The CSPP – also known as the corporate Quantitative Easing (QE) – was designed to allow the European Central Bank (ECB) to lend money to corporations. The corporate QE served as a vehicle for ECB to inject funds directly into the real economy through the purchase of non-financial corporate bonds (eligible according to a set of specific criteria defined by the ECB). According to the Governing Council⁴ the programme was going to “provide further monetary policy accommodation and contribute to a return of inflation rates to levels below, but close to, 2% in the medium term”. The use of non-conventional monetary policy instruments, like the Extended Asset Purchase Programme (compilation of ABSPP, CBPP3, PSPP and CSPP), intended to relieve monetary and financial conditions in the common currency area and to provide cheap financing conditions for firms and households.

In this study, we intend to analyze the impact of the announcement of direct corporate bond purchases performed by the ECB on bond yields. Further, we aim to conduct a deeper analysis of the spillover effects of the announcement on the credit rating of non-financial corporate securities and measure the impact at country-level. Our dataset refers to the period between January 2016 and September 2017. We use the daily yield changes for a given security with respect to the announcement date to employ a difference-in-differences methodology (DiD) to perform graphic analysis. We also use the daily yield changes as the dependent variable in a regression analysis framework in order to quantify the magnitude of the announcement.

To assign each security to the treatment or control group, we use dummy variables for eligible and non-eligible securities, according to two scenarios: 1) eligible versus non-eligible are distinguished according to the ECB criteria⁵ and 2) eligible versus non-eligible where eligible follows the same criteria as before and non-eligible is comprised by securities that fulfill all ECB criteria except for the credit rating. Figures 1 to 14 illustrate the graphic analysis output and show

³ ECB, 22 January 2015 - https://www.ecb.europa.eu/press/pr/date/2015/html/pr150122_1.en.html.

⁴ ECB, 10 March 2016 - https://www.ecb.europa.eu/press/pr/date/2016/html/pr160310_2.en.htm.

⁵ See Section 3.

an outperformance of non-eligible securities comparing to eligible ones. Figures 1 to 6 refer to the first scenario and Figures 7 to 12 refer to the second scenario. Figures 13 and 14 contain the output of scenario 1 and 2 applied to Portuguese issuances, respectively.

This DiD methodology results support the indirect effect (impact on non-eligible bonds' yields is greater than on eligible ones) and gives rise to the portfolio rebalancing theory: the accommodative monetary policy stance carried out by central banks led to changes in the financial market environment and in asset class characteristics, thus causing investors the need to rebalance their portfolio asset allocation in order to recapture the portfolio's original risk and return characteristics. This in turn may induce investors the need to go for more risky assets (such as non-eligible CSPP securities), giving rise to a "search-for-yield" behavior: "investors seek to offset the lower returns on safer assets either through risk-increasing portfolio shifts or through greater risk-taking on new investments" (BIS, 2018). We show that, with the announcement of the corporate QE, non-eligible bond yields declined roughly more 20 to 30 basis points compared to eligible bonds. Taking into consideration scenario 2, where the credit rating variable is of the utmost importance, this skew towards non-eligible bonds is even more noticeable.

As mentioned before, we use the daily yield changes as the dependent variable to perform a regression for each scenario (alternating the group assignment dummy variable) and use some control factors like time-to-maturity, country or credit rating, among others. We also repeat these regressions using the daily yield of each bond as the dependent variable. Lastly, we regress all hypothesis mentioned before (with the different dependent variables and scenarios) but applied for Portuguese issuances only.

When employing the daily yield of each bond as the dependent variable in robust OLS regressions, the estimated coefficients point that the CSPP announcement mitigated the decreasing tendency on the yields of eligible securities. On a more restrictive scenario (where credit rating is the factor that separates treatment from control group), this mitigation pattern is even more evident. Our analysis provides support for a dominance of CSPP indirect effects and evidence in support of portfolio rebalancing theory. If we use the daily yield changes as dependent variables, our results continue to hold. The case for Portugal is the only section that finds evidence for a greater announcement impact on eligible securities.

This study relates to some previous works that analyze how central bank interventions can affect the real economy (Joyce et al., 2011 and Kapetanios et al., 2012). It belongs to a set of growing literature about the impact of non-conventional monetary policy and the possible emergence of market distortions (D'Amico et al., 2012, Altavilla et al., 2016, Zaghini, 2017, Arrata and Nguyen, 2017, Gambetti and Musso, 2017). This study follows closely the work developed by

Grosse-Rueschkamp, Steffen and Streitz, 2017, Arce, Gimeno and Mayordomo, 2017, and Abidi and Miquel Flores, 2017, that examined thoroughly the CSPP.

The first, Grosse-Rueschkamp, Steffen and Streitz, 2017, employed a DiD approach to study CSPP effects and the corporate bond spreads evolution around the announcement date. They found evidence of a change in the composition of firms' credit, from loan to bond financing for eligible companies, due to the low yields' environment. This can be considered a direct effect of the CSPP. Their results also suggest significant spillover effects concerning financing conditions of non-eligible firms. In turn, Arce, Gimeno and Mayordomo, 2017 analyze the combined effect of CSPP and Targeted Longer-Term Refinancing Operations (TLTROs) on Spanish non-financial firms and document a sizeable reallocation of credit towards smaller firms. They also find evidence that CSPP announcement "raised significantly the firms' propensity to issue CSPP-eligible bonds" as well as spillover effects (increase in the loan financing of firms that do not issue bonds), boosted by the TLTROs. Abidi and Miquel Flores, 2017, apply a regression framework to analyze the risk management divergence, as it is their belief that what the ECB considers eligible and investment grade material for CSPP is not necessarily true for market participants. These authors found evidence for i) improved financial conditions for firms around the market eligibility thresholds, ii) a deterioration in CSPP-eligible bonds liquidity conditions and iii) CSPP not only stimulated firms to issue new and more bonds but also led to a drop in yields of non-eligible Eurozone firms – all conclusions favouring the indirect effect. This outcome supports our conclusions previously mentioned that were obtained from both the DiD methodology and the regression framework output (an indirect effect prominence).

Most of the literature about CSPP diverges on which effect plays a bigger role: the direct or the indirect effect. One major difference across the vary papers that causes different outcomes lies on the granularity of the data collected and we innovate in that field since this study is the first to collect the daily credit ratings of each security from all four ECB-elected credit rating agencies⁶. For instance, Grosse-Rueschkamp, Steffen and Streitz, 2017, only consider the credit rating of S&P. Arce, Gimeno and Mayordomo, 2017, only consider the Spanish universe (reduced dataset considering the programme applies to the entire Eurosystem). Another reason that may induce lack of statistical significance could be the range of the data. This point is even illustrated by Grosse-Rueschkamp, Steffen and Streitz, 2017, who stress that their reduced number of observations after the announcement might be reducing the power of their statistical tests. Our dataset has an abundant size and ranges across a considerable time interval to overcome these difficulties felt by other authors.

⁶ S&P, Moody's, Fitch and DBRS.

The remainder of study proceeds as follows. Section 2 addresses the related literature about the central banks' asset purchase programs and the direct and indirect effects on the real economy. Section 3 details the inception and the main components of CSPP. Section 4 makes a broad approach to the European Non-Financial Corporate Bond Market. Section 5 describes the empirical methodology and data treatment used in this study. Section 6 focuses the effects of CSPP around the announcement date and for the period comprehended between January 2016 and September 2017. Section 7 concludes.

2. Literature Review

In 2008 financial markets worldwide took a large hit: the so-called global financial crisis. The collapse of the American house market and Lehman Brothers bankruptcy triggered global panic and completely devastated Wall Street. From Wall Street to Main Street and from the US to Europe, giving rise to the European sovereign debt crisis.

From 2008 to 2012, several European financial institutions started to collapse, followed by countries bearing an extremely high government debt which led to a general rise in government bond yield spreads. Rating agencies started to downgrade the debt of eurozone countries and bailout funds were given to countries in distress (like Ireland, Greece, Portugal and Spain). The collapse of the euro was almost certain for a lot of investors. Among all the jitters, the European Central Bank (ECB) comes to the rescue and vows to save the common currency and the euro area.

“Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough.” (Mario Draghi, ECB President, July 2012)

The first bold action from the ECB to fight rising interest rates, improve banks' access to credit and ensure proper monetary policy transmission was the announcement of the Outright Monetary Transactions (OMT) in the second half of 2012. Although it was never put to practice, the announcement helped to bring down sovereign spreads. According to Altavilla et al., 2016, its impact was greater in Italian and Spanish bond yields than in French and German ones.

Following periods of prolonged low economic growth and inflation, not being able to achieve an inflation level below, but close to, 2%, in March 2015 the ECB started the Public Sector Purchase Programme (PSPP) which consists of outright purchases, in the secondary market, of euro-denominated investment-grade bonds issued by euro area governments, agencies and European institutions.

PSPP became part of the Extended Asset Purchase Programme (EAPP) as the ECB was already executing two private sector programmes: the Covered Bond Purchase Programme 3 (CBPP3) and the Asset-Backed Securities Purchase Programme (ABSPP). The monthly amount of purchases was of 60 billion euros and the euro area Quantitative Easing (QE) was a reality.

Although EAPP contributed to a large decrease of market rates (Andrade et al. 2016, Kojien et al., 2016), it was not fulfilling ECB's expectations of bringing euro area inflation to the optimal level. The work of Markmann and Zietz, 2017, shows that CBPP3 was not helping to produce the desired outcome as it was introduced in a time that market conditions were steady and participants were able to anticipate it. In addition, non-financial corporations (NFCs) credit market conditions were not the desired so in order to strengthen the transmission of the monetary policy channel and

financing conditions of the real economy, on March 2016, another private sector programme was announced – the Corporate Sector Purchase Programme (CSPP) – to improve the funding conditions for non-financial euro area firms and contribute to its growth. CSPP consists on outright purchases of euro-denominated investment-grade bonds, in both primary and secondary markets, issued by non-financial corporations whose country of risk is in the euro area. At the same time the monthly purchases of EAPP were increased to 80 billion euros.

This new CSPP programme was designed to have two effects: pressure and bring down the yields of corporate-eligible bonds (direct effect) and have an impact on the yields of non-eligible bonds (indirect effect). The portfolio rebalancing channel plays a major role. The ECB's actions will lead to a liquidity squeeze in the credit market (bond scarcity) and investors will have to shift to other asset classes, in particular non-eligible non-financial corporate bonds (Vayanos and Villa, 2009; Hancock and Passmore, 2011; Arrata and Nguyen, 2017).

Another effect is that this scarcity will encourage companies to issue more bonds (Abidi and Miquel Flores, 2017), thus increasing liquidity in both primary and secondary markets and giving non-financial firms the necessary conditions to grow their business, easing financing conditions and putting euro area growth on track (ECB, 2017). According to Abidi and Miquel Flores, 2017, bond issuance is more pronounced for firms whose rating is close to the investment grade/non-investment grade frontier. Their results are opposite to those of Grosse-Rueschkamp, Steffen and Streitz, 2017. Comparing both papers, bonds eligible on one of the studies are not necessarily considered to be eligible on the other because Grosse-Rueschkamp, Steffen and Streitz, 2017, only consider the credit rating awarded by S&P, opposed to Abidi and Miquel Flores, 2017, and to the ECB who consider the best credit rating provided by any of the 4 rating agencies (S&P, Moody's, Fitch and DBRS). In addition, Grosse-Rueschkamp, Steffen and Streitz, 2017, treat data collected at a firm level and CSPP is conducted by the Eurosystem on a bond level.

Further effects of the CSPP are that most of the companies rely severely on bank loans and the programme induces a shift from loan to bond financing (Grosse-Rueschkamp, Steffen and Streitz, 2017). This will create a credit reallocation and thus spillover effects, as banks will redirect these funds to other firms - typically small and medium enterprises (SMEs) or firms without access to the bond market -, an effect amplified by the ECB's Targeted Longer-Term Refinancing Operations (TLTROs) which consisted of cheap long-term financing to credit institutions (Arce, Gimeno and Mayordomo, 2017).

The programmes were supposed to end in March 2017 but the ECB extended the deadline to December 2017 and reduced the monthly pace of purchase to 60 billion euros from April 2017

onwards. On October 2017 the ECB extended once again the deadline to September 2018 and reduced the amount of purchases to 30 billion euros, starting January 2018.

The literature about QE measures conducted by central banks as a transmission channel of monetary policy and a mean of having an effect on the economy is more abundant for the US and UK (Kapetanios et al., 2012; D'Amico and King, 2013) than for the euro area. The full-scale QE in euro area started much later than in the US (2008) and in UK (2009) and the work developed about CSPP, in particular, is still limited. As illustrated before, there are several studies on the effectiveness of the ECB non-standard measures but the findings concerning the macroeconomic impact of APP are still not unanimous and somewhat ambiguous as these do not consider the full-time length of the APP (Darracq Pariès and Kühl, 2016; Gambetti and Musso, 2017).

There is some literature related to the credit rebalancing environment and its importance as a mechanism of policy transmission since bank lending is more volatile and pro-cyclical than financing through bond issuance. An analysis to Europe's financial structure states that its structure is severely bank-biased and this rebalancing channel could be a major push towards market-based intermediation. The bank-biased structure is associated with greater systemic risk and worse growth performance (Langfield and Pagano, 2015) and, although bank loans and bond financing are not perfect substitutes (Ivashina, 2014), this shift could help reduce systemic consequences during times of crises. As some authors noticed, in a situation of huge asset prices volatility, banks will move simultaneously; in an asset price increase period, banks will increase their leverage ratios and take unnecessary risks, while in a period of price drop, deleveraging processes will happen at the same time. The latter will most likely lead to fire sales of assets and defaults, resulting in an economy-wide contagion. Bearing in mind all these factors, Brunnermeier and Sannikov, 2012, and Boissay, Colliard and Smets, 2014, expect that economic activity is more sensitive to asset price movements in bank-based structures rather than market-based.

3. Description of the programme

The European Central Bank started using non-standard measures to address market tensions and fragmentation since the very beginning of August 2007, a period when overnight rates traded at severally high spreads to the Main Refinancing Operations (MRO) rate (the interest rate banks pay when they borrow money from the ECB). Intermediation in the interbank market was failing and the ECB decided to set-up and increase the intermediation through the central bank through some unconventional measures: the Fixed-Rate Full Allotment (FRFA) policy, LTROs with 6-month and 12-month maturity, foreign currency operations and changes in the collateral framework.

The FRFA was introduced in October 2008 in all ECB's refinancing operations for the different maturities. This policy allowed counterparties to have their bids fully satisfied as long as they provided the necessary collateral. According to a speech of José Manuel González-Páramo, member of the Executive Board of the ECB, in October 2011, "the fixed rate full allotment policy has proven a very efficient way of offsetting liquidity risk in the market by ensuring banks' continued access to liquidity" and "is probably the most significant non-standard measure the ECB is implementing". This was a sign that the FRFA policy was fulfilling its purpose and especially because this measure was strengthened, in August 2011, with the LTROs for 6-month and 12-month whose objective was to "further reduce the funding risk faced by the banking system over a longer time horizon", according to ECB sources⁷.

Another non-standard measure put into practice was the foreign currency operations conducted with major central banks worldwide. These transactions helped to steer the markets and to show that international cooperation was a concept still alive and possible to implement. José Manuel González-Páramo also stressed in his speech that the swap arrangements made with the US Federal Reserve were especially important to bring markets back up because these swaps "have allowed us (ECB) to conduct fixed-rate full allotment tenders in US dollars which are aimed at repairing impaired money markets in foreign currency. These operations have been instrumental following the collapse of Lehman, while during the course of 2010 demand in these operations petered out."

Lastly, the collateral framework was reviewed in late 2008. This was triggered not only by the crisis environment that the ECB was facing but also due to the very diverse financial system. The range of eligible assets and counterparties was expanded, all refinancing operations were standardised to accept the same kind of collateral and a policy of loss-sharing in case of a counterparty default was also introduced.

⁷ https://www.ecb.europa.eu/press/key/date/2011/html/sp111021_1.en.html.

Notwithstanding, the Governing Council (GC) of the ECB decided that there was a need for more unconventional measures and so they started the programmes of asset purchasing back in July 2009 with the first covered bond purchase programme (CBPP1). This programme ended 1 year after, when it reached €60 billion, in nominal terms. In 2011 they launched the second programme of this kind (CBPP2) which lasted until 2012 and was terminated with a nominal amount of €16.4 billion.

Between these two programmes, in May 2010 the Securities Markets Programme (SMP) was announced. The purpose of SMP was to address certain market segments that were under distress and restore the monetary policy transmission mechanism. The purchases conducted were sterilised, meaning they were intended to be neutral and not supposed to change the central bank liquidity (opposed to APP). The SMP was terminated in 2012 with the announcement of the Outright Monetary Transactions (OMT) programme, a “bazooka” the ECB had in place in order to do “whatever it takes” to calm financial markets and recede market fragmentation. Although it was never used, the announcement had the desired effects and helped to lower yields. One year later, in 2013, Benoit Coeuré (member of the Executive Board of the ECB) reinforced the idea, stating that “OMTs are not just words: the ECB is fully prepared to use them”.

In June 2014 the ECB announced its first series of Targeted Longer-Term Refinancing Operations (TLTRO I). The ECB linked the amount that banks can borrow to their loans to non-financial corporations (NFCs) and households to push banks to pump liquidity into the economy.

In the same year it was also the time for the ABSPP to come to place and, one year later, the ECB announced it would start to acquire public sector securities (PSPP). The combined purchases would amount to €60 billion per month. However, as previously stated, the recovery of the Eurozone was still weak and the programmes implemented so far were lacking effectiveness, especially in bringing inflation back to levels below, but close to 2% and in producing effects in the real economy and thus the GC announced a further expansion on 10 March 2016: the CSPP. The total monthly amount was provisionally increased to €80 billion and a second series of Targeted Longer-Term Refinancing Operations was launched (TLTRO II).

The details of the corporate programme were publicly released on 21 April 2016, among which the eligibility criteria:

- Securities eligible must be acceptable as collateral for monetary policy credit operations.
- Purchases may be carried out in both primary and secondary markets.
- Assets must be denominated in EUR and purchases must be conducted at a yield to maturity (or yield to worst) above the Deposit Facility Rate (DFR, at the moment -0.40%).
- The location of incorporation of the issuer must be in the euro area.

- The issuer's ultimate parent location is not taken into consideration.
- The issuer or its parent company may not be a credit institution neither a public-undertaking.
- Bonds must have a minimum remaining maturity of 6 months and a maximum of 30 and 364 days at the time of purchase.
- The issue must have a minimum credit rating assessment of BBB- or equivalent, provided by at least one of the four ECB-acceptable agencies, namely Fitch, Moodys Standard & Poor's and DBRS.
- There is no minimum issuance volume.
- Although securities from several jurisdictions are bought, Belgium, Germany, Spain, France, Italy and Finland are the only National Central Banks (NCBs) that execute the programme.
- Assets are held until maturity and principal is reinvested.
- In case of a downgrade, the Eurosystem is not required to sell its holdings.

CSPP purchases started effectively on 10 June 2016.

In order to help reduce market distortions and bond scarcity, from July 2016 onwards, all the bonds acquired by the Eurosystem were made available for securities lending purposes, thus contributing to an increase in market liquidity. Each NCB publishes a list of the ISINs⁸ acquired on its own website.

From the inception of the programme until September 2017, the Eurosystem was holding 114658 million of the available universe of securities, 15% of which acquired in primary market purchases⁹.

⁸ International Securities Identification Number.

⁹ Figures disclosed on ECB website:

<https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html#cspp>.

4. The European Non-Financial Corporate Bond Market

While most of the literature focuses on the U.S. non-financial corporate bond market, the European one deserves a deeper analysis as the structure of its financial system is very different. Comparing the European to the U.S. non-financial corporate bond market, the European issuance activity is three times smaller (Bloomberg and Dealogic data). This is in line with Langfield and Pagano, 2016, who show that Europe has a heavily bank-biased structure, opposed to an American market-biased structure. This is strengthened by the fact that in 2017 only 3% of Eurozone large companies issued bonds¹⁰. This statistic drops to 1% when talking about SMEs. Analyzing euro area companies' financial debt structure, for the same period, only 12% was composed by bonds. For the U.S., this figure jumps to 48%.¹¹

Langfield and Pagano, 2015, reported that the European bank-bias is severely related to political factors and policy choices, not being the case for the U.S. reality. Their study was inspired by the work of Calomiris and Haber, 2014, who also focused on this connection between banking and politics. However, Langfield and Pagano go further and blame European governments for what Véron, 2013, introduced as “banking nationalism”, meaning that governments are responsible for nurturing “the birth and growth of mega-banks that act as champions in competition with foreign banks”. They also mention that there is some sort of preferential treatment given to these banks and that governments put an effort on ensuring some banks' survival as in some countries banks are publicly owned or politicians appoint their management.

In addition to the political support for “national champions” banks, the European Systemic Risk Board (ESRB)¹² on its 2014 report¹³ mentions two other economic factors that led to this European overbanking phenomenon, namely (i) public support for banks and inadequate prudential supervision and (ii) technological innovations and increased competition in banking.

To fight this growing overbanking event, the ESRB stresses 3 policy innovations particularly noteworthy: (i) the fourth “capital requirements” legislative package, launched in July 2013, that included a regulation (CRR) and a directive (CRD) and brought to the EU the expected benefits of the Basel III agreement. This legislation created new legal powers for authorities to impose additional capital requirements and thus an “an additional systemic risk buffer on all (or a subset of) banks”; (ii) the Single Supervisory Mechanism (SSM) which attributed bank-supervisory powers to the ECB, starting November 2014; (iii) in April 2014, the establishment of the Single Resolution Mechanism (SRM) and implementation of the bank recovery and resolution directive

¹⁰ Source: ECB Survey on the Access to Finance of Enterprises (SAFE).

¹¹ “Boletim Económico”, Banco de Portugal, May 2018.

¹² Established on December 2010 as a response to the financial crisis.

¹³ “Is Europe Overbanked?”, June 2014.

(BRRD), allowing authorities, from 2016 onwards, to “bail-in” the eligible liabilities (including unsecured creditors) of banks subject to resolution.

This set of measures helped to fight the overbanking syndrome and encouraged a greater openness to financial markets and to a market-based orientation, similar to the U.S. conditions.

Twice a year the ECB and the European Commission conduct a Survey on the Access to Finance of Enterprises (SAFE) to obtain information on the latest developments in the financial situation of enterprises and to document trends in the need for and availability of external financing. The SAFE report of 2017 (with reference to the period April to September 2017) established that, for SMEs, since 2015, “short-term bank finance (credit line/bank overdraft/credit card) remained the most popular instrument by some margin, followed by leasing and long-term bank loans” vis-à-vis market-based instruments and other sources of finance. This preference and easiness of SMEs to obtain a bank loan can potentially be a consequence of CSPP’s direct effect, meaning that the pressure for corporate yields to decrease allowed large companies to finance themselves through debt issuance. Consequently, banks are punished with excessive cash amounts on its balance sheets that need to be lent out and SMEs become banks’ escape room.

A study conducted in 2017 by the European Commission¹⁴ found out that corporate bond markets are becoming more and more appealing to companies due to 5 main reasons:

1. Agility: Quick access and implementation compared to bank loans; in addition, it is possible to take advantage of the current market conditions
2. Diversification: Reduces bank lending dependence and increases the exposure to a broad new range of investors
3. Flexibility: The terms of issuance (tenors, structures, conditions, covenants, timing) can be customized to perfectly fit each company’s needs
4. Pricing: depending on market conditions, pricing can be more attractive and competitive than the ones fixed by banks
5. Tenors: Provides access to longer maturities than loan markets

The same study also illustrates that “in many instances, EU banking markets still offer cheaper sources of financing than bond markets”. However, non-financial corporations are increasing its appetite for bonds (opposed to bank loans). According to ECB Statistical Data Warehouse, from 2016 to 2017, the total amount of outstanding debt securities of NFCs in the Eurozone increased, on average, around 17% (from EUR 916 billion to EUR 1069 billion)¹⁵. The countries that most contributed to this increase were mostly peripheral such as Cyprus, Ireland, Greece and Spain¹⁶.

¹⁴ “Analysis of European Corporate Bond Markets”, European Commission, November 2017.

¹⁵ See Figure 15.

¹⁶ Eurostat - Financial balance sheets - updated on 13/10/2018 and extracted on 14/10/2018.

When we consider the period between January 2016 and September 2017, debt securities net issuance hit its maximum in March 2016 (the announcement month) and later in July 2017.

On the other hand, for the same period, the amount of loans provided to NFCs also increased, almost doubling, as illustrated by Figure 16. The European Commission's 2017 SAFE also found out that "SMEs continued to rank access to finance as their least important concern, suggesting further improvements in their financing conditions". This flow increase might be justified by the fact that banks do not want to keep cash on their balance sheets and so they channel those funds into the economy by lending to small and medium enterprises, companies that cannot easily access financial markets (and thus are neglected in the CSPP actions). SMEs represent 99% of all businesses in the EU¹⁷ and according to Grosse-Rueschkamp, Steffen and Streitz 2017, this shift to bond debt for CSPP-eligible companies had a profound impact on the real sector. The increase in loans is perfectly plausible as the authors also stress that "CSPP had significant spillover effects on the financing conditions of non-eligible firms" as banks redirect lending to these firms.

These results corroborate the ones achieved throughout the following sections. Comparing this analysis with the outcomes obtained from regressions 1 and 2 below, non-financial corporations eligible for CSPP had an incentive to increase their issuances' amount, as there is a significant decrease in the borrowing cost. On Figure 17 it is observable that the interest rates charged by monetary financial institutions (MFIs, except central banks and money market funds) decreased consistently.

Looking to the broader picture, the wide-ranging impact of CSPP on NFCs can be extrapolated from the iBoxx Euro Non-Financials Indices. The iBoxx Indices presented in Figure 18 represent the corporate fixed income market for Euro and Eurozone-currency denominated bonds. The basket of eligible bonds is comprised by fixed and zero-coupon bonds, step-ups, event-driven bonds, dated and undated callable subordinated corporate bonds (fixed-to-floater bonds that change to floating rate note after first call date) and soft bullets. All bonds need to have an average rating of investment grade (ratings from Fitch Ratings, Moody's and Standard & Poor's are considered). For the current analysis, it was extracted the asset-swap spread (ASW) measured by the iBoxx EUR Non-Financials (all ratings) and by the iBoxx EUR Non-Financials for each rating sector ranging from AAA to BBB. We use the ASW in order to measure the implied credit risk.

The impact of the CSPP announcement (March 10th, 2016) is evident as there is, around this date, a decreasing tendency in all indices. Most importantly, it is observable in Figure 18 that the ASW spread between AAA and BBB indices tightened about 20 basis points (bps), from over 100bps at the announcement date, to 80bps at the effective starting date of CSPP (June 8th, 2016). From

¹⁷ http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en.

this date onwards, the spread tightened another 20bps, to roughly 60bps. The announcement effect on A-rated securities was not as impactful as the spread between AAA and A-rated securities only decreased about 10bps from the announcement date onwards.

The analysis conducted in the following sections, although aligned with the outcome from the iBoxx indices, produces much more insight and accurate information. The index analysis complements the results obtained but the study was not conducted nor supported on corporate bonds indices as these do not account for important changes in rating decomposition and include a mix of bonds like non-European euro-denominated bonds, bonds with embedded special features or bonds with very different maturities. As such, in the following sections we will explore in detail bond characteristics, to accurately distinguish eligible from non-eligible bonds.

5. Methodology and data treatment

a. Methodology to be used

To estimate the effect of the CSPP announcement on corporate yields it will be used a difference-in-differences methodology (DiD). The data used in the analysis corresponds to all non-financial European securities available in Bloomberg, with a maturity date equal to or later than January 1st, 2016. The dataset gathered is focused on the bond level rather than firm level (as opposed to the work of Grosse-Rueschkamp, Steffen and Streitz, 2017 or Arce, Gimeno and Mayordomo 2017). This analysis at bond level is extremely important and will allow to produce more accurate results: if it were performed at a firm-level, some firms may not have a credit rating assigned and thus would be excluded from the sample but their bonds could still be eligible for CSPP. A firm that is not rated could still have bonds eligible for the programme as long as its bond belong to the investment grade category and the issuance is guaranteed by the sovereign government. This methodology (bond level granularity) is expected to overcome some of the disadvantages previously mentioned and found in the works of Grosse-Rueschkamp, Steffen and Streitz, 2017, or Abidi and Miquel Flores, 2017.

The graphic analysis to be conducted consists in treating the sample according to certain criteria and in grouping the sample securities into treatment and control groups, in order to draw two comparison scenarios:

1) Eligible versus non-eligible securities

The different bonds will be divided between the treatment and control groups according to the eligibility criteria set out by the ECB (as outlined in the previous section), i.e., a bond eligible to be bought under the CSPP will be part of the treatment group; a non-eligible bond will belong to the control group.

2) Eligible and Investment-grade securities versus Securities that fulfil all eligibility criteria except for the rating

In this case the bonds used in the control group must fulfil all the criteria, as announced by the ECB, excluding the rating. The bonds will be split across the treatment and control groups according to the rating criteria, meaning that if they comply with all the criteria they will go the treatment group (same conditions as used for the treatment group in scenario 1); if securities comply with all the CSPP criteria outlined by the ECB except for the rating, they will be assigned to the control group.

The treatment group is exactly the same in both scenarios and is defined according to the CSPP eligibility criteria, meaning the treatment group is composed by securities that have a yield above -0.40%, a best-rating equal to or above BBB-/Baa3, a tenor between 6 months and 30 years and

364 days and an issuer who is located in a Eurozone country. In the first scenario all observations that do not fit the treatment group criteria belong to the control group. For the second scenario, the control group consists on observations that have a yield above -0.40%, a best-rating below BBB-/Baa3 and a time left to maturity between 6 months and 30 years and 364 days.

In this last scenario the only criteria that differs from the treatment group is the rating. The purpose of this analysis is to have a greater insight on the impact of the credit rating assigned to each bond and draw some conclusions on the behavior of the portfolio rebalancing mechanism. This line of thought is similar to the one of Abidi and Miquel Flores, 2017, where they point out that investors have a different perception from the ECB in terms of how risky a bond is, namely around the Investment Grade boundary. There are several bonds that are classified by the ECB as Investment Grade (because at least one agency assigns them a credit rating of BBB-/Baa3 or above) but investors believe that it should be considered as High Yield and so the authors developed a way of measuring this “risk management wedge”.

In order to fully analyze and understand the impact of CSPP, the change in yield on a given day with respect to the yield on the announcement day will also be used, thus making the announcement date the starting point and equal to zero.

For each scenario, in addition to a graph concerning the whole sample time horizon (from January 2016 to September 2017), there will be a focus on five additional windows around the announcement date. The first window will be 30 days before and after the announcement date; the second will be 10 days before and after the announcement date; the third and fourth will be 10 and 5 days before and after, respectively; the fifth window will be 3 days before and 7 days after the announcement date (as done by Grosse-Rueschkamp, Steffen and Streitz, 2017). It should be noted that all days that are added or subtracted to the announcement date are trading days.

b. Type of data collected and treatment applied

A total of 6,061 ISINs were extracted. The yields of the securities in the analysis were collected on a daily basis for a timeframe between January 2016 and September 2017. The Yield-To-Worst (YTW) and Yield-To-Maturity (YTM) were both retrieved from Bloomberg and Thomson Reuters databases. The sample was initially built with Bloomberg data, starting with the YTW. A few bonds bear some kind of optionality and the YTM ignores these options and assumes that they will not be exercised. We prefer to use the YTW over the YTM as it assumes the worst-case scenario assumptions. Whenever YTW was missing, the YTM for that bond was used. If there were any securities without any Bloomberg data for all sample days, Thomson Reuters data was used also giving preference to YTW over YTM. Other bond characteristics such as credit rating, issuer, country of incorporation, maturity and tenor were also retrieved from Bloomberg.

For each ISIN it was collected the credit rating assigned on each day, by all four agencies (S&P, Moody's, Fitch and DBRS) that the ECB considers eligible for criteria purposes. This is a main driver that can impact results and originate differences relative to other studies developed on the matter. Some authors like Zaghini, 2017, do not consider the rating assigned by DBRS or only consider the rating assigned by one credit rating agency¹⁸.

A numerical scale was applied to ratings, ranging from 0 (not rated or missing) to 22 (AAA/Aaa). With these four rating vectors per ISIN for each day, a single rating variable was created with the highest rating assigned on each day, as the ECB only requires that at least one agency-rating is investment grade. The harmonized rating scale can be found in Table 7.

To have a coherent sample, all securities that were registered outside the Eurozone were eliminated. All perpetual bonds were also dropped from the sample as well as convertible bonds since the ECB neglects these types of securities in the CSPP programme. From the initial 6,061 ISINs, there are 4,765 ISINs left.

As a way of further reducing the impact of the more extreme observations, the yield variable was winsorized at the 5th and 95th percentiles. In addition, this variable was trimmed to expunge the remaining outliers effect.

For each bond the following formula was applied:

$$\Delta \text{yield (in percentage points)} = \text{yield}_t - \text{yield}_0$$

where yield_t refers to the yield of the security on day t and yield_0 refers to the yield of the security on the CSPP announcement date. Then bonds were assigned to their respective treatment or control groups and an average per group was calculated thus allowing to graph the differences for each scenario as previously mentioned.

¹⁸ Grosse-Rueschkamp, Steffen and Streitz, 2017, only consider the credit rating assigned by S&P; Arce, Gimeno and Mayordomo 2017 only analyzed the ratings assigned to Spanish bonds.

6. Results

a. Descriptive Statistics

Table 1 exhibits the descriptive statistics for the complete dataset. It is observable that the initial yield variable had some extreme values (mainly related to firms that went bankrupt thus spiking its bond yields). After the winsorization and trimming processes described above, the average yield for corporate bonds is about 1.70p.p.. One can also observe that bonds have, on average, a credit rating of CCC+/Caa1. This is corroborated by the fact that most of the sample is composed by non-investment grade securities.

The descriptive statistics for the yield behavior concerning the first scenario (where it is compared eligible bonds vs. non-eligible bonds to be acquired under CSPP) are presented in Table 2. The instruments that belong to the treatment group have, on average, a yield of 0.82p.p. and a credit rating equal to A-/A3. The average daily yield change for the treated is -0.43p.p.. For the control group, composed by CSPP non-eligible securities, the yield and credit rating are, on average, 2.39p.p. and CCC-/Caa3, respectively. The average daily yield change for the control group is -0.92p.p.. It is possible to infer that the impact of the corporate quantitative easing is greater on the control group rather than on the treatment group. The period under analysis is from January 2016 to September 2017.

Regarding the second scenario, Table 3 presents its summary statistics. The yield for securities belonging to the treatment group is, on average, 2.52p.p. lower than the yield of control securities (0.82p.p. vs. 3.34p.p.). Bonds in the treatment group are investment grade and have, on average, a rating of A-/A3, while bonds in the control group are non-investment grade with an average rating equal to CC/Ca. Analyzing the average daily yield change for both groups, treated securities decreased on average 0.43p.p. while control securities decreased, on average, 0.76p.p., for the same period as before (January 2016 to September 2017). This result is in line with the one obtained from the previous scenario.

b. Graphic analysis

In the first scenario it is analyzed the yield change between treatment and control groups defined according to the CSPP eligibility criteria. Prior to the announcement, Eurozone high-yield securities were underperforming the investment grade ones. However, there is a huge fluctuation around 20 days before the announcement date, as the change in yield for the control group starts to decrease at a higher pace. This behavior could be related to some comments released by the press about which decisions the ECB would announce at its March 10, 2016 meeting, after in January of the same year, at an ECB meeting, Mario Draghi stated that “there are no technical limits” to the measures that could be used. On the days before the announcement date, there were a lot of jitters¹⁹ and presumptions from analyst and market commentators about the options that were on the table for the ECB and this could have been on the origin for the volatility seen in the yield change.

After the announcement date, the control group outperforms the treatment group. This effect is more pronounced on the Figures 5 and 6 ([-3, +3] and [-3, +7] day windows, respectively). On the first three days after the announcement the yields for treatment group securities remain practically unchanged. The same does not apply to the control group where a clear decline pattern is visible (yields decrease around 20 basis points) and this pattern is even more pronounced after the fourth day, with the control group yields declining between 30 to 40 basis points while the effect on treatment group is a decrease around 10 basis points.

These results are opposed to the ones reported on related literature referenced before like Mayordomo et al., 2017, Grosse-Rueschkamp, Steffen and Streitz, 2017, or Zaghini, 2017. However, the results illustrated above are aligned with the ones obtained by Abidi and Miquel Flores, 2017, where the impact on yields of non-eligible bonds is greater than eligible bonds, meaning that the indirect effect of the CSPP supplants the direct one. Taking into consideration the entire timeframe, it is the control group that experiences the sharpest decrease in yields. This is evidence for the portfolio rebalancing channel theory, as the purchases conducted by the ECB create a shortage of supply and give rise to a scarcity in the market, thus pointing investors to pick other (non-eligible) bonds to their own portfolios, increasing their price and compressing their yields. The presence of this rebalancing effect is one of the most important factors in the transmission of QE policies, as it helps to fight possible market distortions induced by the central bank purchases (also illustrated by Altavilla et al., 2015, and Musso and Gambetti, 2017, for the euro area, Joyce et al., 2011, for the UK and D’Amico et al., 2012, for the US). If the corporate purchase programme activity was distorting market functioning, the treatment group should have had a greater impact than control group. However, according to Boermans and Keshkov, 2018,

¹⁹ <https://www.poundsterlinglive.com/eur/3721-ten-policy-measures-the-ecb-might-adopt-in-march>.

and in line with portfolio rebalancing models, a distortion is happening as there has been an impact on the dispersion of bond ownership with groups of investors being displaced asymmetrically due to the activity carried out by the central regulator.

Analyzing the outcome of the second scenario, securities that fulfil all the necessary criteria to be eligible except the investment grade rating (the control group) exhibit a better performance than eligible bonds after March 10th, 2016. During the days prior to the announcement, securities that belong to the control group experienced some volatility while treatment group yields percentage change had a decreasing trend all the way. Roughly 20 days prior to the announcement, it is possible to see a decline pattern for the control group, eventually outperforming the treatment group after the announcement date. Looking at the [-3, +3] day window (Figure 11) one can see that the effect on the yields of the control group happened much faster. On the [-3, +7] day window (Figure 12) one can infer that while treatment group yields reduced on average 10 basis points, the yields of securities in the control group reduced three times more. These results are aligned with the ones from the first scenario, showing an even more pronounced spillover effect than before. Again, the outcome is different from most of the related literature published so far. However, according to Jiménez et al., 2014, the portfolio rebalancing channel is a “perverse byproduct of asset purchase programs”, as it is allied to an enhanced risk-taking behavior which, according to some authors, can represent the initial steps for a future crisis to happen. Ugo Albertazzi, Bo Becker and Miguel Boucinha, 2016, also find statistically significant evidence for the APP-related portfolio rebalancing for vulnerable countries like Greece, Ireland, Italy or Portugal to name a few, which has positively affected the number of bonds issued and resulted in more credit risk-taking (opposed to maturity or currency risk-taking). This is consistent with the work developed in this study so far as the majority of the assets belonging to these countries are part of the control group. Table 6 indicates how many ISINs from each country belong to the treatment and control group.

c. Regression Analysis

Using the DiD methodology previously mentioned, it was estimated the following equation using robust OLS regressions:

Regression (1)

$$\text{Yield Winsorized}_{i,t,j} = \alpha + \beta_1 \text{Treated}_{i,t} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} \\ + \beta_5 \text{Treated} * \text{Post} + \lambda_j + \varepsilon_{i,t,j}$$

where $\text{Yield Winsorized}_{i,t,j}$ is the yield variable winsorized at the 5th and 95th percentiles and trimmed for extreme values for security i , at time t . $\text{Treated}_{i,t}$ is a dummy variable that equals

one if security i fulfils the eligibility criteria for the CSPP (the treatment group) at time t , and zero otherwise. $Tenor_{i,t}$ is a variable that measures the remaining time-to-maturity of security i at time t . $Rating_{i,t}$ is a numerical variable with the best credit rating awarded to a given security i by all four agencies (S&P, Moody's, Fitch and DBRS) at time t . λ_j refers to country fixed effects.²⁰ $Post$ is a dummy variable equal to one if in the period after the CSPP announcement, i.e., after March 10th, 2016, and zero otherwise. $Treated*Post$ is an interaction variable that captures the differential effect on the treatment group after the treatment, i.e., if bonds that belong to the treatment group reacted in a different way from those in the control group to the announcement of the CSPP. The results are presented in Table 4.

A security that is eligible for the purchases conducted by the ECB will on average, *ceteris paribus*, have a yield that is 138bps lower than a comparable non-eligible security. The Rating coefficient shows that the better the rating assigned to a security, the lower the yield, which is as expected. The Tenor coefficient is positive, also as expected, reflecting the risk associated to time value of money. According to the Post coefficient, which is statistically significant, there is a generalized decrease in yields of, on average, *ceteris paribus*, 95bps on the period after CSPP announcement (from March 2016 to September 2017). However, when taking into consideration the positive and statistically significant interaction term $Treated*Post$, equal to 46bps, we observe that the Post decreasing effect concerning eligible securities was mitigated.

This is a very important conclusion, as it is evidence that, when controlling for a number of factors like tenor, rating and country of risk, in the post-CSPP announcement period, the yields of non-eligible securities benefited more than the eligible ones. In addition, this outcome is consistent with the one found in the previous section with the graphic analysis: the indirect effect stands out. This finding is aligned with the results of Abidi and Miquel Flores, 2017 and those of Musso and Gambetti, 2017, who document the presence of the portfolio rebalancing effect and its importance for avoiding market distortions. Investors are pushed to “search-for-yield” and with the CSPP announcement they start chasing high-yield corporate bonds.

We repeat the same regression methodology but in the next regression we will replace the $Treated$ dummy variable by the $Treated_Rating$ dummy variable, one that assigns securities to each group (treatment or control) according to the criteria of the second scenario drawn in section 5 (where rating plays a major role):

²⁰ See Table 6. Base country corresponds to Austria.

Regression (2)

$$\text{Yield Winsorized}_{i,t,j} = \alpha + \beta_1 \text{Treated_Rating}_{i,t} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} \\ + \beta_5 \text{Treated_Rating} * \text{Post} + \lambda_j + \varepsilon_{i,t,j}$$

Where $\text{Treated_Rating}_{i,t,j}$ is a dummy variable that equals one if security i fulfils the eligibility criteria for the CSPP (the treatment group) at time t , and zero if the security fulfils all criteria except for the rating. $\text{Tenor}_{i,t}$ is a variable that measures the remaining time-to-maturity of security i at time t . $\text{Rating}_{i,t}$ is a numerical variable with the best credit rating awarded to a given security i by all four agencies (S&P, Moody's, Fitch and DBRS) at time t . λ_j refers to country fixed effects. Post is a dummy variable equal to one if in the period after the CSPP announcement, i.e., after March 10th, 2016, and zero otherwise. $\text{Treated_Rating} * \text{Post}$ is an interaction variable that captures the differential effect on the treatment group after the treatment, i.e., if bonds that belong to the treatment group reacted in a different way from those in the control group to the announcement of the CSPP. The results are presented in Table 4.

This second regression gives further strength to the results previously found, supported by the statistical significance of the Treated_Rating and Rating coefficients and, most importantly, by the increase in their magnitude. Between January 2016 and September 2017, an eligible security to be purchased by the Eurosystem will on average, *ceteris paribus*, have a yield that is 338bps lower than a comparable non-eligible security. The post announcement effect has a greater magnitude in this scenario since the yields have a generalized decrease, on average, of 109bps on the period after March 10, 2016 (CSPP announcement date). The $\text{Treated_Rating} * \text{Post}$ interaction term of 60bps illustrates that, as observed in regression (1), after the announcement, the effect on eligible securities was reduced. When controlling specifically for the credit rating criteria (among other factors), there is stronger evidence in favour of a greater impact on CSPP non-eligible securities.

Both cases illustrated above (with the independent variables Treated or Treated_Rating and Yield Winsorized as dependent variable) support the graphic analysis outcome. Nevertheless, we will run regressions (1) and (2) again but we will use the change in yield on a given day with respect to the yield on the announcement day as the dependent variable (the same variable that was used in section 6.b to draw the graphs). By using this new dependent variable, we expect to be more consistent with the data that was graphed and we believe that our results will hold, meaning that we await for an outperformance of control group securities relative to the treatment group.

Regression (3)

$$\Delta \text{ in Yield} = \alpha + \beta_1 \text{Treated}_{i,t} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} + \beta_5 \text{Treated} * \text{Post} + \lambda_j + \varepsilon_{i,t,j}$$

Regression (4)

$$\Delta \text{ in Yield} = \alpha + \beta_1 \text{Treated_Rating}_{i,t} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} \\ + \beta_5 \text{Treated}_{\text{Rating}} * \text{Post} + \lambda_j + \varepsilon_{i,t,j}$$

The results are presented in Table 4.

As observed before from regression (1) to (2), using the Treated_Rating independent variable from regression (3) to (4) also increases the magnitude of the coefficients. Whether it is used the treatment group variable from the first or the second scenario traced (Treated or Treated_Rating, respectively) with the daily change in yield as the dependent variable, we obtain a treatment group coefficient that is still statistically significant and, most importantly, it is positive. Securities that belong to the treatment group showed higher daily increases in yields during the entire sample period (23bps and 79bps, in each scenario, respectively), compared to control group securities – the indirect effect and spillover effects dominate once again. The announcement effect also has a statistically significant and measurable impact as the Post coefficient is negative (-1.34p.p. in the first scenario and -1.12p.p. in the second scenario), suggesting an overall yield decrease after the announcement.

The interaction variables Treated*Post and Treated_Rating*Post coefficients (positive and statistically significant) are 70bps and 48bps, respectively. When using the daily change in yield as the dependent variable there is evidence that not only treatment group securities will suffer an increase in yields but also that the generalized decrease in yields in the post-announcement period will be partially offset.

The outcomes of regressions (3) and (4) undoubtedly give strength to the fact that CSPP non-eligible securities benefited more from the programme announcement than eligible securities. When controlling more specifically for the credit rating factor (employing the Treated_Rating variable), this impact increases.

d. Regression Analysis – The Case for Portugal

In this section the purpose is to conduct the same analysis but only to the Portuguese case in order to observe how the Portuguese eligible securities perform against the non-eligible ones. For the period under analysis (January 2016 to September 2017), only three corporations have issuances that are CSPP-eligible: *Brisa*, *Energias de Portugal (EDP)* and *Redes Energéticas Nacionais (REN)*. We repeat regressions 1 and 2 from the previous section but the database is composed only by securities issued with Portugal as country of risk.

Regression (5)

$$\text{Yield Winsorized}_{i,t} = \alpha + \beta_1 \text{Treated} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} + \beta_5 \text{Treated} * \text{Post} + \varepsilon_{i,t}$$

Regression (6)

$$\begin{aligned} \text{Yield Winsorized}_{i,t} = & \alpha + \beta_1 \text{Treated_Rating} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} \\ & + \beta_5 \text{Treated_Rating} * \text{Post} + \varepsilon_{i,t} \end{aligned}$$

The results are presented in Table 5.

In the first case the only variables that are statistically significant are tenor and post, thus the information we can retrieve from these results is very limited. Post is a dummy variable equal to one if in the period after the CSPP announcement, i.e., after March 10th, 2016, and zero otherwise. After the announcement, there was a generalized decrease in the yield of Portuguese eligible securities of, on average, 100bps. However, the interaction term Treated*Post is not significant, showing that eligible bonds did not perform differently from those in the control group, after the announcement of the CSPP.

On the second regression, the Treated_Rating coefficient is negative and statistically significant. When controlling for factors like tenor and credit rating, the yield of a Portuguese eligible security is, on average, *ceteris paribus*, 205bps lower than the yield of a Portuguese rating-non-eligible security. Similar to the previous regression, the interaction term Treated_Rating*Post is not significant nor the Post coefficient.

From regressions (5) and (6) we can infer that for the Portuguese case, for the period after the announcement, the performance of eligible securities was not very different from that of non-eligible securities. Although there was some yield spread tightening between core countries (Germany or France) and Portugal, boosted by the upgrades to the Portuguese Republic credit rating, which contributed to an increase in demand for Portuguese issuances, it did not have a greater impact on control group securities. The companies that were already eligible continued to issue securities to be bought under the actions of the Eurosystem and benefitted from continuous

decreases in yield. During this period there were no new Portuguese CSPP-eligible issuers coming to the market.

According to a report from Banco de Portugal²¹, in 2017, Portuguese companies decreased the amount loaned from domestic banks and started to obtain loans from foreign entities or through debt issuance. However, only a very limited group of (large) companies had access to these funding sources (and only 3% of Portuguese largest companies issued debt in 2017). Still, during the same period, companies without access to foreign sources engaged in a process of financial restructuring by reducing loans and increasing equity through the investment of retained earnings.

We will apply regressions (3) and (4) from section 6.c (that consider the change in yield on a given day with respect to the yield on the announcement day as the dependent variable) to the Portuguese case:

Regression (7)

$$\Delta \text{ in yield} = \alpha + \beta_1 \text{Treated} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} + \beta_5 \text{Treated*Post} + \varepsilon_{i,t}$$

Regression (8)

$$\Delta \text{ in yield} = \alpha + \beta_1 \text{Treated_Rating} + \beta_2 \text{Tenor}_{i,t} + \beta_3 \text{Rating}_{i,t} + \beta_4 \text{Post} + \beta_5 \text{Treated_Rating*Post} + \varepsilon_{i,t}$$

The results are presented in Table 5.

The outcome of these regressions produces some groundbreaking evidences. Although the Treated coefficient is not significant in regression (7), Post shows that there was a generalized decrease in Portuguese corporate yields (roughly 46bps) and the interaction term Treated*Post coefficient is negative and statistically significant (-74bps). In regression (8) the only statistically significant coefficient is also the interaction term, equal to -101bps. Contrary to the Eurosystem analysis and results found in the previous section, for the case of Portugal, the results are more in line with what could be initially expected: bonds that the Eurosystem can purchase showed a larger decrease in yields than non-eligible bonds.

The performance of the change in yield with respect to the yield on the announcement day, exhibited in Figures 13 and 14, also supports that, for the case of Portugal, the treatment group benefited the most with the CSPP announcement.

²¹ “Boletim Económico”, Banco de Portugal, May 2018.

7. Conclusion

Through an extensive granular data collection, particularly at the credit rating level, our study provides new insights regarding the impact of the CSPP announcement. The analysis conducted finds evidence for: i) a decrease in the cost of funding for non-financial corporations in the euro area, ii) the portfolio rebalancing effect and iii) the case for Portugal contradicts the Eurosystem behavior.

Our analysis supports that there was a generalized decrease in Eurosystem corporate bond yields in the period after the CSPP announcement (from March 2016 to September 2017) for both treatment and control group securities. When controlling for some specific factors like the credit rating, tenor or the period (before or after the announcement), and considering the deeper analysis at the credit rating and country level, there is strong evidence that the announcement caused a partial mitigation on the decrease of treatment group yields, thus favoring non-eligible securities. This is a confirmation of the indirect effect and also motive for investors to engage in a “search-for-yield” behavior and think of reshaping their portfolios – the portfolio rebalance theory. Investors will go for more risky assets, betting on an eligible/non-eligible spread compression. While the Eurosystem pursues its massive non-financial corporate bond “shopping list”, bond scarcity becomes more noticeable and eventually all big market players will also have to chase other type of assets. Some related literature like Altavilla et al., 2015, Musso and Gambetti, 2017 and Abidi and Miquel Flores, 2017, corroborates these results. These authors also support that CSPP not only benefited euro area corporations by lowering their funding cost but also opened a direct road for firms to access funds. On one hand, the announcement induced a decrease in the spread charged that created an incentive for companies to issue more public debt and to take advantage of the extremely good market conditions; on the other hand, large companies no longer needed to apply for bank loans, causing the latter to re-direct these funds to SMEs, as evidenced in related literature.

When applying the same framework for the specific case of Portugal we obtain different results. We found evidence for a greater announcement impact on eligible-securities. This result is more in line with the vast majority of the related literature, more specifically, the work developed by Grosse-Rueschkamp, Steffen and Streitz, 2017 or Arce, Gimeno and Mayordomo, 2017.

Tables and Figures

Figure 1 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is the entire dataset (January 2016 to September 2017). Source: Bloomberg, Reuters and Stata output (based on own calculations).

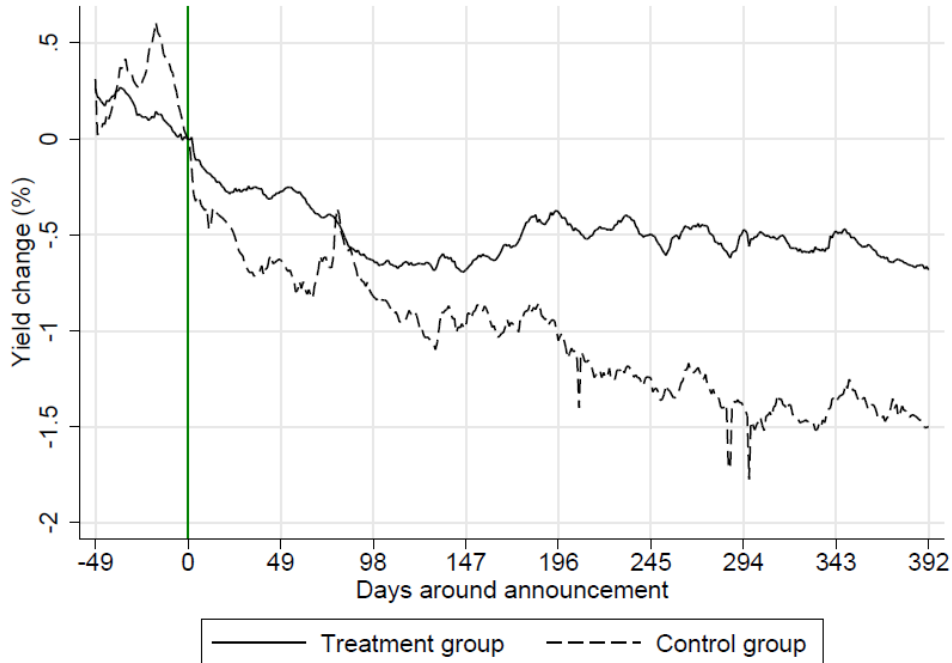


Figure 2 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is [-30 days; +30 days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

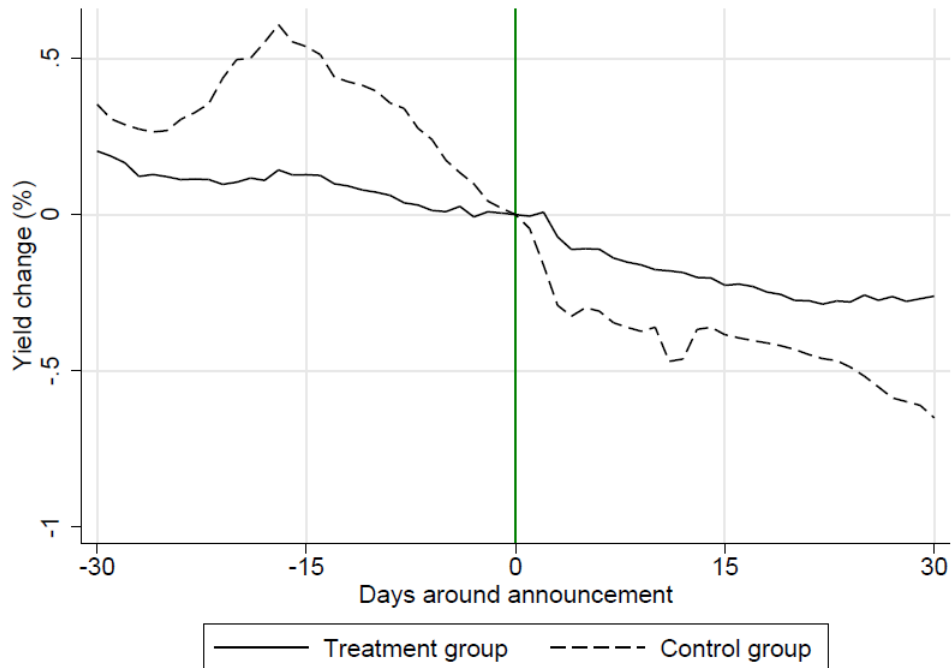


Figure 3 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is [-10 days; +10 days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

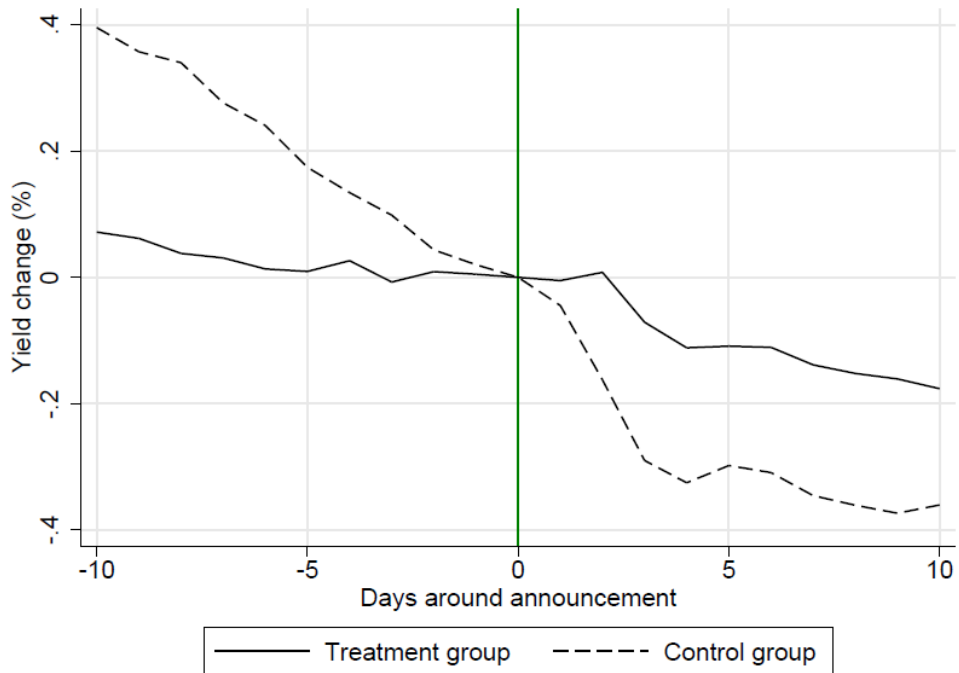


Figure 4 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is [-5 days; +5 days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

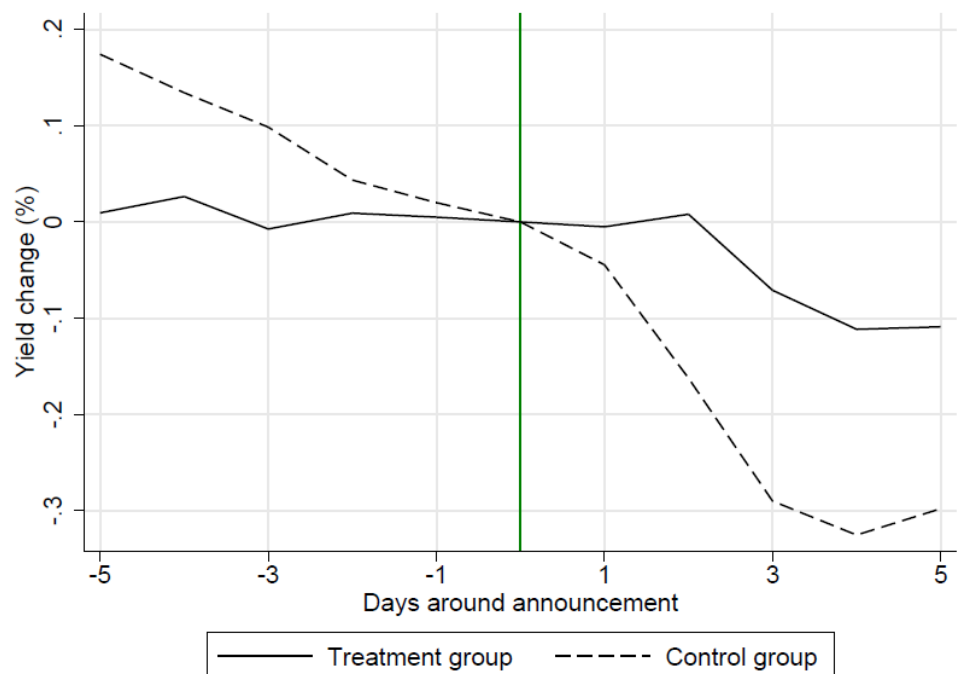


Figure 5 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is [-3 days; +3 days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

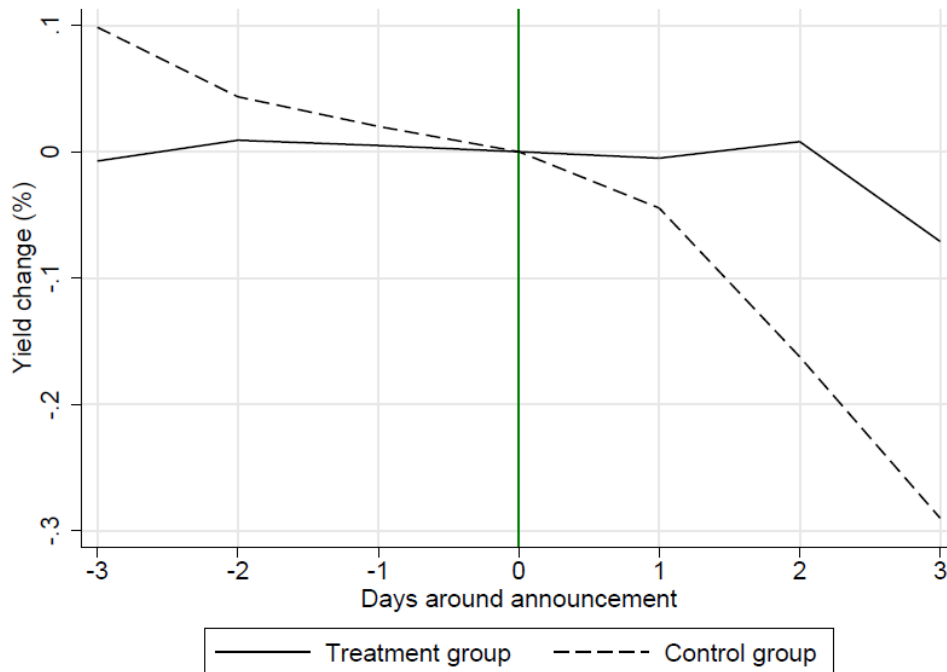


Figure 6 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1. Time horizon is [-3 days; +7 days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

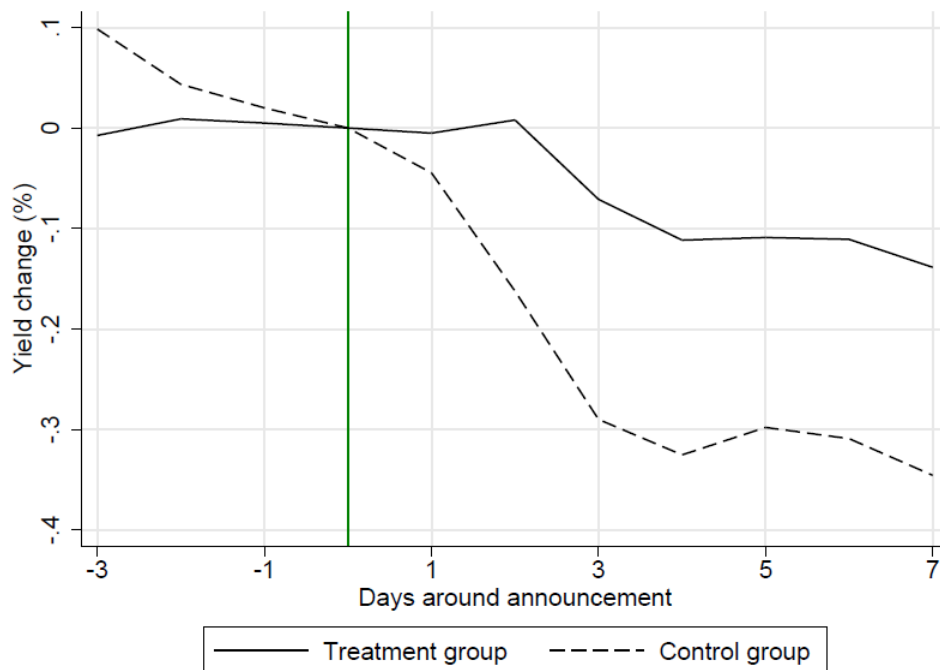


Figure 7 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is the entire dataset (January 2016 to September 2017). Source: Bloomberg, Reuters and Stata output (based on own calculations).

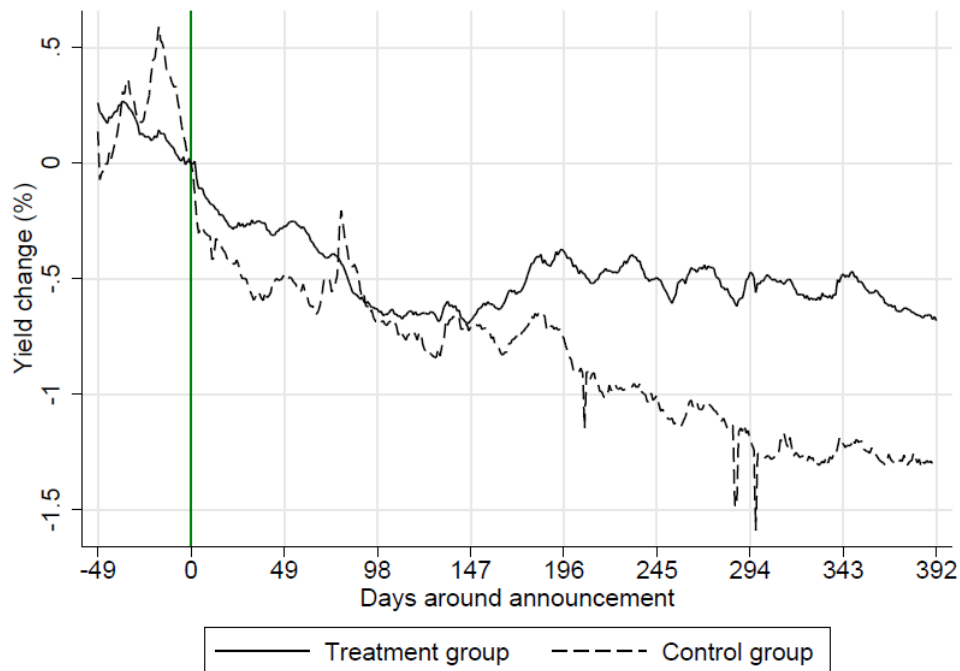


Figure 8 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is [-30 days; +30days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

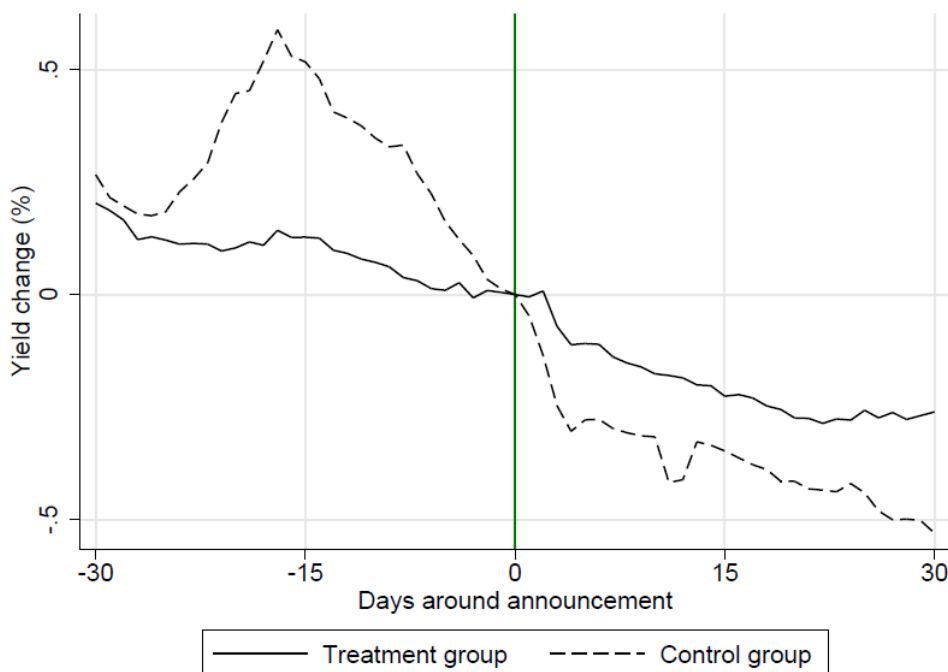


Figure 9 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is [-10 days; +10days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

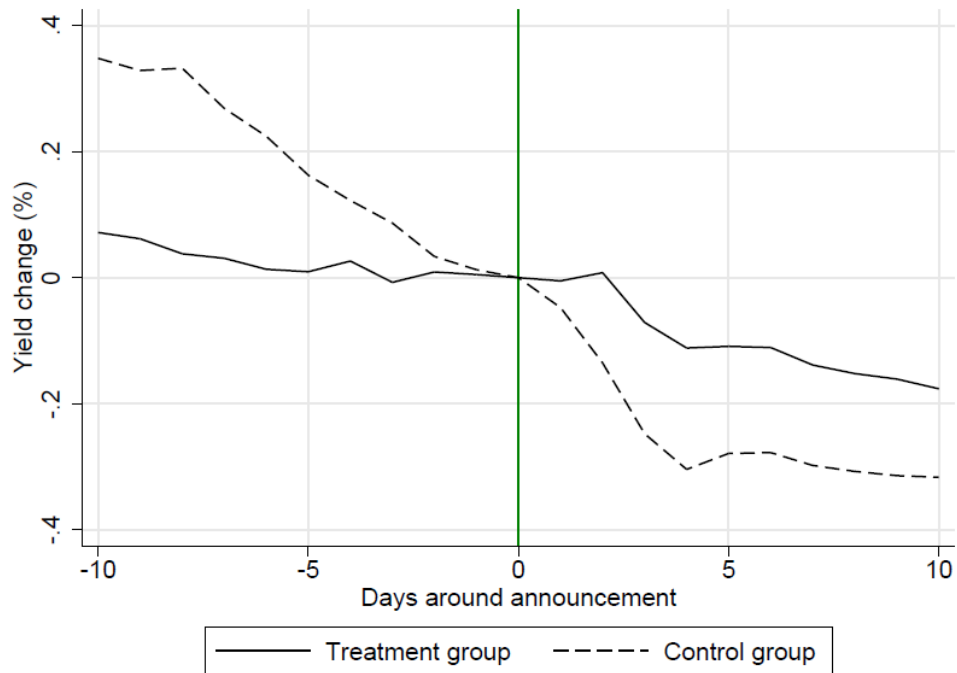


Figure 10 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is [-5 days; +5days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

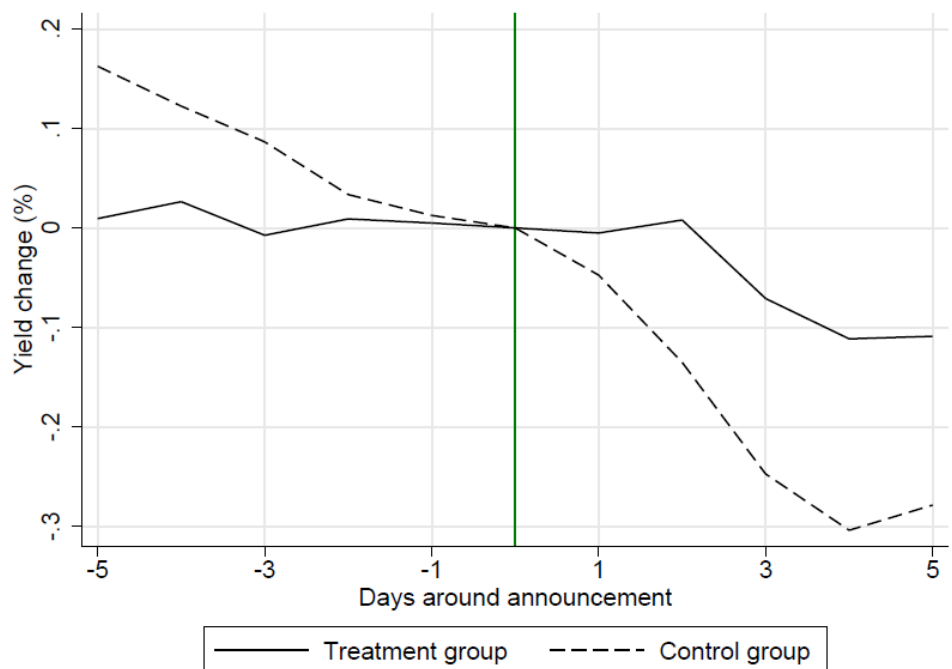


Figure 11 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is [-3 days; +3days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

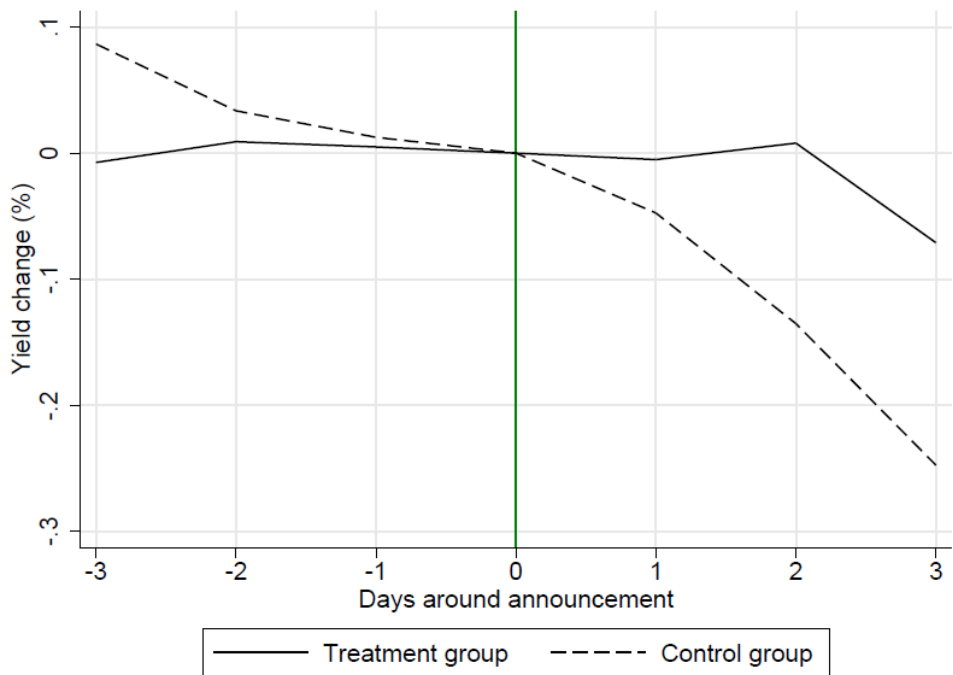


Figure 12 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2. Time horizon is [-3 days; +7days] around announcement. Source: Bloomberg, Reuters and Stata output (based on own calculations).

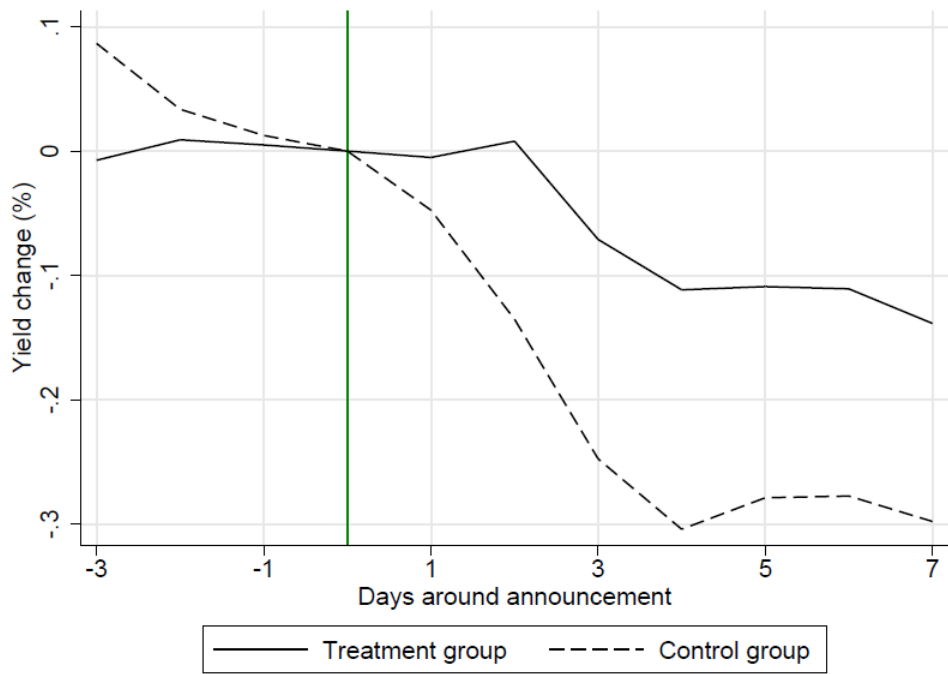


Figure 13 – Change in yield with respect to the yield on the CSPP announcement day for scenario 1, only considering securities with Portugal as country of risk. Time horizon is the entire dataset (January 2016 to September 2017). Source: Bloomberg, Reuters and Stata output (based on own calculations).

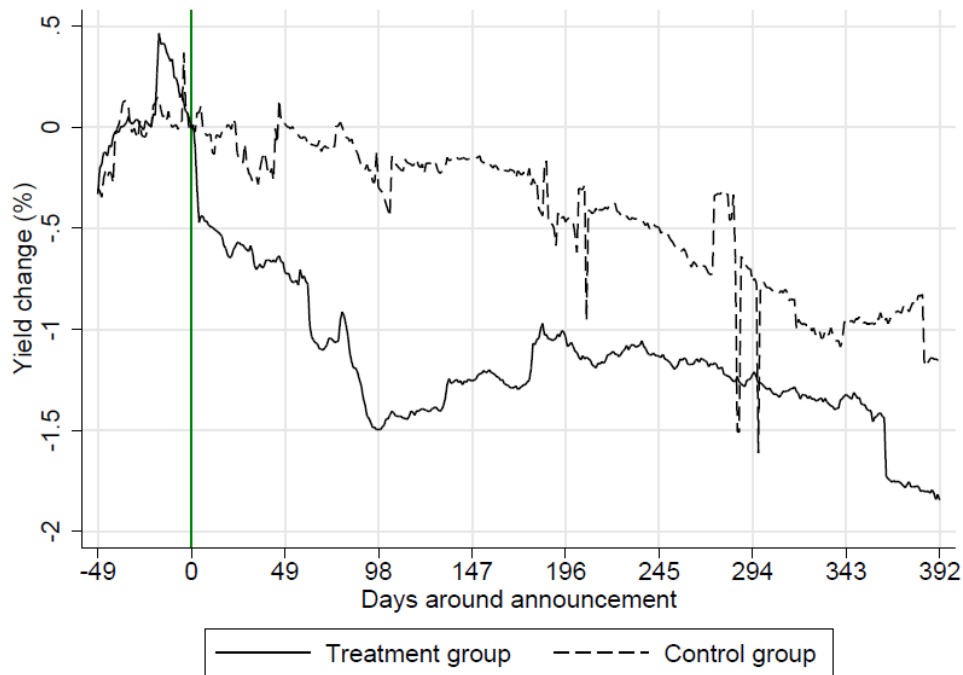


Figure 14 – Change in yield with respect to the yield on the CSPP announcement day for scenario 2, only considering securities with Portugal as country of risk. Time horizon is the entire dataset (January 2016 to September 2017). Source: Bloomberg, Reuters and Stata output (based on own calculations).

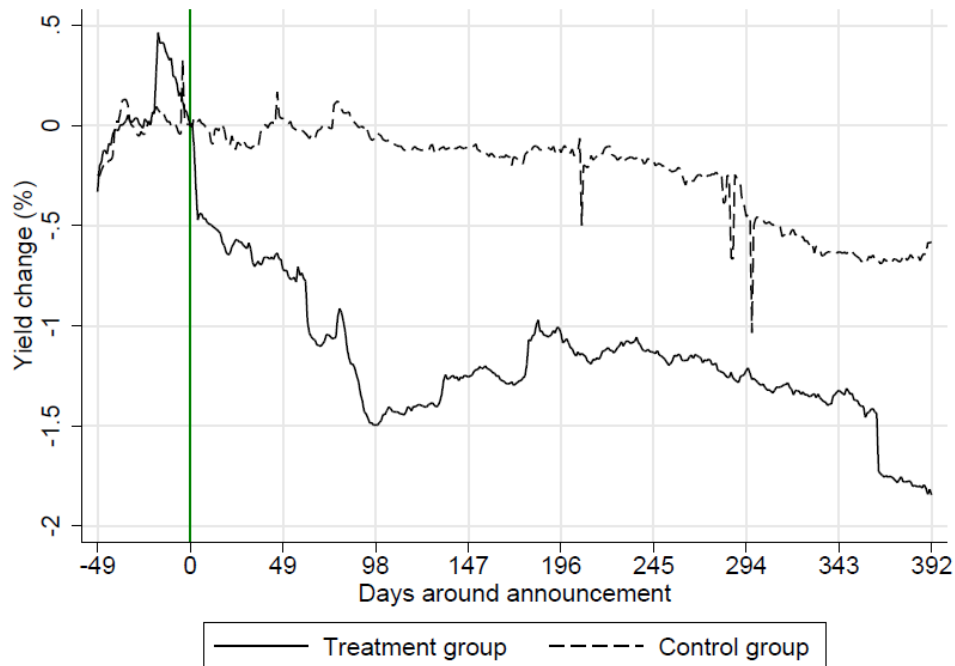


Figure 15 – Nominal Debt Outstanding amounts at the end of the period (stocks) and Net issues (flows), of non-financial corporations belonging to the European Union (28 countries), denominated in EUR. Monthly frequency. Source: ECB Statistical Data Warehouse.

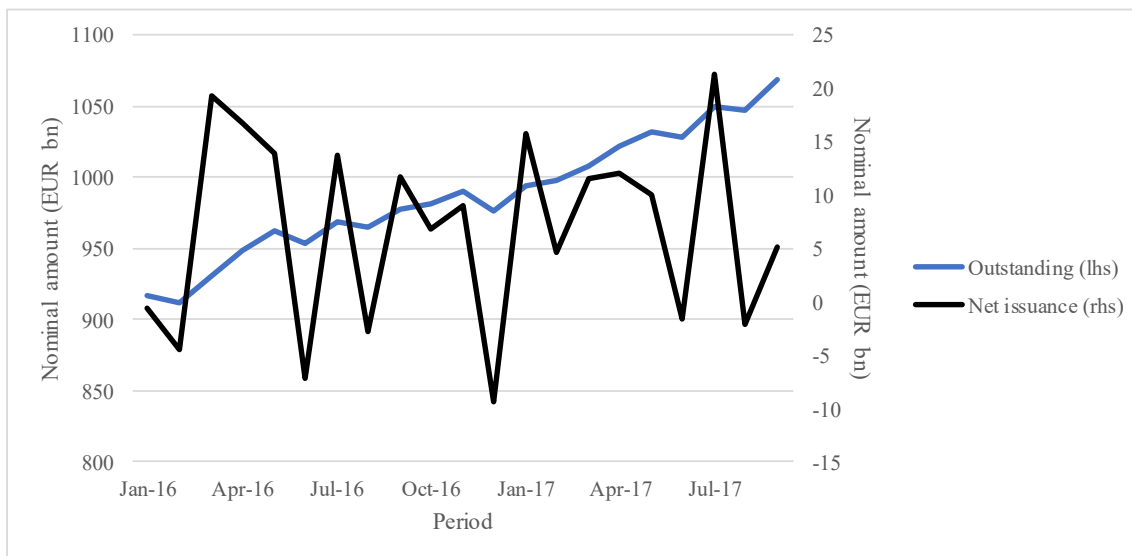


Figure 16 – Statistics on the year-on-year growth rate of the amount of loans granted by monetary financial institutions (except central banks and money market funds) to Euro area member states non-financial corporations, denominated in EUR, seasonally adjusted. Source: ECB and Thomson Reuters Datastream.

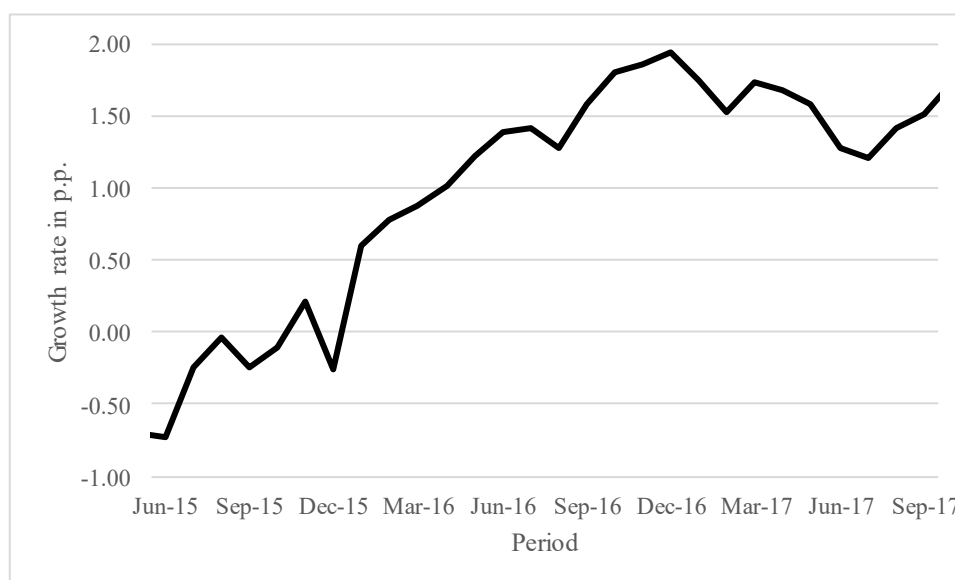


Figure 17 – Statistics on interest rates applied by monetary financial institutions (except central banks and money market funds) on loans granted to Euro area member states non-financial corporations, denominated in EUR. Monthly frequency. Source: ECB Statistical Data Warehouse.

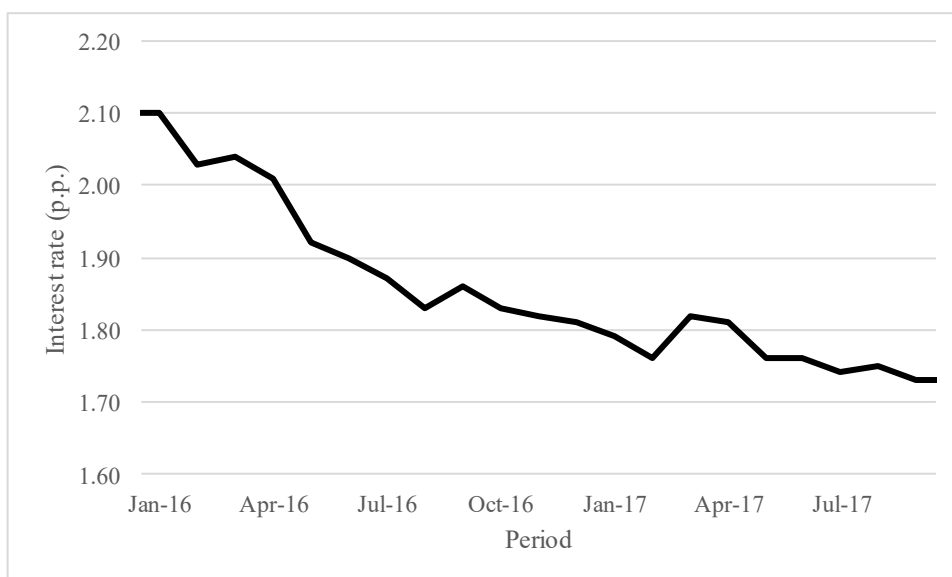


Figure 18 –Asset Swap Spread (ASW) - Markit iBoxx Corporate EUR Non-Financials Index. Source: Markit.

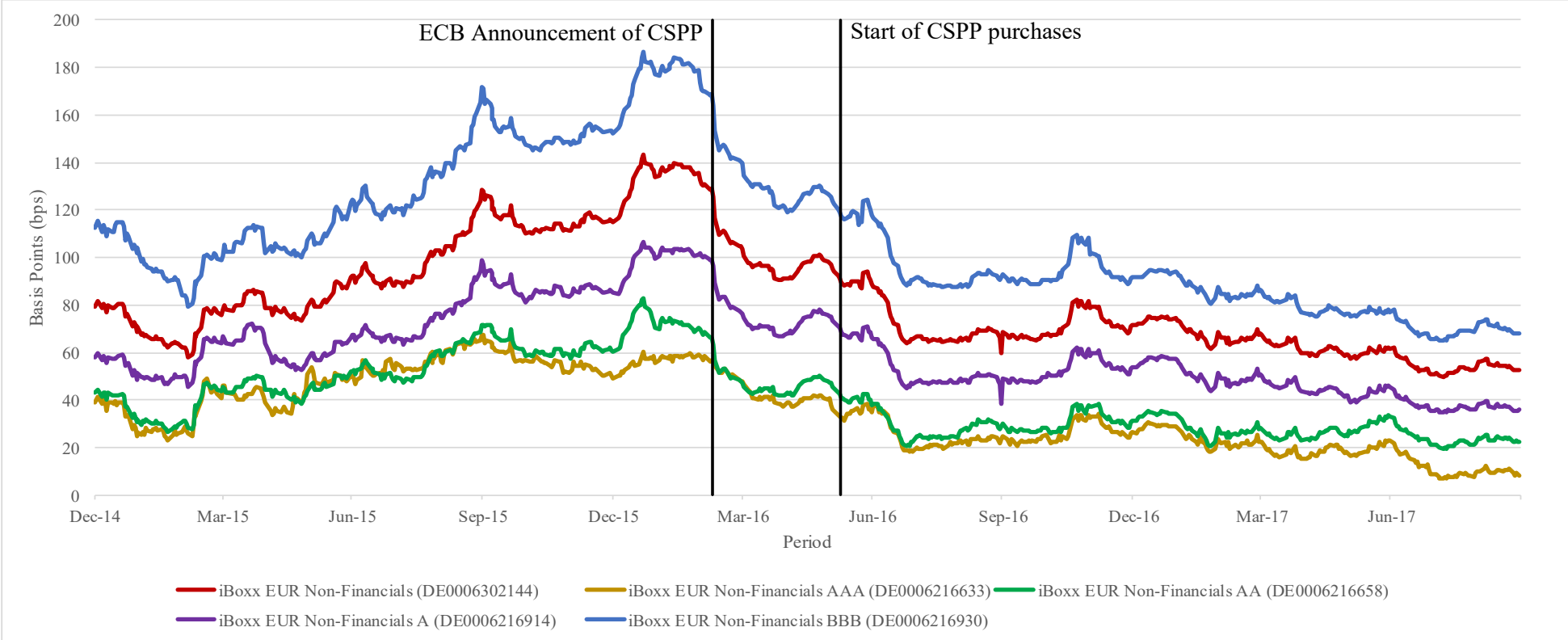


Table 1 – Descriptive Statistics of the entire dataset

This table reports the descriptive statistics for the key variables of the entire dataset for the period between January 2016 and September 2017.

Variable	Mean	Median	Std. Dev.	Min	Max	Observations
Yield	3.77E+15	1.05	3.62E+18	-36,190	4.19E+21	1,383,933
Yield (winsorized)	1.70	1.05	3.21	-16.65	16.57	1,250,206
Tenor (in days)	1,946	1,476	2,313	0	34,772	2,106,130
Credit Rating	6.01	0.00	7.21	0	22	2,106,130
Average Yield Change (for Treated=1)	-0.43	-0.50	0.23	-0.69	0.27	547,700
Average Yield Change (for Treated=0)	-0.92	-0.99	0.53	-1.77	0.61	702,506
Average Yield Change (for Treated_Rating=1)	-0.43	-0.50	0.23	-0.69	0.27	547,700
Average Yield Change (for Treated_Rating=0)	-0.76	-0.76	0.46	-1.59	0.59	566,707

Table 2 – Descriptive Statistics for Scenario 1

This table reports the descriptive statistics for the key variables of the dataset for scenario 1 for the period between January 2016 and September 2017. Treated securities are CSPP-eligible securities. The control group comprises all non-eligible CSPP securities.

Variable	Treated						Control					
	Mean	Median	Std. Dev.	Min	Max	Observations	Mean	Median	Std. Dev.	Min	Max	Observations
Yield (winsorized)	0.82	0.54	1.02	-0.40	15.04	547,700	2.39	2.07	4.05	-16.65	16.57	702,506
Tenor (in days)	2,281	1,907	1,762	183	10,956	547,700	1,832	1,308	2,896	0	34,769	702,506
Credit Rating	15.75	15.00	1.97	13	22	547,700	4.06	0.00	5.47	0	22	702,506
Average Yield Change	-0.43	-0.50	0.23	-0.69	0.27	547,700	-0.92	-0.99	0.53	-0.18	0.61	702,506

Table 3 – Descriptive Statistics for Scenario 2

This table reports the descriptive statistics for the key variables of the dataset for scenario 2 for the period between January 2016 and September 2017. Treated securities are CSPP-eligible securities. The control group comprises all securities that are not eligible for CSPP due to non-eligible credit rating.

Variable	Treated						Control					
	Mean	Median	Std. Dev.	Min	Max	Observations	Mean	Median	Std. Dev.	Min	Max	Observations
Yield (winsorized)	0.82	0.54	1.02	-0.40	15.04	547,700	3.34	2.63	2.90	-0.40	16.57	566,707
Tenor (in days)	2,281	1,907	1,762	183	10,956	547,700	1,747	1,492	1,305	183	10,934	566,707
Credit Rating	15.75	15.00	1.97	13	22	547,700	3.30	0.00	4.61	0	12	566,707
Average Yield Change	-0.43	-0.50	0.23	-0.69	0.27	547,700	-0.76	-0.76	0.46	-1.59	0.59	566,707

Table 4 – Regression Analysis Output

This table reports results from the estimation of a pooled panel regression analyzing the effect of the CSPP announcement. The dependent variable is either Yield Winsorized, i.e., the daily yield of each bond, or the change in yield, i.e., the difference between the yield of a security on a given day and its yield at the announcement date. Treated is a variable that equals one if the security belongs to the treated group (CSPP-eligible) and zero otherwise. Treated_Rating is a variable that equals one if the security belongs to the treated group (CSPP-eligible) and zero if the security is not eligible only because it does not fulfill the minimum credit rating criteria. BE to SK refers to dummy variables that are equal to one if that is the security's country of risk and zero otherwise. Rating is a numerical variable that refers to the credit rating of a security on a given day. Tenor is a numerical variable for the number of remaining days until the maturity of the security. Post is a dummy variable equal to one if in the period after the CSPP announcement, i.e., after March 10th, 2016, and zero otherwise. Treated*Post and Treated_Rating*Post are interaction variables. We report t-values based on standard errors clustered at the ISIN-level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level, respectively.

	Yield Winsorized	Yield Winsorized	Change in Yield	Change in Yield
Treated (0/1)	-1.3789*** (-7.85)	<i>Not used</i>	0.2343** (2.46)	<i>Not used</i>
Treated_Rating (0/1)	<i>Not used</i>	-3.3768*** (-20.25)	<i>Not used</i>	0.7864*** (7.73)
BE	-0.3544* (-1.84)	-0.4809** (-2.25)	0.1911*** (3.17)	0.2245*** (3.93)
DE	0.7799*** (3.55)	1.2141*** (5.56)	-0.0555 (-0.50)	0.0679 (0.75)
EE	0.6141 (0.68)	1.4560** (2.32)	-0.2380 (-1.12)	0.0098 (0.06)
ES	0.7617*** (3.04)	1.2880*** (5.24)	-0.1715* (-1.69)	-0.0572 (-0.65)
FI	0.2355 (0.87)	0.5053* (1.94)	-0.2093* (-1.92)	-0.1712 (-1.63)
FR	0.3076* (1.67)	0.7229*** (3.74)	-0.2542*** (-3.13)	-0.0833 (-1.20)
GR	4.1807*** (2.71)	3.5898** (2.09)	-0.9366*** (-15.28)	-0.5924*** (-10.10)
IE	0.2758 (0.74)	0.8747*** (3.07)	-0.0694 (-0.29)	0.0259 (0.21)
IT	0.9282*** (4.13)	1.2498*** (5.57)	-0.1077 (-1.24)	-0.0367 (-0.52)
LT	1.1219*** (6.32)	1.5384*** (8.04)	<i>Not used</i>	<i>Not used</i>
LU	1.2883*** (4.23)	2.1538*** (8.75)	-0.6517*** (-3.23)	-0.0187 (-0.11)
LV	-1.2162*** (-4.48)	-1.375*** (-4.47)	0.1714*** (2.86)	0.1282** (2.26)
MT	1.8962*** (5.64)	2.1287*** (5.30)	-2.9548*** (-6.17)	-1.347*** (-10.23)
NL	0.2584 (1.26)	0.9510*** (4.79)	-0.2607*** (-2.98)	-0.0991 (-1.39)
PT	0.3534 (1.15)	0.4098 (1.58)	0.1053 (0.59)	0.2316 (1.51)
SI	-0.0841 (-0.23)	-0.1683 (-0.41)	-0.1059 (-0.63)	-0.0736 (-0.40)
SK	0.4683 (1.1)	0.5119 (1.11)	-0.1717 (-1.08)	-0.0551 (-0.45)
Rating	-0.0512*** (-4.06)	0.0168 (1.47)	-0.0344*** (-4.70)	-0.0688*** (-9.42)
Tenor (in days)	0.0002*** (9.86)	0.0003*** (13.79)	0.0000 (0.85)	0.0000 (0.40)
Post (0/1)	-0.9468*** (-11.30)	-1.0899*** (-18.60)	-1.3400*** (-21.88)	-1.1184*** (-19.14)
Treated (0/1) x Post (0/1)	0.4626*** (5.34)	<i>Not used</i>	0.7051*** (11.10)	<i>Not used</i>
Treated_Rating (0/1) x Post (0/1)	<i>Not used</i>	0.6044*** (9.72)	<i>Not used</i>	0.4779*** (7.85)
Constant	2.5471*** (13.22)	2.8398*** (14.30)	0.6323*** (9.51)	0.4800*** (7.52)
Observations	1,250,206	1,114,407	1,051,909	926,473

Table 5 – Regression Analysis Output: the Case for Portugal

This table reports results from the estimation of a pooled panel regression analyzing the effect of the CSPP announcement for Portugal (the sample is composed exclusively by securities with Portugal as country of risk). The dependent variable is either Yield Winsorized, i.e., the daily yield of each bond, or the change in yield, i.e., the difference between the yield of a security on a given day and its yield at the announcement date. Treated is a variable that equals one if the security belongs to the treated group (CSPP-eligible) and zero otherwise. Treated_Rating is a variable that equals one if the security belongs to the treated group (CSPP-eligible) and zero if the security is not eligible only because it does not fulfill the minimum credit rating criteria. Rating is a numerical variable that refers to the credit rating of a security on a given day. Tenor is a numerical variable for the number of remaining days until the maturity of the security. Post is a dummy variable equal to one if in the period after the CSPP announcement, i.e., after March 10th, 2016, and zero otherwise. Treated*Post and Treated_Rating*Post are interaction variables. We report t-values based on standard errors clustered at the ISIN-level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level, respectively.

	Yield Winsorized	Yield Winsorized	Change in Yield	Change in Yield
Treated (0/1)	-0.7971 (-0.97)	<i>Not used</i>	-0.0997 (-0.38)	<i>Not used</i>
Treated_Rating (0/1)	<i>Not used</i>	-2.0552*** (-3.12)	<i>Not used</i>	-0.1984 (-0.84)
Rating	-0.0703 (-1.25)	0.0388 (0.90)	0.0064 (0.36)	0.0212 (1.49)
Tenor (in days)	0.0002** (2.50)	0.0004** (2.19)	-0.0001*** (-4.36)	0.0000 (-0.16)
Post (0/1)	-0.9979*** (-3.00)	-0.5584 (-1.58)	-0.4594** (-2.22)	-0.2019 (-1.23)
Treated (0/1) x Post (0/1)	0.5759 (1.21)	<i>Not used</i>	-0.7400*** (-2.67)	<i>Not used</i>
Treated_Rating (0/1) x Post (0/1)	<i>Not used</i>	0.0237 (0.05)	<i>Not used</i>	-1.0097*** (-4.06)
Constant	2.9497*** (6.40)	2.3536*** (4.53)	0.2140* (1.89)	-0.0072 (-0.04)
Observations	28,418	28,418	22,886	20,420

Table 6 – Country description and ISINs distribution

This table contains the number of unique ISINs (International Securities Identification Number) per country of risk in the entire dataset and in each scenario.

Country (ISO Code)	Description	Number of unique ISINs*				
		All data	Scenario 1		Scenario 2	
			Treated	Control	Treated	Control
AT	Austria	187	31	80	31	67
BE	Belgium	268	72	169	72	156
DE	Germany	692	224	432	224	322
EE	Estonia	8	4	3	4	3
ES	Spain	316	118	171	118	131
FI	Finland	149	37	100	37	87
FR	France	1040	477	622	477	480
GR	Greece	20	0	9	0	8
IE	Ireland	114	36	68	36	58
IT	Italy	554	138	271	138	223
LT	Lithuania	1	1	0	1	0
LU	Luxembourg	462	76	353	76	314
LV	Latvia	5	1	2	1	2
MT	Malta	21	0	11	0	11
NL	Netherlands	740	424	373	424	252
PT	Portugal	145	11	81	11	73
SI	Slovenia	19	1	10	1	10
SK	Slovakia	24	4	14	4	14
TOTAL		4765	1655	2769	1655	2211

*after winsorization and trimming processes.

Table 7 – Harmonized Rating Scale

This table contains the mapping of S&P, Moody’s, Fitch and DBRS into twenty-two numerical values, with 22 corresponding to the highest rating and 0 to the lowest. The horizontal dashed-line separates assets from “Non-Investment Grade” to “Investment Grade”.

Harmonized Rating Scale									
Credit Quality	S&P		Moody's		Fitch		DBRS		Ranking
	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	
Investment Grade	AAA	A-1+	Aaa	P-1	AAA	F1+	AAA	R-1 (high)	22
	AA+	A-1+	Aa1	P-1	AA+	F1+	AA (high)	R-1 (high)	21
	AA	A-1+	Aa2	P-1	AA	F1+	AA	R-1 (mid)	20
	AA-	A-1+	Aa3	P-1	AA-	F1+	AA (low)	R-1 (mid)	19
	A+	A-1	A1	P-1	A+	F1	A (high)	R-1 (low)	18
	A	A-1	A2	P-1	A	F1	A	R-1 (low)	17
	A-	A-2	A3	P-2	A-	F2	A (low)	R-1 (low)	16
	BBB+	A-2	Baa1	P-2	BBB+	F2	BBB (high)	R-2 (high)	15
	BBB	A-2	Baa2	P-2	BBB	F3	BBB	R-2 (mid)	14
BBB-	A-3	Baa3	P-3	BBB-	F3	BBB (low)	R-2 (low), R-3	13	
Non-Investment Grade	BB+	B	Ba1	NP	BB+	B	BB (high)	R-4	12
	BB	B	Ba2	NP	BB	B	BB	R-4	11
	BB-	B	Ba3	NP	BB-	B	BB (low)	R-4	10
	B+	B	B1	NP	B+	B	B (high)	R-4	9
	B	B	B2	NP	B	B	B	R-5	8
	B-	B	B3	NP	B-	B	B (low)	R-5	7
	CCC+	C	Caa1	NP	CCC+	C	CCC (high)	R-5	6
	CCC	C	Caa2	NP	CCC	C	CCC	R-5	5
	CCC-	C	Caa3	NP	CCC-	C	CCC (low)	R-5	4
CCC+	C	Ca	NP	CC	C	CC	R-5	3	
CCC+	C	C	NP	C	C	C	R-5	2	
Default	SD or D	D	-	NP	RD or D	D	D	D	1
	Not Rated	Not Rated	Not Rated	Not Rated	Not Rated	Not Rated	Not Rated	Not Rated	0

Bibliography

Abidi, N. and Miquel Flores, I. (2017) *Who Benefits from the Corporate QE? A Regression Discontinuity Design Approach*. European Central Bank, Directorate Monetary Policy.

Albertazzi, U., Becker, B. and Boucinha, M. (2016) *Portfolio Rebalancing and the Transmission of Large-Scale Asset Programs: Evidence from the Euro Area*. Bank of Italy (Directorate General Economic Research and Statistics), Stockholm School of Economics and CEPR, and the European Central Bank (Directorate General Economics).

Ammer, J., Claessens, S., Tabova, A. and Wroblewski, C. (2018) *Searching for Yield Abroad: Risk-Taking through Foreign Investment in U.S. Bonds*. BIS Working Paper No. 687.

Andrade, P., Breckenfelder, J., De Fiore, F., Karadi, P. and Tristani, O. (2016) *The ECB's asset purchase programme: an early assessment*. ECB Working Paper Series No. 1956.

Arce, O., Gimeno, R. and Mayordomo, S. (2017) *Making room for the needy: The credit reallocation effects of the ECB's Corporate QE*. Madrid: Banco de España, ADG Economics and Research.

Arrata, W. and Nguyen, B. (2017) *Price impact of bond supply shocks: Evidence from the Eurosystem's asset purchase program*. Banque de France Working Paper 623.

Banco de Portugal. (2018) Tema em Destaque II: As decisões de financiamento das empresas portuguesas: factos estilizados e desenvolvimentos recentes. *Boletim Económico – Maio 2018*, 119-140.

Bartocci, A., Burlon, I., Notarpietro A. and Pisani, M. (2017) *Macroeconomic effects of non-standard monetary policy measures in the euro area: the role of corporate bond purchases*. Banca D'Italia Working Paper No. 1136.

Bedendo, M. and Colla, P. (2015) Sovereign and corporate credit risk: Evidence from the Eurozone. *Journal of Corporate Finance*, 33, 34-52.

Boermans, M.A. and Keshkov, V. (2018) *The Impact of the ECB Asset Purchases on the European Bond Market Structure: Granular Evidence on Ownership Concentration*. De Nederlandsche Bank Working Paper No. 590.

D'Amico, S. and King, T.B. (2013) Flow and stock effects of large-scale treasury purchases: Evidence on the importance of local supply. *Journal of Financial Economics*, 108(2), 425-448.

Darracq Pariès, M. and Kühl, M. (2016) *The optimal conduct of central bank asset purchases*. ECB Working Paper Series No. 1973.

Draghi, M. (2012) Verbatim of the remarks made by Mario Draghi, *Speech by the President of the European Central Bank at the Global Investment Conference in London*. European Central Bank. [Online] Available at: <https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html> [Accessed 10th December 2016].

ECB CSPP Interest Group. (2016) *The Eurosystem's Corporate Sector Purchase Programme (CSPP) – opportunities for non-corporates and beyond*. Allen & Overy LLP.

ECB Statistical Data Warehouse. (2018). *Outstanding amounts at the end of the period (stocks), Securities other than shares, excluding financial derivatives, Nominal value, Non-financial corporations (ESA 95 classification) issuing sector, Euro, denominated in Euro, Euro area (changing composition) - ECB Statistical Data Warehouse*. Retrieved 22 November 2018:

https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=130.SEC.M.U2.1100.F33000.N.1.EUR.E.Z&start=01-01-2016&end=30-09-2017&submitOptions.x=0&submitOptions.y=0&trans=PC

ECB Statistical Data Warehouse. (2018). *Statistics on interest rates applied by monetary financial institutions (except central banks and money market funds) to loans granted to non-financial corporations of Euro area Member States*. Retrieved 10 Mar. 2019: https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=124.MIR.M.U2.B.A2I.AM.R.A.2240.EUR.N

European Central Bank. (2015). ECB announces expanded asset purchase programme. [Online] Available at: https://www.ecb.europa.eu/press/pr/date/2015/html/pr150122_1.en.html [Accessed 10th December 2016].

European Central Bank. (2016) *Decision (EU) 2016/[XX*] of the European Central Bank of 1 June 2016 on the implementation of the corporate sector purchase programme (ECB/2016/16)*. [Online] Available from: <http://www.dirittobancario.it/sites/default/files/allegati/ecb-2016-16.pdf> [Accessed 14th November 2017].

European Central Bank. (2016) *DECISION (EU) 2016/948 OF THE EUROPEAN CENTRAL BANK of 1 June 2016 on the implementation of the corporate sector purchase programme ECB/2016/16*. [Online] Available from: https://www.ecb.europa.eu/ecb/legal/pdf/celex_32016d0016_en_txt.pdf [Accessed 14th November 2017].

European Central Bank. (2016). Asset purchase programmes. [Online] Available at: <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html> [Accessed 10th December 2016].

European Central Bank. (2016). Corporate Sector Purchase Programme (CSPP) - Q&A. [Online] Available at: <https://www.ecb.europa.eu/mopo/implement/omt/html/cspp-qa.en.html> [Accessed 11th October 2017].

European Central Bank. (2016). ECB adds corporate sector purchase programme (CSPP) to the asset purchase programme (APP) and announces changes to APP. [Online] Available at: <https://www.ecb.europa.eu/mopo/implement/omt/html/cspp-qa.en.html> [Accessed 11th October 2017].

European Central Bank. (2017) *Decision (EU) 2017/[XX*] of the European Central Bank of 11 January 2017 amending Decision (EU) 2016/948 on the implementation of the corporate sector purchase programme (ECB/2017/4)*. [Online] Available from: https://www.ecb.europa.eu/ecb/legal/pdf/en_ecb_2017_1_f_signed.pdf [Accessed 14th November 2017].

European Central Bank. (2017) *Survey on the Access to Finance of Enterprises in the euro area: October 2016 to March 2017*. [Online] Available from: <https://www.ecb.europa.eu/stats/accesstofinancesofenterprises/pdf/ecb.accesstofinancesmallmediumsizedenterprises201705.en.pdf> [Accessed 10th January 2018].

European Central Bank. (2017) *Survey on the Access to Finance of Enterprises in the euro area: April to September 2017*. [Online] Available from: <https://www.ecb.europa.eu/stats/accesstofinancesofenterprises/pdf/ecb.accesstofinancesmallmediumsizedenterprises201711.en.pdf> [Accessed 10th January 2018].

European Central Bank. (2017) *The ECB's corporate sector purchase programme: its implementation and impact*. ECB Economic Bulletin, Issue 4 / 2017.

- European Central Bank. (2019). *Year-on-Year growth rate of the amount of loans granted by monetary financial institutions (except central banks and money market funds) to Euro area member states non-financial corporations, denominated in EUR, seasonally adjusted*. Retrieved from Thomson Reuters Datastream on 13 March 2019.
- European Commission. (2017) *Analysis of European Corporate Bond Markets*. European Commission Expert Group on Corporate Bonds.
- European Stability Mechanism. (2017). *EFSS/ESM programme evaluation report published today | European Stability Mechanism*. [Online] Available at: <https://www.esm.europa.eu/press-releases/efsfesm-programme-evaluation-report-published-today> [Accessed 10th January 2019].
- European Systemic Risk Board's Advisory Scientific Committee. (2014) *Is Europe Overbanked?* Reports of the Advisory Scientific Committee No. 4.
- Eurostat. (2016). Financial balance sheets [nasa_10_f_bs]. Retrieved 14th October 2018: Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nasa_10_f_bs&lang=en
- Fawley, B.W. and Neely, C.J. (2013) Four Stories of Quantitative Easing. *Federal Reserve Bank of St. Louis Review*, January/February 2013, 95(1), 51-88.
- Federal Reserve Bank of St. Louis (2011). *Summary of Gagnon et al. (2011): Large-Scale Asset Purchases by the Federal Reserve: Did They Work?*. [Online] Available at: https://www.stlouisfed.org/~media/files/pdfs/press-releases/2011-06-30/summary_gagnon.pdf?la=en [Accessed 20th November 2017].
- Gambetti, L. and Musso, A. (2017) *The macroeconomic impact of the ECB's expanded asset purchase programme (APP)*. ECB Working Paper Series No. 2075.
- González-Páramo, J.M. (2011) The ECB's monetary policy during the crisis, *Closing speech at the Tenth Economic Policy Conference*. European Central Bank. [Online] Available at: https://www.ecb.europa.eu/press/key/date/2011/html/sp111021_1.en.html [Accessed 20th October 2017].
- Grosse-Rueschkamp, B., Steffen, S. and Streitz, D. (2017) *Cutting Out the Middleman – The ECB as Corporate Bond Investor*. ESMT European School of Management and Technology, Frankfurt School of Finance & Management, and Copenhagen Business School, Department of Finance.
- Hancock, D. and Passmore, W. (2011) Did the Federal Reserve's MBS purchase program lower mortgage rates? *Journal of Monetary Economics*, 58(5), 498-514.
- Jiménez, G., Ongena, S., Peydró, J. and Saurina, J. (2014) Hazardous Times for Monetary Policy: What Do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk-Taking? *Journal of the Econometric Society*, 82(2), 463-505.
- Joyce, M.A.S., Lasasosa, A., Stevens, I. and Tong, M. (2011) The financial markets impact of quantitative easing in the United Kingdom. *International Journal of Central Banking*, 7(3), 113-162.
- Kapetanios, G., Mumtaz, H., Stevens, I. and Theodoridis, K. (2012) Assessing the Economy-wide Effects of Quantitative Easing. *Economic Journal*, 122(564), 316-347.
- Koijen, R., Koulischer, F., Nguyen, B. and Yogo, M. (2016) *Quantitative Easing in the Euro Area: The Dynamics of Risk Exposures and the Impact on Asset Prices*. Banque de France Document de Travail No. 601.

- Langfield, S. and Pagano, M. (2015) *Bank bias in Europe: effects on systemic risk and growth*. ECB Working Paper Series No. 1797.
- Langfield, S. and Pagano, M. (2016) Bank bias in Europe: effects on systemic risk and growth. *Economic Policy*, 31(85), 51-106.
- Ruggiero, F. (2018) *Loan to Bond Substitution: An Empirical Analysis on the Functioning of the Substitution Channel for Eurozone Firms*. University of Naples Federico II
- TD Securities. (2019). TD Securities - Ratings Correlation Chart. [Online] Available at: https://www.tdsecurities.com/tds/content/CMkt_RatingsCorrelation?language=en_CA [Accessed 10th January 2019].
- The Financial Crisis Inquiry Commission. (2011) *Final Report Of The National Commission On The Causes Of The Financial And Economic Crisis In The United States*. [Online] Available at: <https://www.govinfo.gov/content/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf> [Accessed 10th January 2019].
- Todorov, K. (2018) *Quantify the Quantitative Easing: Impact on Bonds and Corporate Debt Issuance*. Finance Department, the London School of Economics and Political Science.
- Vayanos, D. and Vila, J. (2009) *A Preferred-Habitat Model of the Term Structure of Interest Rates*. National Bureau of Economic Research Working Paper No. 15487.
- Véron, N. (2013) *Banking Nationalism and the European Crisis*. Peterson Institute for International Economics.
- Zaghini, A. (2017) *The CSPP at work: yield heterogeneity and the portfolio rebalancing channel*. Banca D'Italia Working Paper No. 1157.