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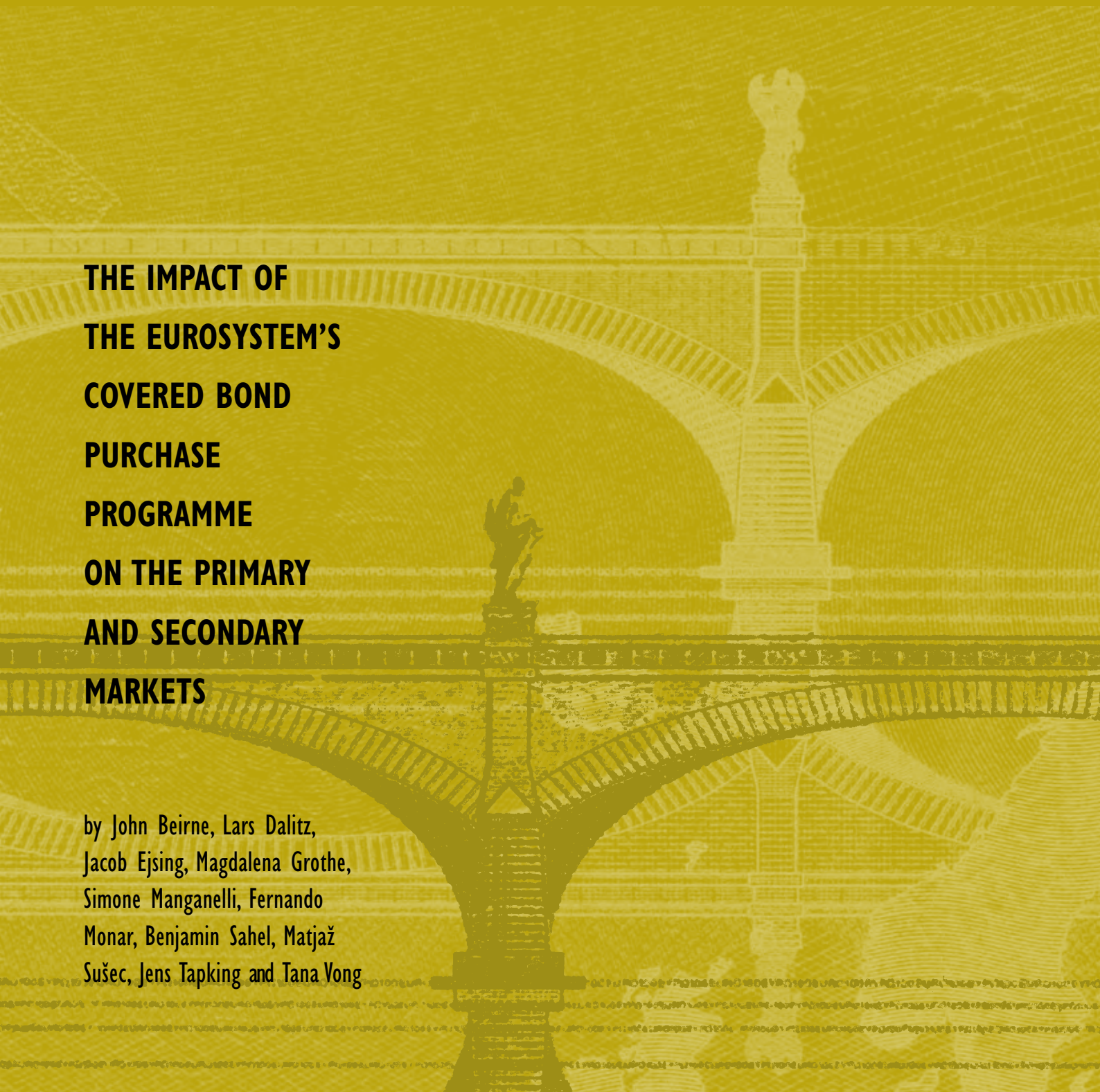

THE IMPACT OF THE EUROSYSTEM'S COVERED BOND PURCHASE PROGRAMME ON THE PRIMARY AND SECONDARY MARKETS

by John Beirne, Lars Dalitz, Jacob Ejsing, Magdalena Grothe, Simone Manganelli, Fernando Monar, Benjamin Sahel, Matjaž Sušec, Jens Tapking and Tana Vong

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ABSTRACT

This paper provides an assessment of the impact of the covered bond purchase programme (hereafter referred to as the CBPP) relative to its policy objectives. The analysis presented on the impact of the CBPP on both the primary and secondary bond markets indicates that the Programme has been an effective policy instrument. It has contributed to: (i) a decline in money market term rates, (ii) an easing of funding conditions for credit institutions and enterprises, (iii) encouraging credit institutions to maintain and expand their lending to clients, and (iv) improving market liquidity in important segments of the private debt securities market. The paper also provides an overview of the investment strategy of the the Eurosystem with regard to the CBPP portfolio.

JEL code: G12, G14, G21

Keywords: covered bonds, liquidity, primary market, secondary market

NON-TECHNICAL SUMMARY

The CBPP was announced on 7 May 2009 in order to stimulate activity in the euro area covered bond market. Under the CBPP, the Eurosystem made outright purchases of covered bonds to the nominal value of €60 billion over the 12-month period from 6 July 2009 to the end of June 2010, when the programme was completed.[1] Over this period, a total of 422 different bonds were purchased, 27% in the primary market and 73% in the secondary market, with an average modified duration of 4.12 as of 30 June 2010. It was mainly bonds with maturities of three to seven years that were purchased under the programme. This equates to an average modified duration of 4.12 years. The Eurosystem intends to hold the bonds until maturity.[2] This paper presents an analysis of the impact of the CBPP, i.e. its effectiveness as a policy instrument. More specifically, empirical evidence is presented to show that the CBPP has been effective in meeting its objectives. According to the ECB Decision mentioned in footnote 1, the four objectives of the CBPP were to contribute to (a) promoting the ongoing decline in money market term rates, (b) easing funding conditions for credit institutions and enterprises, (c) encouraging credit institutions to maintain and expand their lending to clients, and (d) improving market liquidity in important segments of the private debt securities market. The analysis conducted in this paper shows that the CBPP has led to a narrowing of covered bond yield swap spreads, which is consistent with objective (a).[3] Moreover, the long-term funding provision under covered bonds reduces the demand for short-term funding, and this is consistent with a decline in money market term rates. Regarding objective (b), we show that the CBPP has stimulated an issuance of covered bonds in the primary market, thereby easing funding conditions for banks. For objective (c), anecdotal evidence from market participants in conjunction with the quantitative findings relating to objectives (a) and (b) suggests that positive real economy effects are evident as regards bank lending. Regarding objective (d), empirical evidence is presented to show that, during the period of the CBPP, covered bond market liquidity has improved, moving closer to pre-crisis levels.

The empirical analysis of the impact of the CBPP on the primary market focuses on whether it had an impact on the outstanding amounts of bonds issued by banks (i.e. both covered and uncovered). The central issue examined is that, while the CBPP may have had a positive impact on the outstanding amount of covered bonds, there may have been no effect on the overall amounts of covered and uncovered bonds. Thus, the CBPP may have triggered a substitution effect, whereby uncovered bank bonds would have been crowded out by covered bank bonds. Using cointegration techniques, it is shown that the CBPP did, in fact, stimulate a revival of the covered bond market. This revival appears to have been driven by banks substituting the issuance of uncovered bonds with that of covered bonds, rather than reviving the bank bond market as a whole. The CBPP was effective in lowering the overall funding costs of banks. Indeed, covered bonds were an attractive alternative way of obtaining long-term funding, with banks' uncovered bond yields rising rapidly, owing to both the flight-to-quality phenomenon and the government guarantee feature, which was necessary to attract the interest of investors.

The CBPP is also shown to have had positive effects on the secondary market. The analysis controls for the effects of the sovereign debt crisis. The reaction of most European covered bond markets to the announcement of the CBPP is shown to be noticeable, and appears to have

1 Decision of the European Central Bank of 2 July 2009 on the implementation of the covered bond purchase programme (ECB/2009/16), available at http://www.ecb.europa.eu/ecb/legal/pdf/l_17520090704en00180019.pdf

2 Further information on covered bond market developments over the course of the period in which the CBPP was implemented can be found in monthly reports published by the ECB, which are available at: http://www.ecb.int/pub/pub/mopo/html/index.en.html?skey=covered%20bond.

3 It is important to note that the CBPP was introduced in conjunction with the first 12-month longer term refinancing operation. This operation had a major impact in relation to reducing money market term rates. The effect of the CBPP on yields in the covered bond market is in line with this outcome.

initiated a declining trend in covered bond spreads. While the German covered bond market had already started recovering in early 2009, the announcement of the CBPP seems to have been an important stimulus to the recovery of other covered bond markets. In addition to these two "event study" analyses, the impact of the CBPP is assessed using a regression model for the euro area covered bond yields, including measures controlling for overall bond market developments, factors specific to the covered bond market but not related to the CBPP, and accounting for the broad market turbulence in 2010 relating to the sovereign debt crisis. Using this simple model, we assess the impact of the CBPP on the euro area market as a whole, and conduct a similar analysis for single country-level covered bond indices.

Overall, the results show that the CBPP had a dampening effect on euro area covered bond yields of approximately 12 basis points. This result is in line with the initial decline in spreads during the first week after the CBPP announcement, when a trend of daily yield declines could be observed. However, in the countries affected by the sovereign debt crisis, as well as at the euro area level, the declines have been offset by the recent upward pressures on yields. Beyond this, we do not find that the purchases conducted by the Eurosystem have had any significant impact on prices. This suggests, along the lines of the rational expectations hypothesis, that the introduction of the programme alone had a significant and complete price impact, while the purchases were only seen as the execution of the previously announced commitment. This observation probably reflects the fact that the total amount of the purchases (€60 billion in nominal terms) and the period over which the purchases would take place (until the end of June 2010) were announced at the time the programme itself was announced, and that the implementation of the programme was fully in line with these announcements.

Our work also includes an analysis of the effect of the CBPP on liquidity in the covered bond market, suggesting that, since the introduction of the CBPP, liquidity conditions have improved, and are now similar to those before the crisis. The quantitative work carried out is in line with anecdotal evidence from market participants that the CBPP has led to a very rapid tightening of covered bond spreads in the secondary market and a narrowing of bid-offer spreads. The positive impact of the CBPP on covered bond spreads and market liquidity is particularly notable given the tensions that emerged in sovereign debt markets at the end of April 2010. Overall, it is concluded that the CBPP has been effective in achieving its objectives.

Going forward, the CBPP is not expected to be extended or expanded. The investment strategy of the Eurosystem with regard to the CBPP is a hold-to-maturity strategy. The estimates of financial risks for such a portfolio, obtained following standard calculation methods based on historical default rates, are substantially lower than the corresponding expected return estimates. It can therefore be concluded that there is a high likelihood that the CBPP will generate positive returns to the Eurosystem.

I INTRODUCTION

This paper presents an analysis of the impact of the CBPP. It was announced on 7 May 2009 in order to stimulate activity in the euro area covered bond market. Over the 12-month period from July 2009 to the end of June 2010, the effective period of the CBPP, the Eurosystem made outright purchases of covered bonds to the nominal value of €60 billion. The remainder of this paper is structured as follows. Section 2 provides an overview of the context in which the CBPP was introduced. This includes a discussion of the evolution of credit and liquidity risk pricing in the period before the Programme began, as well as a description of the aims and modalities of the programme. A discussion of issues more theoretical in nature is also provided. This refers to how the programme is expected to affect the covered bond market, for example in relation to liquidity risk.

Section 3 presents an empirical analysis of the impact of the CBPP on the primary market. The analysis focuses on whether the CBPP had an impact on banks' outstanding amounts of bonds (i.e. both covered and uncovered). The central issue examined is that, although the CBPP may have had a positive impact on the outstanding amount of covered bonds, there may not have been any overall effect on covered and uncovered bonds. Thus, the CBPP may have triggered a substitution effect, whereby uncovered bank bonds would have been crowded out by covered bank bonds. Using cointegration techniques, it is shown that the CBPP did, in fact, stimulate a revival of the covered bond market. This revival, however, appears to have been driven by banks substituting the issuance of uncovered bonds with that of covered bonds, rather than reviving the bank bond market as a whole. The CBPP was effective in lowering the overall funding costs of banks. Indeed, covered bonds were an attractive alternative way of obtaining long-term funding, with banks' uncovered bond yields rising rapidly, owing to both the flight-to-quality phenomenon and the government guarantee feature, which was necessary to attract the interest of investors.

Section 4 assesses empirically the impact of the CBPP on the secondary market. The analysis controls for the effects of the sovereign debt crisis. The reaction of most European covered bond markets to the announcement of the CBPP is shown to be noticeable, and appears to have initiated a declining trend in covered bond spreads. While the German covered bond market had already started recovering in early 2009, the announcement of the CBPP seems to have been an important stimulus to the recovery of other covered bond markets. In addition to these two "event study" analyses, the impact of the CBPP is assessed using a regression model for the euro area covered bond yields, including measures controlling for overall bond market developments, factors specific to the covered bond market but not related to the CBPP, and accounting for the broad market turbulence in 2010 related to the sovereign debt crisis. Using this simple model, we assess the impact of the CBPP on the euro area market as a whole, and conduct a similar analysis for single country-level covered bond indices. Overall, the results show that the CBPP had a dampening effect on euro area covered bond yields of approximately 12 basis points. This result is in line with the initial decline in spreads during the first week after the CBPP announcement, when a trend of daily yield declines could be observed. However, in the countries affected by the sovereign debt crisis, as well as at the euro area level, the declines have been offset by the recent upward pressures on yields. Beyond this, we do not find that the purchases conducted by the Eurosystem have had any significant impact on prices. This suggests, along the lines of the rational expectations hypothesis, that the announcement of the programme itself had a significant and direct impact on prices, while the purchases were only seen as the execution of the previously announced commitment. Section 4 also presents an analysis of the effect of the CBPP on liquidity in the covered bond market, suggesting that, since the introduction of the CBPP, liquidity conditions have improved, moving closer to the situation before the crisis. The quantitative work carried out in Section 4 is in line with anecdotal evidence from market

participants that the CBPP has led to a very rapid tightening of covered bond spreads in the secondary market and a narrowing of bid-offer spreads. The positive impact of the CBPP on covered bond spreads and market liquidity is particularly notable given the tensions that emerged in sovereign debt markets at the end of April 2010.

Section 5 presents our overall conclusions on the impact of the CBPP as a whole, including a discussion of whether policy goals have been achieved and an overview of lessons that may be taken on board for the future. This includes a discussion of the hold-to-maturity investment strategy of the Eurosystem as regards the CBPP portfolio. Finally, Appendices 1 and 2 provide technical details on the econometric models used on the primary and secondary markets respectively, and Appendix 3 provides a description of the risk management aspects of the CBPP's investment strategy.

2 THE COVERED BOND PURCHASE PROGRAMME

2.1 INTRODUCTION

This section provides an overview of the context within which the CBPP was introduced. This includes a discussion on the covered bond market in the euro area and general financial market conditions at the time of the crisis. In addition, an outline of the specific objectives and modalities of the programme is provided. Finally, the section concludes with a discussion of theoretical considerations relating to the expected impact of the CBPP in reviving activity in the primary market and suppressing spreads in the secondary market.

2.2 OVERVIEW OF THE CONTEXT

The covered bond market is the most important privately issued bond segment in Europe's capital markets. Prior to the intensification of the financial crisis in October 2008, covered bonds were a key source of funding for euro area banks. The market had grown to over €2.4 trillion by the end of 2008, compared with about €1.5 trillion in 2003 (ECBC, 2009). As defined in a recent ECB publication on covered bonds (ECB, 2008), *"Covered bonds are dual-recourse bonds, with a claim on both the issuer and a cover pool of high-quality collateral (which the issuer is required to maintain), issued under specific covered bond legislation (or contracts which emulate this). The recourse to the issuer and consequent lack of credit risk transfer distinguishes covered bonds from asset-backed securities, with significant implications for issuers and investors"*.

The lack of credit risk transfer with covered bonds is an important distinction with this asset class compared with, for example, asset-backed securities (ABS) and other securities that were subject to securitisation. This may well explain the resilience of the covered bond market at the initial stage of the crisis in August 2007. Investors' affinity for covered bonds can be explained by their relative safety compared with any non-securitised asset class. In relation to covered bonds, the credit risk of the issuer is backed by a pool of collateral, which is usually of high quality. In the case of ABS, the underlying pool is transferred to a special purpose vehicle (SPV), while the assets pledged as collateral for a covered bond remain on the balance sheet (thereby giving the issuer bank an incentive to keep only high quality assets).[4]

Despite this, however, the covered bond market was not totally immune to the effects of the crisis. Up to the intensification of the crisis following the collapse of Lehman Brothers in mid-September 2008, it was clear that the covered bond market had outperformed other wholesale funding instruments. The widening of spreads was much less substantial for covered bonds than other ABS and unsecured debt. After mid-September 2008, however, spreads in the secondary market widened and issuance stalled in the primary market. In addition, secondary market liquidity deteriorated. A smoothly functioning covered bond market is highly important in the context of financial stability. This market provides a useful funding source for mortgage lending. For example, the issuance of covered bonds enables banks to match liability duration relative to its mortgage loan portfolio. As a result, this improves a bank's ability to manage funding and interest rate risk. In times of financial crisis, the risk appetite of investors shifted towards less risky assets.

As the crisis progressed and became more intensive at the beginning of 2009, spreads in the euro area covered bond market continued to widen, and liquidity continued to worsen. The financial crisis exacerbated the lack of confidence between banks, leading to a halt in interbank market activity. In turn, this raised concerns about the liquidity risk of a large number of banks and, to a certain extent, their solvency, thereby threatening the whole banking system. This scenario sets the context for the introduction of the European Central Bank's decision to provide support to the

4 This feature explains partially the lack of transparency highlighted in the ABS market during the crisis.

covered bond market in the euro area through outright purchases of covered bonds under the Covered Bond Purchase Programme (CBPP). Specifically, it was felt that the CBPP "could help to revive this market, in terms of liquidity, issuance and spreads".[5] It was also felt that the CBPP could help to encourage lending to the non-financial sector given that the market was a major source of funding for euro area banks. The aim of the ECB was "to implement the CBPP gradually, taking into account market conditions and the Eurosystem's monetary policy needs". The rationale for selecting covered bonds to purchase outrightly over any other asset class can be summarised as follows (ECB, 2008): *"Covered bonds possess a number of attractive features from the perspective of financial stability. Covered bonds as dual recourse instruments are less risky than most other bank securities and also increase banks' access to long-term funding, thereby mitigating liquidity risks. In the context of the ongoing financial market turmoil, it is important to stress that, on the whole, covered bonds have proven themselves relatively resilient, in particular in comparison with securitisation".*

2.3 THEORETICAL RATIONALE FOR CENTRAL BANK ASSET PURCHASES

This section considers the economic theory underlying outright asset purchases by central banks, including a discussion on asset purchase programmes implemented by central banks outside the Eurosystem. From a theoretical perspective, an asset purchase facility, regardless of the economy in which it is carried out, follows the same principles. The main goals may include injecting money into the economy (possibly targeted at specific sectors thereof) in order to revive spending and/or to address market functioning concerns in particular market segments.

There are four main channels through which a purchase programme is transmitted to the real economy. The primary channels are via the so-called "announcement" effect (which affects investor expectations), the "portfolio balance" effect (which transmits through both expectations on the announcement of an asset purchase scheme and/or the actual period of purchasing itself), the liquidity premium effect (whereby central bank purchases can restore market liquidity through stimulating two-way market flows) and the "real economy" effect (whereby proceeds from central bank purchases are injected into the real economy).

Regarding the first channel, when a central bank announces its programme, this provides the market with a signal of its willingness to restore confidence in the economy and/or in certain market segments. Conventional New Keynesian models adhere to the view that asset purchases can only work through a signalling channel and by impacting upon investor expectations (see, for example, Eggertson and Woodford 2003). However, as described by Joyce et al (2010), actual asset purchases can also affect asset prices in models with financial frictions or incomplete markets, and with imperfect substitutability between different asset classes.[6]

The second channel, described by Tobin (1958) as the "portfolio balance" effect, refers to the idea that the purchase of assets by the central bank leads to an increase in asset prices and a reduction in the supply of the asset held by the market. Since the purchases by the central bank are replaced with short-term risk-free reserves, this reduces the term premium on the asset and results in a decline in yields, as there is less duration risk in the market.

The third channel, the liquidity premium effect, refers to the tightening effect of central bank asset purchases on liquidity premia. When a central bank purchases assets, trading opportunities are improved, as investors are less reluctant to invest, knowing that they have a

5 Keynote address by Jean-Claude Trichet, President of the ECB, at the University of Munich, 13 July 2009. http://www.ecb.int/press/key/date/2009/html/sp090713.en.html.

6 Other previous literature describing signalling and portfolio balancing impacts of asset purchases include Clouse et al. (2003), Bernanke, Reinhart and Sack (2004), Ugai (2006), and Borio and Disyatat (2009).

potential buyer if they decide to sell. This can also affect the liquidity of other asset classes as investors seek higher returns in securities with higher comparable yields than the securities purchased by the central bank. The rise in the asset prices leads to an increase in the wealth of the asset holders, thus boosting their willingness to spend. Joyce et al. (2010) note that the portfolio balance effect on yields is likely to be persistent given that it is dependent upon market expectations on the stock of bonds. By contrast, the liquidity premium effect (which can be significant when markets are dysfunctional) is likely to be temporary, as it is driven by the flow of purchases.

The fourth channel could be termed the "real economy" effect. Indeed, when a central bank purchases an asset, it credits the account of the seller with the proceeds of the transaction. The expectation is that this amount of money, irrespective of whether the total amount of money injected by the central bank remains unchanged or not (sterilisation), is then injected into the real economy, in a direction and manner which may depend upon the type of asset purchased and the counterparty to the central bank's purchase transaction.

The impact of the purchases by the central bank across these channels essentially triggers a revival in the confidence of investors in the security being purchased as an investment asset class. An open issue is whether the asset purchases work more through flows (amounts purchased over a given period of time) or stocks (amounts held, and thus withdrawn from the market, by the central bank at a given point in time).

In the Eurosystem, owing to the economic structure, where the banking system is the first source of financing for firms, boosting the real economy requires providing accommodative support to the banks' access to funding. In this respect, on 7 May 2009, the ECB announced its intention to make outright purchases of covered bonds. Indeed, in line with the economic theory described, the most significant impact of the CBPP in terms of reducing yields occurred on the announcement of the programme, as opposed to when the actual purchases began. A more detailed overview of the CBPP is described in Section 2.4.

The theoretical rationale outlined is relevant not only for the CBPP, but also for the Eurosystem's Securities Markets Programme or for asset purchases by other central banks, including, for example, the Federal Reserve and the Bank of England, in response to the crisis, even though the specific objectives and implementation features of these various programmes were significantly different. Large-scale asset purchases by the Federal Reserve are described in Gagnon et al. (2010). The programme by the Federal Reserve was established in the context of enabling a further easing of the monetary policy stance. In November 2008, the Federal Reserve announced that it would purchase housing agency debt and agency mortgage-backed securities of up to $600 billion. In addition, on 18 March 2009, the Federal Open Market Committee press release announced a plan to purchase longer-term Treasury securities and increase total asset purchases to up to $1.75 trillion. The former was mainly aimed at providing support to mortgage lending and housing markets, while the latter was aimed at improving conditions in private credit markets.

The Bank of England, under its Quantitative Easing (QE) programme, intended to purchase £75 billion of assets financed through the creation of central bank reserves (see Joyce et al. (2010) for full details). This amount has subsequently been increased four times, to an overall amount of £200 billion by the time of the programme's completion in February 2010. The assets targeted were mainly UK government securities (gilts) in the secondary market and, to a lesser extent, high-quality private sector assets, including commercial paper and corporate bonds.

Other major central banks have also carried out outright asset purchase programmes in order to mitigate the impact of the financial crisis. For example, the Bank of Japan launched two programmes in early 2009. The first, which expired on 31 March 2009, was aimed at

"ensuring stability in financial markets as well as facilitating corporate financing by conducting appropriate money market operations".[7] The assets targeted were commercial paper, including asset-backed commercial paper. The maximum outstanding amount of commercial paper purchased was ¥300 billion. The Bank of Japan launched a similar programme on 22 February 2009, tackling the same issues.[8] The scale was higher, with a total outstanding amount of purchases of ¥1 trillion. The main difference consisted of the type of assets targeted, as this facility was focusing on corporate bonds.[9]

Overall, the theory outlined for conducting asset purchases appears to have been borne out empirically across the asset purchase programmes described. Going forward, Bullard (2009) has suggested a theory to introduce a policy rule for asset purchases by central banks, although the implementation procedure of such a rule in practice remains uncertain.

2.4 OBJECTIVES AND MODALITIES OF THE CBPP

The ECB Executive Board decided that the CBPP should be established on the basis of a Governing Council decision under Article 18.1 of the Statute. The CBPP was announced on 7 May 2009. The objectives of the purchases under the CBPP were to contribute to[10]:

1. promoting the ongoing decline in money market term rates;

2. easing funding conditions for credit institutions and enterprises;

3. encouraging credit institutions to maintain and expand their lending to clients;

4. improving market liquidity in important segments of the private debt securities market.

Following the announcement, the President of the ECB, Jean-Claude Trichet, noted that covered bonds provide banks with "access to funding of a longer-term nature than the ECB's refinancing operations. Covered bonds thus allow banks to manage the maturity mismatch between their assets and liabilities".[11] The announcement was a surprise to the markets, leading to a sharp tightening of secondary market covered bond yield spreads in the euro area, as well as a recovery in the primary market. Although the announcement clearly had a positive impact, markets were initially uncertain about the types of covered bonds that the ECB would target, as well as about the maturity level. There was also some uncertainty about whether the primary market would be included in addition to the secondary market, and about the process through which the programme would be carried out. Following this, on 4 June 2009, the Governing Council of the ECB decided on the technical modalities. These modalities were as follows[12]:

1. The purchases, to the amount of €60 billion, would be distributed across the euro area and carried out by means of direct purchases. Thus, there was no auction process in place; instead, Eurosystem portfolio managers purchased the assets in the market directly.

2. The purchases would be conducted in both the primary and secondary markets.

3. In order to be eligible for purchase under the programme, covered bonds must:

   - be eligible for use as collateral for Eurosystem credit operations;

   - comply with the criteria set out in Article 22(4) of the Directive on undertakings

7 Establishment of "Principal Terms and Conditions for Outright Purchases of CP", 22 January 2009. http://www.boj.or.jp/en/type/release/adhoc09/mok0901a.pdf.

8 Establishment of "Principal Terms and Conditions for Outright Purchases of Corporate Bonds", February 19, 2009. http://www.boj.or.jp/en/type/release/adhoc09/mok0902b.pdf.

9 The former programme focused on the purchase of assets with a residual maturity of up to three months, while the latter focused on assets with a residual maturity of up to one year.

10 These objectives were outlined in the ECB Decision of 2 July on the implementation of the CBPP (ECB/2009/16).

11 Keynote address by Jean-Claude Trichet, Munich, 13 July 2009 (see footnote 2 above).

12 See Decision of the European Central Bank of 2 July 2009 on the implementation of the CBPP (ECB/2009/16), available at http://www.ecb.europa.eu/ecb/legal/pdf/l_17520090704en00180019.pdf.

for collective investment in transferable securities (UCITS) or similar safeguards for non-UCITS-compliant covered bonds;

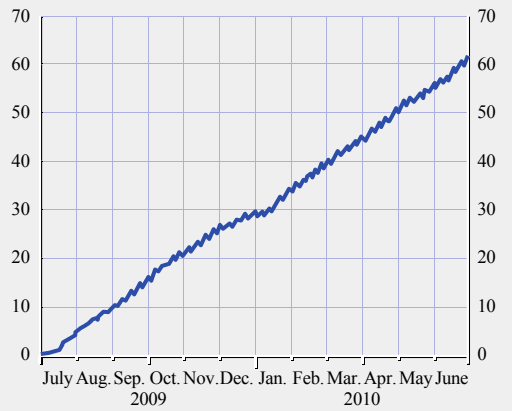
- have, as a rule, an issue volume of about €500 million or more and, in any case, not lower than €100 million;
- have, as a rule, been given a minimum rating of AA or equivalent by at least one of the major rating agencies (Fitch, Moody's, S&P or DBRS) and, in any case, not lower than BBB-/Baa3; and
- have underlying assets that include exposure to private and/or public entities.

4. The counterparties eligible for the purchase programme were those eligible for the Eurosystem's credit operations, as well as euro area-based counterparties used by the Eurosystem for the investment of its euro-denominated portfolios.

5. The purchases would start in July 2009 and were expected to be fully implemented by the end of June 2010 at the latest.

The progression of purchases under the CBPP is provided in Chart 1 below.

Chart 1 Accumulated covered bond purchases by the Eurosystem under the CBPP



Source: Eurosystem.

Average daily purchases under the CBPP amount to €240 million across the Eurosystem as a whole. As can be seen from Chart 1, total accumulated purchases amounted to a nominal €60 billion as at 30 June 2010.[13] Overall, over the last 12 months to 30 June 2010, there were 148 new CBPP-eligible covered bonds issued and 48 tap issuances of already outstanding CBPP-eligible covered bonds. The total amount of these issues reached around €150 billion. Since the announcement of the CBPP, one new covered bond jurisdiction, namely Greece, saw its first publicly placed covered bond; and, overall, 24 inaugural issuers entered the covered bond market in various euro area countries. Some national markets, such as that in Italy, saw a significant increase in the number of issuers and outstanding amounts, and thus a deepening and broadening of their covered bond market.

It is worth noting that the CBPP was not the only initiative in place to restore activity in the euro area bond market. For example, a range of government guarantee programmes were introduced in order to support the issuance of uncovered bank bonds.[14] Government guarantee programmes have a direct impact on both the interbank and capital markets, as they relate directly to investor appetite. They aim to address "funding problems of liquidity constrained solvent banks".[15] To some extent, this measure therefore has a similar aim as the CBPP. Indeed, both tend to address medium/long-term funding and depend on the activity of the capital market. While the CBPP tries to do so via improving market liquidity and reducing funding costs,

13 The total amount of purchases settled within the CBPP provided €61,118 million of liquidity to the money market, according to the ECB's liquidity analysis. The difference between the latter amount and the nominal amount of €60 billion of purchased bonds mainly reflects differences between purchase price and par. It should be noted that, at the time of purchase, many covered bonds, in particular those that were issued some time ago, had a market yield to maturity below the percentage of the coupon of the bond. The purchase prices of those bonds were therefore higher than par, i.e. those bonds traded at a value above their nominal amount.

14 EU Member States also engaged in other measures to combat the crisis, including nationalisation, government investment, government loans and depositor protection schemes.

15 The declaration of the euro area summit in Paris of 12 October 2008, Section (8).

government guarantee programmes virtually eliminate credit risk. The provision of support under government guarantee programmes has been effective. During the peak of the crisis, nearly all new bank debt issuances required a government guarantee to appease investors' risk concerns. This has enabled banks to raise substantial amounts of term funding to stabilise their balance sheets.

2.5 LENDING OF SECURITIES UNDER THE CBPP

The securities held by the Eurosystem in its CBPP portfolio have been made available for lending to eligible counterparties against eligible collateral since March 2010. Eurosystem central banks may lend CBPP securities through direct lending and/or facilities via central securities depositories.

Making the CBPP securities available for lending meets some demand and therefore contributes positively, albeit probably in a rather small way, to the proper functioning of the covered bond market. The activity is also a source of small, but still positive, financial returns for the Eurosystem. In addition, it can be argued that the knowledge among market participants that CBPP securities are available for lending on demand against eligible collateral provides a reassurance that securities are unlikely to be unduly squeezed, which contributes to expectations that the market will continue to function properly at the aggregate level.

2.6 HOW TO MEASURE THE IMPACT OF THE CBPP

The analysis of the impact of the CBPP on the primary market is carried out on the basis of a cointegration analysis to indicate the effect on outstanding amounts of covered and uncovered bonds. Regarding the effect on the secondary market, event study analyses, as well as a regression analysis, provide evidence that the CBPP has had a notable effect on reducing euro area covered bond yield swap spreads since the announcement of the programme. The use of event study analyses in conjunction with econometric techniques helps to provide robustness to conclusions made on the impact of the programme. Measurement of the programme impact is driven by data availability on the covered bond market. As regards the secondary market, the lack of a suitable time series for liquidity in the covered bond market means that it is difficult to quantitatively measure the effect of the programme on this measure.[16] On the other hand, data on yields in the covered bond market are readily available, meaning that the impact of the programme on the implied risk in the covered bond market can be quantitatively measured. In the following sections, empirical analyses are presented to show the effect of the CBPP on both the primary and secondary markets.

16 We have, however, been able to discuss the liquidity effect using the market efficiency coefficient (MEC) technique, and this is discussed further in Section 4.

3 IMPACT OF THE CBPP ON THE PRIMARY MARKET OF BANK BONDS

3.1 INTRODUCTION

The CBPP has been established to support a revitalisation of the covered bond market. And indeed, total outstanding amounts of covered bonds increased significantly shortly after the announcement of the CBPP on 7 May 2009.[17] Even so, this development is not necessarily the result of the CBPP, as other factors could have played a more important role. In particular, it is important to recall in this context that market conditions generally improved in 2009. On the other hand, it is also possible that, while the CBPP may have had a positive effect on the outstanding amounts of covered bonds, the CBPP had no effect on the outstanding amounts of bonds (both covered and uncovered) issued by banks.[18] In this case, the CBPP would merely have triggered a substitution effect: uncovered bank bonds would have been crowded out by covered bank bonds. This section tries to shed some light on these two questions through the use of cointegration techniques. All data used for the analysis are from the eligible assets database. Data refer to outstanding amounts of three types of (euro-denominated) bonds: covered bank bonds, uncovered bank bonds and corporate bonds.[19] The reason data on corporate bonds are used will be explained later.[20]

3.2 LONG-RUN RELATIONS BETWEEN COVERED, UNCOVERED AND CORPORATE BONDS

Chart 2 illustrates the evolution of outstanding amounts of covered and uncovered bonds since January 2002. Although the total amount of covered bonds in circulation has always been higher than that of uncovered bank bonds, both series tend to move closely together through time, reflecting the fact that both types of bank bonds are driven by common fundamental factors. Indeed, both series show a remarkable parallelism between their respective upward trends until 2006, as illustrated by a stable gap of about 100 billion between covered and uncovered bonds. From then to the beginning of the turmoil (August 2007), the outstanding volume of uncovered bonds slowed, which resulted in a gradual widening of the gap between the two types of bond. During the first phase of the turmoil (August 2007-September 2008), the growth in uncovered bonds decreased further, and the difference between the two series reached a gap of about 300 billion. This may reflect reduced demand for riskier bonds when investors were looking for safe investment opportunities. With the worsening of the crisis, however, and especially after the end of 2008, we observe a gradual reversal of both trends, as uncovered bonds recovered while covered bond growth lessened, with the gap starting to narrow again. This is likely to be due to the significant number of government-guaranteed (uncovered) bank bonds issued in the first few months of 2009. At the beginning of 2009 the increase in covered bonds almost came to a complete stop, as seen by the flattening of the curve. In June 2009 the gap between both series showed a record low of about 30 billion. The issuance of covered bonds picks up again after the launch of the CBPP in July 2009 (represented by the vertical line), apparently at the expense of the issuance of uncovered bonds, whose curve flattens. The current gap between covered and uncovered bonds is close to 60 billion.

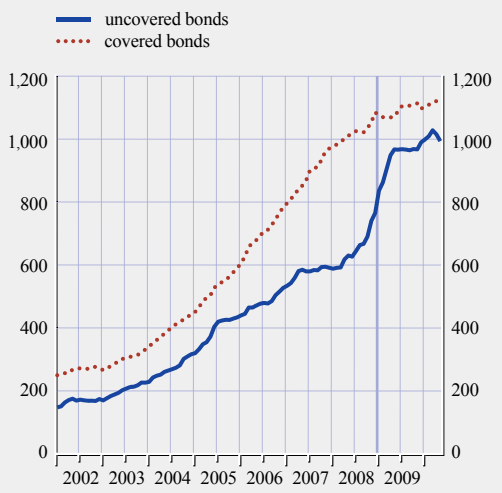
17 Issuance volumes increased by about 36% to €32 billion from May 2009 to June 2009 (data from EADB).

18 The net issuance is the amount of newly issued bonds minus the amount of maturing bonds within a given period, and equals the change in the total outstanding amount of bonds between the start and end of the respective period. The term "issuance" refers here to net issuance.

19 The replacement of uncovered bank bonds by uncovered bank bonds guaranteed by government has been evident since the onset of the financial crisis. This should be borne in mind when considering the results presented.

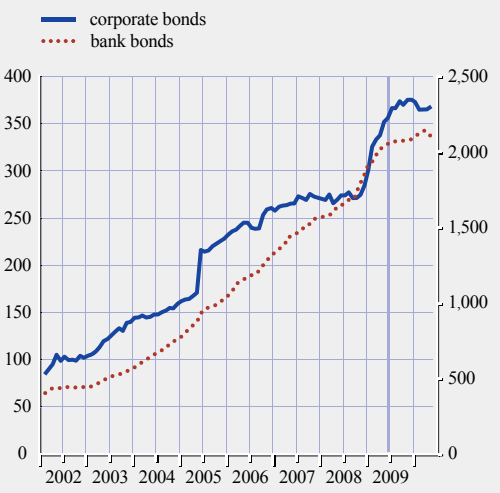
20 Only bonds that would be eligible even without the temporary expansion of collateral are included so as to avoid breaks in the time series around the time of the temporary expansion of collateral in October/November 2008. Thus, for example, only bonds with a rating of at least A- are included. A size threshold is not applied, i.e. bonds are included regardless of their outstanding amount. Bonds that are classified as covered bonds according to Dealogic, but not according to the eligible assets database (i.e. structured, or non-UCITS, covered bonds) are treated as covered bonds throughout the study.

Chart 2 Total outstanding amount of covered and uncovered bank bonds



Source: Eligible assets database.

Chart 3 Total outstanding amount of (euro-denominated) bank and corporate bonds



Source: Eligible assets database.

Chart 2 suggests that the CBPP coincided with a revival of the covered bond market. However, it is not clear whether this revival came at the expense of the uncovered bond market. To address this issue, we compare in Chart 3 the total outstanding amounts of corporate bonds with those of all bank bonds (reported on different scales, corporate bonds on the left axis and bank bonds on the right axis). The idea is to check whether corporate and bank bonds also follow a common long-run trend, and whether there have been deviations from this trend after the introduction of the CBPP. We look at corporate bonds because it appears likely that bank bonds and corporate bonds are driven by more common factors than bank bonds and other possible types of bonds. For example, outstanding amounts of bank bonds and corporate bonds might on average move in a pro-cyclical way, while government bonds might move counter-cyclically. Similarly, euro-denominated bank bonds and euro-denominated corporate bonds both depend on developments specific to the euro area, while USD-denominated bank bonds do not. The figure confirms that corporate and bank bonds also appear to be driven by common fundamental factors in the long run. Note, however, that, after June 2009, the growth of the bank bond market came to a stop, while the corporate bond market continued a strong growth trend. This evidence suggests that the CBPP did have a positive impact on the outstanding amount of covered bank bonds, but mainly triggered a substitution of uncovered bank bonds for covered bonds.[21] In particular, the CBPP on bank bonds does not seem to have had any aggregate effect, as a comparison with the behaviour of corporate bonds shows. Nonetheless, it cannot be ruled out that, without the CBPP, the overall outstanding amount of bank bonds would have decreased and created more severe refinancing problems.

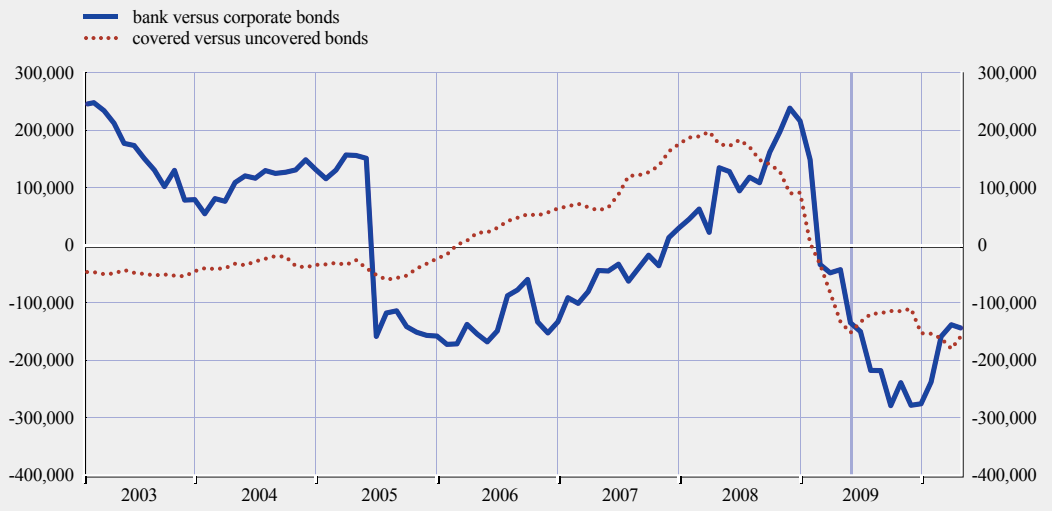
3.3 THE RELATIONSHIP BETWEEN COVERED AND UNCOVERED BANK BONDS

Using cointegration techniques, which are based on estimating long-run equilibrium relationships, it turns out that the difference between the outstanding amount of covered bonds and that of uncovered bank bonds may centre on an

21 Having said that, the role played by disintermediation and the issuance of corporate bonds may affect this conclusion, although this would require further investigation.

Chart 4 Long-run equilibrium relationships

(February 2003 – May 2010, monthly data)



Source: Authors estimations.

equilibrium level. The figure tends to return to this level following shocks that have changed the relationship, after previously hovering around it.[22] The model estimated is summarised in Chart 4.

The thick line in Chart 4 displays the deviation from the equilibrium over time. The zero line marks the long-run equilibrium. As is visible from the chart, the system has started to diverge "downwards" from its long-run equilibrium in 2009. The start of the CBPP (vertical line), however, has triggered a correction, by having a positive effect on the outstanding amount of covered bonds relative to that of uncovered bank bonds.

3.4 THE RELATIONSHIP BETWEEN (COVERED AND UNCOVERED) BANK BONDS AND CORPORATE BONDS

The previous analysis suggests that the CBPP did have a positive effect on the outstanding amount of covered bank bonds. However, it is important to understand whether the CBPP also had an overall positive effect on the outstanding amount of total bank bonds (i.e. both covered and uncovered), or whether it simply triggered a substitution effect, with covered bonds crowding out uncovered bank bonds.

The same cointegration technique is used to address this question. As it can be assumed that the CBPP had no significant impact on the outstanding amount of corporate bonds, it may be concluded that any change in the direction of the relationship between bank bonds and corporate bonds around the start of the CBPP reflects the impact of the CBPP on bank bonds. The thin line in Chart 4 displays the deviation from this equilibrium over time. As before, the zero line marks the long-run equilibrium to which the system has a tendency to return after a shock. As in the previous case, the system started to diverge from its long-run equilibrium in 2009. Unlike in the previous case, however, the start of the CBPP (vertical line) did not trigger any immediate correction, suggesting that the CBPP did not have any overall effect on the outstanding amount of bank bonds (i.e. both covered and uncovered). This evidence supports

22 Please refer to Appendix 1 for full details on the methodology employed, as well as the econometric results.

the hypothesis that the CBPP did help to revive the covered bond market. This revival was, however, driven by banks substituting the issuance of uncovered bonds for that of covered bonds, rather than by reviving the bank bond market as a whole. It may be worth carrying out the analysis for individual euro area countries to see if the CBPP had a similar impact in another country. This extension of the analysis will be the subject of future research.

4 IMPACT OF THE CBPP ON THE SECONDARY MARKET

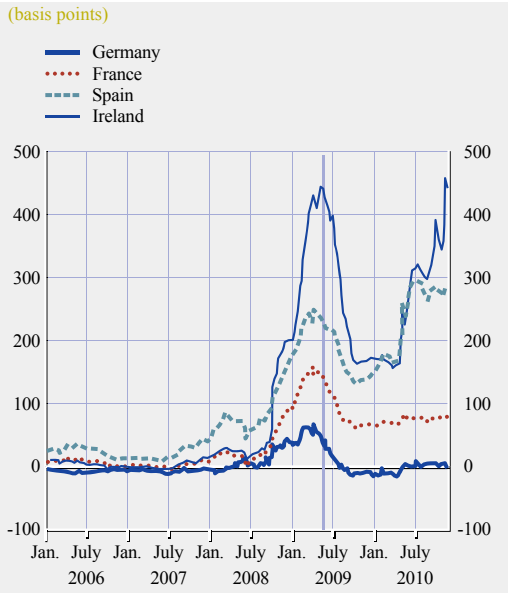
4.1 INTRODUCTION

This section provides an assessment of the impact of the CBPP on the yields of covered bonds. The reaction of most European covered bond markets to the announcement of the CBPP was noticeable, and appears to have initiated a declining trend in covered bond yield spreads. The comparison of covered bond yields with a risk-free benchmark shows that German covered bond spreads even declined below zero for a time, but now stand at around the levels observed in late 2007. French covered bond spreads seem to have stabilised at the level of approximately 30-50 basis points higher than their pre-Lehman values, while spreads in other countries significantly widened again during the recent sovereign debt crisis. A regression analysis, controlling for the overall developments in the covered bond markets, shows that the CBPP resulted in an average spread tightening by about 12 basis points at the euro area level, although this effect differed significantly across countries. Overall, the results suggest that the CBPP had a noticeable impact on euro area covered bond secondary markets. While the German covered bond market had already started recovering by early 2009, the announcement of the CBPP seems to have been an important stimulus to the recovery of other covered bond markets.

4.2 DEVELOPMENTS IN EURO AREA COVERED BOND SPREADS

The announcement of the CBPP by the ECB was followed by a recovery in the euro area covered bond market (see Chart 5). To assess the exact impact of the programme on prices, it is crucial to disentangle its effect from other factors that may have influenced covered bond markets at the same time. This note presents: (1) an event study of the price reaction to the initial announcement of the CBPP, (2) a comparison of covered bond yield developments with risk-free, but comparably liquid, benchmarks, and (3) a regression analysis, where the impact of the programme is analysed, controlling for broader bond market developments.

Chart 5 Covered bond swap spreads



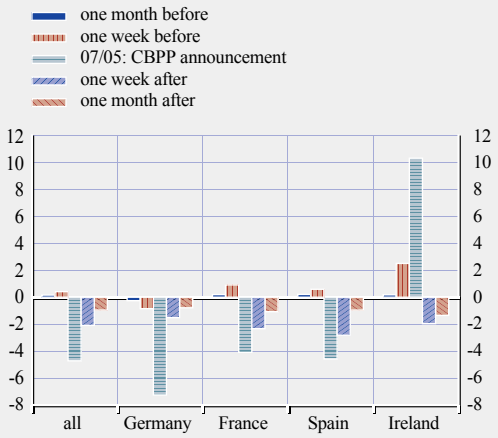
Sources: DataStream and ECB calculations.
Period under review: 2 January 2006-12 July 2010.
Notes: All spreads refer to the covered bond iBoxx indices for the five-year maturity vis-à-vis the five-year swap rate. The vertical line marks the announcement of the CBPP.

4.3 THE REACTION OF COVERED BOND YIELDS TO THE ANNOUNCEMENT OF THE CBPP

This section analyses the reaction of covered bond spreads on the day of the initial announcement of the CBPP (7 May 2009). This reaction is compared with the trend of changes observed over a longer period around the event (see Chart 6). For most euro area covered bond markets, the results are consistent with a noticeable tightening of spreads induced by the CBPP. While the average daily change in spreads in the weeks before the event was close to zero, the spread tightened by up to 7 basis points (in the case of German covered bonds) on the day of the announcement, and declined in the following week at an average pace of

Chart 6 Average daily changes of covered bond swap spreads around the CBPP announcement

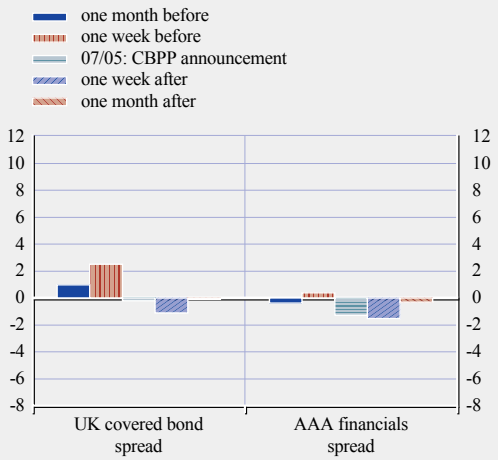
(basis points)



Sources: DataStream and ECB calculations.
Notes: The figure presents the average daily changes of the covered bond spread over the five-year euro swap computed for the following time windows: 1 April-6 May 2009 ("one month before"), 30 April-6 May 2009 ("one week before"), 6 May-7 May 2009 ("CBPP announcement"), 7 May-14 May 2009 ("one week after") and 7 May-5 June 2009 ("one month after"). Covered bond yields are iBoxx country indices.[1)]
1) For France, there are two covered bond markets: legal and structure. The yields in those markets move very similarly, differing only in their levels. We use the iBoxx index for the French legal covered bonds.

Chart 7 Average daily changes of the UK covered bond swap spread and AAA financials spread around the CBPP announcement

(basis points)



Sources: DataStream, Barclays Capital and ECB calculations.
Notes: The figure presents the average daily changes of the five-year UK covered bond swap spread and the spread of AAA financials computed for the following time windows: 1 April-6 May 2009 ("one month before"), 30 April-6 May 2009 ("one week before"), 6 May-7 May 2009 ("CBPP announcement"), 7 May-14 May 2009 ("one week after") and 7 May-5 June 2009 ("one month after").

3 basis points per day.[23] To control for any broader trends in the covered and corporate bond markets, Chart 7 presents the movement of the UK covered bond spread versus swaps and the AAA financial corporate bond spread around the day of the announcement (using the same y-axis scaling as in Chart 6).[24] The pattern observed in the euro area covered bond markets around the event cannot be found for either the UK covered bond market or an overall index of financial corporate bonds.[25]

4.4 LONGER-TERM PRICE IMPACT OF THE CBPP

4.4.1 IMPACT ON COVERED BOND YIELDS

To assess the longer-term impact of the purchase programme, there is a need to find appropriate benchmark bonds whose movements were similar to those of covered bonds prior to the crisis. Chart 8 presents covered bond spreads over the yields of French and German government-guaranteed agency bonds.[26] This choice of a benchmark has two important advantages. First, it allows control for country-specific effects. Second, agency yields are characterised by market liquidity more comparable to covered

23 This result is *robust*, considering other benchmarks, such as the five-year overnight indexed swap. The result is also *significant*, since the magnitude of the spread change observed on 7 May 2009 is between 1.4 (Spain and Ireland) and 2.9 (France and Germany) basis points higher than the average *absolute* daily change in the period before the event. The only exception was the Irish covered bond spread, which increased substantially on 7 May 2009. It seems unlikely that this increase was driven by adverse news that was specific to Ireland, as a substantial tightening of the Irish sovereign spread was observed on this day. The reaction observed was temporary, however, and the tightening started a couple of days after the event.

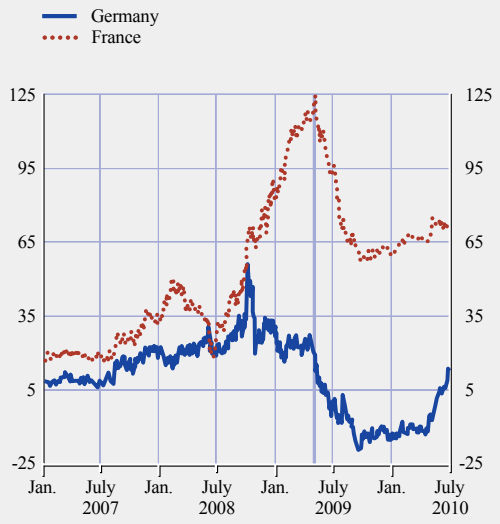
24 These markets are likely to be influenced by broader trends but, should not be moved by the news about the CBPP. Importantly, on 7 May 2009, the Eurosystem also announced the introduction of the 12-month LTROs, an announcement with potentially larger ramifications for the euro area banking system than the CBPP.

25 These results also hold for other bonds (such as BBB financials, BBB non-financials, as well as government and agency bonds) and are robust to taking other benchmarks, such as the overnight indexed swap and German agency bond yields, for spreads.

26 The analysis in this section is constrained to two countries due to the availability of the agency data. For Germany, we use bonds issued by Kreditanstalt für Wiederaufbau (KfW) and for France, Caisse d'Amortissement de la Dette Sociale (CADES). Both agencies have an explicit and full debt guarantee from the respective governments. See "Gesetz über die KfW", available at www.kfw.de.

Chart 8 Covered bond spreads vis-à-vis agency yields

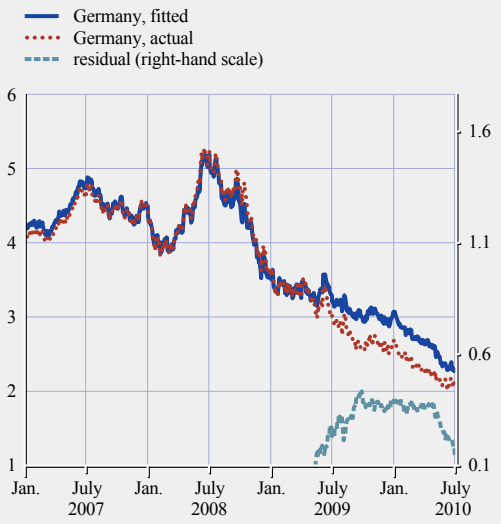
(basis points)



Sources: DataStream, Bloomberg and ECB calculations.
Notes: Period under review: 2 January 2007-7 January 2010. All spreads refer to the five-year maturity. The agency yield is the yield of KfW (German agency) and CADES (French agency) bonds. The debt of both agencies is fully and explicitly guaranteed by the corresponding government. The vertical line marks the announcement of the CBPP. Covered bond yields are iBoxx country indices.

Chart 9 Five-year German covered bond yields projected using agency yields (KfW)

(percentage per annum and basis points; January 2007 – July 2010)



Sources: Bloomberg and ECB calculations.
Notes: The fitted German covered bond yields are constructed on the basis of a regression of observed German covered bond yields on observed KfW yields (both five-year maturity) using data up to 6 May 2009. A positive excess performance reflects the fact that German covered bond yields declined by significantly more than agency yields after the announcement of the CBPP.

bonds, and are unlikely to be strongly affected by "flights to liquidity".[27]

Chart 8 shows that, prior to the onset of the financial crisis, the spread between covered bond and agency yields had remained fairly stable at low levels; around 10 basis points for Germany, and 20 basis points for France. These spreads increased progressively in both countries as the crisis intensified, although the pattern differed. Whereas the German covered bond spreads (relative to agency yields) had already started to recover in early 2009, French spreads kept widening. After the announcement of the CBPP, covered bond spreads decreased in both markets. German covered bond spreads declined from a level that was already fairly normal and continued well into negative territory in spite of their higher credit risk relative to agency bonds.[28] In contrast, the CBPP announcement was a clear turning point for the French covered bond spreads. Since 7 May they have declined by around 50 basis points and now stand approximately 30 basis points above their pre-Lehman level. The analysis of covered bond spreads vis-à-vis respective sovereign yields is presented in the Appendix.[29]

Another way to look at the developments in German covered bond yields relative to the risk-free benchmark is to project these yields beyond 7 May 2009, based on their comovement with agency yields prior to that date. Chart 9 shows that, since 7 May 2009, German covered

27 The yields of KfW and CADES moved very closely throughout the crisis, which suggests strongly the lack of any strong liquidity effects in any of those markets. For more details, see Box 4 in September 2009 Monthly Bulletin, entitled "New evidence on credit and liquidity premia in selected euro area sovereign yields".

28 Since 7 May German spreads have declined by around 35 basis points.

29 Note that sovereign bonds are much more liquid than agency bonds, thus requiring an additional liquidity premium. Since this premium changed during the crisis, owing to flight-to-liquidity effects, agency yields probably better reflect a country-specific risk-free rate. Owing to the lack of data on agency bonds for other countries, the above analysis can be conducted only for German and French markets.

bond yields have declined by around 40 basis points more than their previous comovement with agency yields would have suggested, and returned closer to agency yields during May and June 2010.

4.4.2 IMPACT ON COVERED BOND MARKET LIQUIDITY

Over the 12-month period of the programme, which spanned from 6 July 2010 to 30 June 2010, 148 new eligible covered bonds, as well as 47 taps of existing covered bonds, were issued for an overall amount of €148 billion. This helped to deepen and broaden the covered bond market. In the meantime, the bid-offer spread tightened. These two factual pieces of evidence are indicative of the positive impact of the CBPP on covered bond market liquidity. In terms of quantitatively measuring the impact of the CBPP on liquidity in the covered bond market, the market efficiency coefficient (MEC) approach is applied (see Sarr and Lybek (2002) for further details). Essentially, this concept exploits the fact that price movements are more continuous in liquid markets. Thus, the coefficient is defined as the ratio between the variance of long-term and short-term returns, adjusted by the number of short-term returns per long period. For a similar level of market volatility, an MEC value of close to, but slightly below, one reflects a liquid market, in turn reflecting relatively low short-term return variability. Moreover, when short-term variability is in line with that of the longer term, this implies that the asset class is less sensitive to shocks. Table 1 presents short and longer-term variances and MECs for euro area covered bond yields before and during the crisis.[30] After the outbreak of the crisis, following the bankruptcy of Lehman Brothers, the volatility of covered bond prices more than doubled in comparison to the period before September 2008. Although the MEC in this period is very low, it should not be interpreted as a signal of improved market liquidity, owing to the unusually high yield variance. Following the introduction of the CBPP, the variance of euro area covered bond yields has returned to the levels observed in 2007 and early 2008, and this is consistent with one of the objectives of the CBPP, namely to contribute to improving liquidity in the covered bond market.

On the issue of liquidity (as measured by the ability to execute two-way flows in the covered bond market), anecdotal evidence from market participants indicates that it gradually improved following the drop in secondary market spreads. While the MEC measure in the post-CBPP period is higher than in the pre-crisis period (suggesting that the liquidity of the covered bond market is still slightly lower than before the turmoil), anecdotal evidence, in combination with the similar bond yield volatilities in the period before September 2008 and the period since the introduction of the CBPP, suggests that covered bond market liquidity moved towards, although it did not reach, the conditions prevailing before September 2008.

30 The returns are computed as differences in yields, which broadly corresponds to the log returns of bond prices.

Table 1 Volatility and liquidity of covered bond yields

		Variance of short-term returns	Variance of long-term returns	MEC
2 Jan. 2007	*14 Sep. 2008*	0.0014	0.0079	1.13
15 Sep. 2008	*6 May 2009*	0.0035	0.0155	0.89
7 May 2009	*30 June 2010*	0.0012	0.0084	1.45

Notes: The market efficiency coefficient is calculated as the ratio of the variance of long-term to short-term returns, scaled with the number of short-term returns per long period. The returns are computed as differences in yields, which broadly correspond to the log returns of bond prices.

4.5 "FAIR-VALUE" MODEL FOR COVERED BONDS

This section presents a regression model for the euro area covered bond yields, including measures controlling for overall bond market developments (as captured by the five-year overnight indexed swap) as well as factors influencing the covered bond sector. These are controlled for by introducing the five-year swap spread of UK covered bonds, which should not be influenced by the CBPP, but may reflect other factors relevant for the covered bond market.[31] The results do not change if we additionally account for bond market liquidity, banking sector credit risk and sovereign credit risk. Thus, we present here the most parsimonious model, avoiding the risk of choosing cointegrated variables.[32] Furthermore, accounting for the recent period of spillovers from sovereign markets, we introduce a dummy for the period of broad market turbulence following the downgrade of Greece on 24 April 2010. Using this simple model, we assess the impact of the CBPP on the euro area covered bond market as a whole, and conduct a similar analysis for single country-level indices. The regression is conducted for weekly data to avoid strong autocorrelation, with an intercept and one autoregressive term. Overall, the results show that the CBPP had a dampening effect on euro area covered bond yields of approximately 12 basis points. The decline in yields due to the CBPP was largest for Germany and Spain. However, in the countries affected by the sovereign debt crisis, as well as at the euro area level, these declines have been offset by the recent upward pressures on yields.

In addition, we check whether the purchases conducted by the Eurosystem had a significant impact on the covered bond yields, introducing the flows of purchases to the regression. However, we do not find any significant impact on prices. This suggests that, along the lines of the rational expectations hypothesis, the introduction of the programme alone had a significant and full impact on prices, while the purchases were only seen as the execution of the previously announced commitment. Thus, the overall price impact as indicated by the regression analysis is in line with the initial decline in spreads during the first week after the CBPP announcement, when a trend of daily yield declines could be observed.

31 As expected, and as shown in Chart 7, the UK covered bond swap spread did not react to the announcement of the CBPP. Therefore, it can be seen as an independent benchmark not influenced by the CBPP in the euro area. Another suitable benchmark would be Swedish or Danish euro-denominated covered bonds. However, DataStream does not provide five-year iBoxx indices for those markets. Further variables that could be included in a more elaborated analysis could be (euro area) residential mortgage-backed securities and unsecured bank bond spreads.

32 Please refer to Appendix 2 for an outline of the model used, as well as a full description of the variables used in the regression.

Table 2 Estimation of the influence of the CBPP on euro area covered bond yields

Regressors	Euro area	Germany	France	Spain	Ireland
Five-year overnight indexed swap	0.85***	0.90***	0.86***	0.85***	0.87***
Five-year UK covered bond swap spread	0.59***	0.21***	0.50***	0.75***	1.14***
CBPP dummy	-0.12***	-0.17***	-0.10***	-0.17***	0.05
Sovereign debt crisis	0.14***	0.04	0.02	0.24***	0.38***

Notes: ***, ** and * denote significance at the level of 99, 95 and 90%, respectively. There are no signs of serial correlation and the t-statistics for each β coefficient are based on Newey-West heteroskedasticity and autocorrelation-corrected standard errors. The CBPP dummy, starting 7.05.2009 equals 0 before the announcement and 1 thereafter. The sovereign debt crisis dummy equals 0 before the downgrade of Greece on 24 April 2010, which triggered broad market turmoil, and 1 thereafter. The regression is conducted for weekly data to avoid strong autocorrelation, with an intercept and one autoregressive term (neither coefficient is reported here). Please refer to the Appendix for full descriptions and definitions of all variables used. Period under review: 2 January 2006-2 July 2010.

5 CONCLUSIONS

Overall, we conclude that the CBPP has been effective in achieving its objectives. The programme stimulated a notable reactivation of covered bonds being issued in the primary market. In particular, the CBPP led to a noticeable broadening of the spectrum of euro area credit institutions that turned to the covered bond product as a funding instrument, which helped increase primary market activity in previously underdeveloped or smaller market jurisdictions or segments (such as Italy, Portugal, Greece, Austria and UCITS-compliant bonds in the Netherlands) and revived, at least temporarily, segments that had suffered particularly badly from the financial crisis. These developments contributed significantly to improving the overall funding situation in euro of euro area and also non euro area (particular the United Kingdom) financial institutions, and arguably also alleviated some of the pressure on euro area banks to rely on the Eurosystem's liquidity providing operations. Despite the surge in the primary supply of covered bonds, the launch of the CBPP also quickly led to a very rapid tightening of covered bond spreads in the secondary market and a narrowing of bid-offer spreads. While the sovereign debt crisis may have impeded the extent of the effect of the programme to some extent, the positive impact of the programme in spite of this event is notable.

In addition, some market participants have noted that the CBPP has aroused interest in covered bonds as an asset class for the first time for some investors. According to these market participants, this suggests that the covered bond market will continue to receive attention from a broad range of investors in the future, including after the end of the CBPP's purchases.

Going forward, the investment strategy of the Eurosystem with regard to the CBPP is a hold-to-maturity strategy. The risk associated with such a strategy is primarily default risk, although market risk and credit migration risk could also have an effect on the financial statements of the Eurosystem if some assets needed to be liquidated before maturity or if estimated credit losses needed to be written down. In this regard, Appendix 3 describes the financial risk of a diversified euro area covered bond portfolio with similar characteristics to that of the CBPP. Owing to the high average credit quality of the universe of assets considered, the credit risk estimate is substantially lower than the expected return of the considered portfolio. It can therefore be concluded that there is a very high likelihood that the CBPP will generate positive returns to the Eurosystem.

Appendix 1 provides the methodology and detailed results for the econometric work undertaken on the primary market. Appendix 2 provides additional background information on the empirical work carried out for the secondary market impact analysis. Finally, Appendix 3 outlines some important features of the risk control framework of the CBPP. Moreover, an overview of expected returns and risks for a diversified euro area covered bond portfolio with similar characteristics to that of the CBPP, assuming an investment strategy of holding the securities until maturity, is presented.

APPENDIX I

BACKGROUND TO THE PRIMARY MARKET ANALYSIS

Model Specification

The following error correction model is analysed for this purpose:

$$dy_{1,t} = \beta_1 \cdot dy_{2,t} + \beta_2 \cdot (y_{1,t\text{-}1} - \beta_0 - \beta_1 \cdot y_{2,t\text{-}1}) + \varepsilon_t$$

Here, $y_{1,t}$ is the outstanding amount of covered bonds in t and $y_{2,t}$ is the outstanding amount of uncovered bank bonds. The term in parentheses measures the deviation from the long-term equilibrium, and is the object of interest. Such a cointegration relationship provides an estimate of the equilibrium distance to which the covered and uncovered bonds described in Chart 2 should revert in the long run. Short-term deviations from this distance are possible, but will eventually be corrected by the underlying fundamental factors. In order to show that the model adequately describes the relationship between the outstanding amounts of covered and uncovered bank bonds, it is sufficient to show that the term in parentheses is stationary. We find that the null hypothesis that it is not stationary is rejected at the 5% confidence level, suggesting that covered and uncovered banks bonds do indeed have a long-term equilibrium.

Econometric results

Cointegrating equation for covered and uncovered bank bonds regression (standard errors in parentheses):

Cointegrating equation:	Cointegrating equation 1		
β_2	1.000000		
β_1	-1.143010		
	(0.10918)		
β_0	-117,979.1		
Unrestricted cointegration rank test (trace)			
Hypothesised Number of cointegrating equations	Trace statistic	0.05 Critical value	Probability
None	18.46786	15.49471	0.0173

Null hypothesis that process is not stationary is rejected on 5% confidence interval. Probability that it is not stationary is 1.7%.

Cointegrating equation for bank and corporate bonds regression (standard errors in parentheses):

Cointegrating equation:	Cointegrating equation 1		
β_2	1.000000		
β_1	-8.000451		
	(0.43038)		
β_0	642,406.9		
Unrestricted cointegration rank test (trace)			
Hypothesised Number of cointegrating equations	Trace statistic	0.05 Critical value	Probability
None	18.88617	15.49471	0.0148

Null hypothesis that process is not stationary is rejected on 5% confidence interval. Probability that it is not stationary is 1.5%.

APPENDIX 2

BACKGROUND TO THE SECONDARY MARKET ANALYSIS

Covered bond spreads vis-à-vis respective sovereign yields

Chart A1 presents the covered bond spreads vis-à-vis respective sovereign yields.

Econometric specification and data description

The model that forms the basis of the results in Table 2 is as follows:

$$y_t = \alpha + \beta_0 y_{t-1} + \beta_1 x_{1,t} + \beta_2 x_{2,t} + \beta_3 D_{CBPP,t} + \beta_4 D_{SovCrisis,t} + \varepsilon_t$$

where:

y: Covered bond yield as measured by the five-year iBoxx covered bond index for the euro area (or Germany, France, Spain and Ireland for country-level regressions);

x_1: Five-year overnight indexed euro swap rate;

x_2: Spread between five-year UK covered bond yield and five-year libor-euro swap;

D_{CBPP}: Dummy equal to 0 before the announcement of the CBPP (7 May 2009) and 1 thereafter;

$D_{SovCrisis}$: Dummy equal to 0 before the downgrade of Greece on 24 April 2010, which triggered broad market turmoil, and 1 thereafter;

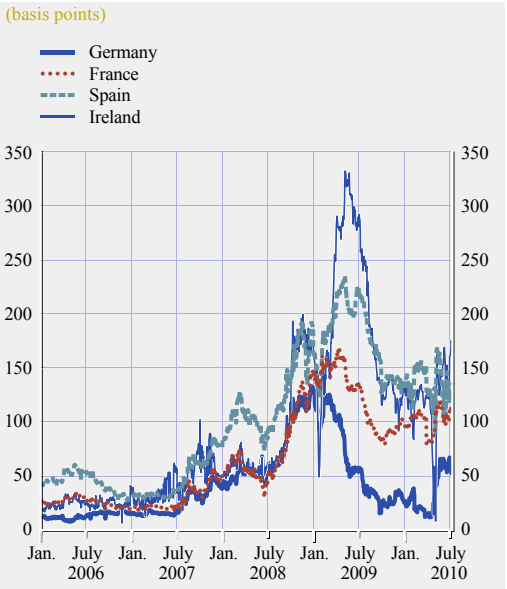
ε: White noise residual.

Other control variables checked in the regressions:

- Bond market liquidity, defined as the spread between the five-year yield of government-guaranteed bonds and the respective five-year government bonds;
- Banking sector credit risk, as defined by the five-year euro area iTraxx senior financials;
- Five-year sovereign spread vis-à-vis the overnight indexed swap;
- Daily flows of covered bonds purchased under the CBPP programme.

Data are computed on a weekly basis. Sources: Bloomberg, DataStream and ECB calculations.

Chart A1 Covered bond spreads vis-à-vis sovereign yields



Sources: DataStream, Bloomberg and ECB calculations.
Note: All spreads refer to the iBoxx indices for five-year maturity.
Period under review: 2 January 2006 – 12 July 2010.

APPENDIX 3

RISK MANAGEMENT ASPECTS OF THE COVERED BOND PURCHASE PROGRAMME

INTRODUCTION

This appendix outlines the main financial risk management aspects of the CBPP. The fundamental risk characteristics of the programme, such as portfolio size and allocation across markets and maturities, have been determined by policy considerations. To meet the policy objectives of the programme, the investment framework has been designed not to be overly constrained by risk mitigation measures. However, a comprehensive risk control and monitoring framework has been set up to provide up-to-date information on the risks assumed by the programme.

An outline of some important features of the CBPP risk control framework is provided. Moreover, an overview is presented of expected returns and risks for a diversified euro area covered bond portfolio with similar characteristics to that of the CBPP, assuming an investment strategy of holding the securities until maturity.[33]

THE RISK CONTROL FRAMEWORK AND ITS IMPLICATIONS FOR THE COMPOSITION OF THE PORTFOLIO

The risk control frameworks for both the purchases and the lending of covered bonds have been set up in order to allow for the policy objectives of the programme to be fulfilled, while at the same time limiting exposure to financial risks. These objectives are not contradictory, but rather complementary in several aspects.

The modalities of the programme outlined in Section 2.4 of this paper restrict potential exposure to credit risk by imposing a minimum credit rating for securities eligible for purchases set at 'AA' or equivalent. Potential liquidity risks were addressed by setting the minimum covered bond issue target size at €500 million. These eligibility criteria ensure that the bulk of securities purchased under the CBPP adhere to characteristics that can be seen as market standards for euro area covered bonds.

The policy-based benchmark for the programme is diversified in order to ensure a broad and balanced impact of the programme over the aggregate euro area covered bond market. Diversification is also a key objective of the risk management framework. The risk control framework has therefore attempted to contain financial risks that could arise from excessive concentration and an undue departure of the programme from its relevant policy-based diversified benchmark. To achieve these goals while preserving the necessary flexibility required for the implementation of the CBPP in an effective manner, a specific system of limits was designed. It includes limits for the purchases of specific issues expressed in relative terms to the total amount outstanding, limits to the holdings of securities issued by a specific issuer group, and country limits.

The allocation of the CBPP to various segments of the covered bond market by and large shapes the characteristics of the portfolio in terms of financial risks. It was determined by the size of each segment of the covered bond market and by the discretionary component based on market developments. Hence, the largest shares of covered bonds were bought in the covered bond market segments with the highest capitalisation.

The maturity distribution of the securities held in the CBPP portfolio shows that most of the covered bonds are expected to mature between five and seven years from the end of the implementation of the programme, while the bond with the longest maturity is not expected to be fully redeemed until 2022.

The creditworthiness of securities held in the portfolio is the main determinant of the risk aspects described in the following section.

33 Remember that the investment strategy of the Eurosystem with regard to the CBPP is a hold-to-maturity strategy, as stated in the press release announcing the competition of the programme on 30 June 2010 (http://www.ecb.europa.eu/press/pr/date/2010/html/pr100630.en.html).

In this regard, it can be concluded that the creditworthiness of the portfolio is broadly in line with that of the overall covered bond market. In fact, most of the securities held by the CBPP were assigned the highest credit rating assessment on 30 June 2010.

The possible risks arising from the securities lending activity are mitigated by risk control measures taking the form of haircuts, counterparty limits and eligibility criteria.

A COMPARISON OF RISKS AND RETURNS EXPECTED FROM A PORTFOLIO OF COVERED BONDS

Although the CBPP has been devised in order to fulfil the policy objectives outlined in Section 2.4 of this paper, its expected risks and return were assessed continuously throughout the implementation period and upon completion of the programme. This section outlines the main approaches undertaken in the evaluation of the risk-return profile of the portfolio and applies them to a sample portfolio of covered bonds with similar characteristics to the CBPP.

The sample portfolio

For confidentiality reasons, the risk and return analysis is applied to a sample portfolio with similar characteristics to that of the CBPP.

The sample portfolio has been built by randomly selecting instruments that fulfilled the eligibility criteria set for the CBPP from a covered bond market index. The weight of each security in the sample portfolio is determined by its face value. The number of securities, average credit quality, diversification profile, and average maturity and duration of the sample portfolio are very similar to that of the CBPP portfolio.

Expected returns of the portfolio

The financial result of a policy programme such as the CBPP can be measured on the basis of the internal rate of return of the investment and the average yield-to-maturity of the instruments purchased.

The internal rate of return (IRR) is the annualised effective compounded return used to evaluate the return of an investment. As such, it serves as an estimate of the hold-to-maturity return of the portfolio. The IRR is computed as the annualised effective discount rate that makes the net present value of all cash flows (both positive and negative) of the portfolio equal to zero.

The IRR is closely related to the yield-to-maturity of the bonds at the time of their purchase. The average effective yield-to-maturity of the sample portfolio considered in the analysis was estimated to be 3.16% as of 30 June 2010. In the following section, this estimate will be used as an indicator of the expected return of the sample portfolio following a hold-to-maturity strategy.

Expected losses from credit events and risk-return adjusted returns

The expected return measure presented so far for the sample portfolio relies on the assumption that no credit events will materialise during the maturity horizon of the portfolio, so that no negative impact on the financial result will materialise from defaults. This seems to be a natural simplifying assumption, since defaults can be considered highly unlikely, owing to the high credit quality of the assets held in the portfolio.

To corroborate the validity of the aforementioned assumption, an estimate of the expected credit losses for the portfolio has been produced. The estimate is based on historical migration and default rates,[34] as well as the level of the yield curves and credit spreads observed as of 30 June 2010. Two types of credit events are considered: defaults and credit migrations. Losses arising from credit migrations could take

34 The assumed transition matrix is based on the global average one-year transition rates by rating reported in Standard & Poor's "Default, Transition, and Recovery: 2009 Annual Global Corporate Default Study And Rating Transitions", March 17, 2010, available at http://www.standardandpoors.com/ratings/articles/en/us/?assetID=1245207201119. The average one-year matrix is scaled up in order to obtain transition and default rates for horizons above one year. The recovery rate is assumed to be 40%.

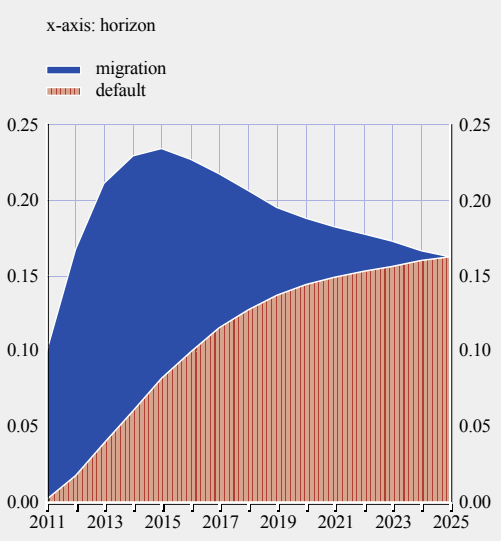
the form of negative results from the liquidation of assets (a realised loss) or of accounting write-downs (a "mark-to-market" loss), reflecting a possible impairment of the assets. However, if assets are held to maturity, the cumulative expected losses of the portfolio over the total holding period could only take the form of losses due to defaults.

Expected credit losses are estimated as the difference between the market value of the portfolio at the end of the analysis horizon, assuming that no credit events occur, and the expected market value of the portfolio, accounting for the probability of experiencing credit events. The expected value of the portfolio is the sum of the expected value of its different components, including risk-free cash generated by paid-in coupons and redemptions. The expected value of a single bond corresponds to the weighted average of the value the bond would have at the end of the horizon under different credit states. The latter include credit upgrades or downgrades where a price effect would be registered due to the application of different credit yield curves to price the bond, and defaults, where the value of the bond would be given by the assumed recovery rate. The evolution of expected losses arising from credit events over the holding horizon for a sample portfolio of covered bonds with similar characteristics to the CBPP is shown in the following figure (expressed as a percentage over the projected future value of the portfolio).

An interesting finding reported in Chart A2 is that expected losses due to credit rating migrations are the main determinant of credit risk during the first few years, while default risk becomes more relevant as the horizon is increased. Notably, the peak of the cumulative expected losses for the portfolio is in 2015, owing to possible mark-to-market losses arising from rating downgrades. Given the high credit quality of the instruments contained in the sample portfolio and its maturity profile, default risk would remain very low during the first few years of the holding period. At the same time, an increasing number of rating downgrades could occur. However, as the assets contained in the portfolio approach their maturity date, cash flows from coupons and redemptions, and the "pull-to-par" price-effect would compensate the price losses as a result of credit downgrades experienced in previous periods, meaning that the cumulative expected losses would start to decline. This effect is based on the assumption that assets would be held until maturity in the portfolio, at the cost of experiencing an increased default risk. According to the simulation exercise, under such an assumption, most of the losses due to credit downgrades would not be realised, since they would rarely materialise into defaults over the rest of the holding horizon.

Chart A2 Projected evolution of the cumulative expected losses until maturity of the portfolio

(as a percentage)



Source: ECB calculations.

Most importantly, Chart A2 also shows that the cumulative annualised expected losses for a portfolio of covered bonds by the end of the holding horizon would be on a minor scale, compared with the expected return of the sample portfolio approximated by its average yield to maturity. In effect, the cumulative expected losses of 0.16% shown in the figure, corresponding to the end of the holding period (15 years), can also be expressed at an annualised loss rate of only 1 basis point (0.01%), while the

average yield-to-maturity of the sample portfolio considered was estimated to be around 3.16%. This observation validates the use of the internal rate of return and the average yield-to-maturity as expected return indicators for the portfolio.

The financial risk characteristics of the portfolio over the holding horizon

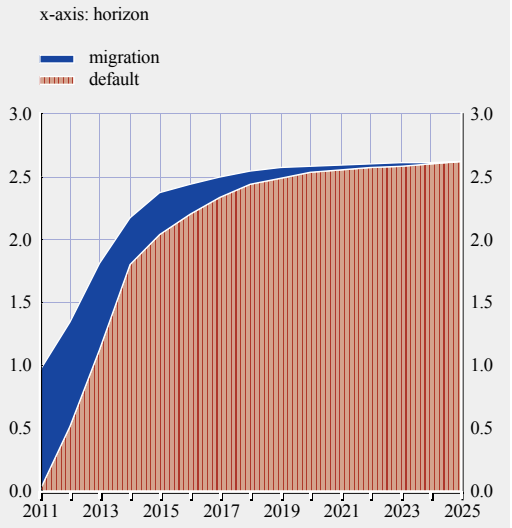
The modified duration of the CBPP portfolio measuring the sensitivity of the portfolio to interest rate changes was 4.12 on 30 June 2010. The market risk of the portfolio is expected to decrease over the holding period, as both the size and duration will decrease. Although market risk is not necessarily relevant for a held-to-maturity portfolio, it could translate into real financial losses should the Eurosystem decide to liquidate all or part of the portfolio before maturity.

The credit risk of the portfolio can be measured by a credit value-at-risk (VaR).[35] A credit VaR at a level of 99% is computed as the difference between the expected (average) market value of the portfolio at the end of the analysis horizon and the value the portfolio would have in the (worst) first percentile of the simulated distribution of possible values of the portfolio, based on the same data and methodology used to compute the credit expected losses.[36] In the simulation stage, all the bonds and cash flows of the portfolio are repriced at the end of each analysis horizon under the different simulated scenarios, implying possible defaults and changes in the creditworthiness of obligors. The creditworthiness of a given obligor at the end of each simulation determines the credit yield curve used to discount the cash flows of the different bonds. The cash generated by paid-in coupons and redemptions is assumed to be risk-free.

Chart A3 shows the evolution of the annualised credit VaR over the holding horizon. Migration risk is the main determinant of credit VaR during the first year, but default risk becomes more relevant as the horizon is increased. This finding is due to the assumption that all assets are held to maturity, so that "mark-to-market" losses arising from credit migrations are not realised unless a default occurs.

Chart A3 Projected evolution of the cumulative credit VaR at a 99% confidence level

(as a percentage of the future market value of the portfolio)



Source: ECB calculations.

The short-term credit risk of the sample portfolio of covered bonds analysed, corresponding to the first year of the holding period and measured as a creditVaR at an annual horizon and a 99% confidence level, amounts to 0.95% of the projected market value of the portfolio at the end of the one-year horizon considered. This figure is fully explained by possible losses arising from migration, which would be realised only in the event of all or part of the portfolio being liquidated, but could also affect the holder of the portfolio financially in the short run as a consequence of write-downs.

Since the assets in the portfolio are assumed to be held to maturity, the focus of interest from a risk management perspective may be the total credit risk of the portfolio over the holding horizon, i.e. the losses from any defaults that will have occurred by the time the last bond

35 For example, see Bindseil et al. (2009).
36 An asset correlation across issuers of 0.24 has been assumed for the purposes of the analysis.

in the portfolio has matured. The default risk of the sample portfolio expressed by the credit VaR (99%) over the holding horizon is estimated to be around 2.6% of the projected future value of the cash flows of the portfolio. This figure can also be expressed as an annualised credit VaR (99%) rate of 0.18%, being substantially smaller than the annualised expected return of the portfolio as measured by its average yield-to-maturity (3.16%). From the comparison of those two magnitudes, it can be concluded that the holder of a diversified covered bond portfolio (such as the sample portfolio analysed in this appendix) will earn a positive interest income that is not expected to be significantly eroded by credit losses. Specific analysis conducted for the CBPP portfolio has validated this general conclusion. Based on standard return and risk estimation techniques, it can therefore be concluded that there is a high likelihood that the CBPP will generate positive returns to the Eurosystem.

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