

The market for corporate bonds in the low-interest-rate environment

The market for bonds of non-financial corporations in the euro area has grown strongly in recent years amid falling yields. This article examines the causes of this development, looking in particular at the period since the start of 2011, which encompasses structural changes in the banking sector, the impact of the sovereign debt crisis in the euro area and the accompanying low-interest-rate environment. The analysis therefore focuses on a period subsequent to the height of the severe financial and economic crisis in which the market for bonds of non-financial corporations had stagnated and was thus untypical.

The market for bonds of non-financial corporations has been subject to strong supply-side and demand-side forces in recent years. On the supply side, enterprises active in the capital market are likely to have replaced bank loans with bonds as a consequence of the crisis years, thus increasing the bond supply. In addition, the more favourable financing conditions brought about by the low-interest-rate environment have boosted enterprises' issuance activity. At the same time, on the demand side, falling risk-free interest rates have led to avid interest among investors, who have increasingly shifted their investments to higher-yielding, risky instruments such as corporate bonds in their search for yield. Since June 2016, the Eurosystem's corporate sector purchase programme (CSPP) has also boosted demand for bonds of non-financial corporations.

Prices predominantly reflect the pressure of high demand, which is probably partly attributable to the above-average level of risk appetite seen of late. Despite the increase in supply, the yields on bonds of non-financial corporations as well as the spreads over risk-free bonds – which had both reached a relatively high level during the sovereign debt crisis – have fallen significantly on balance. The decline in yields is a reflection of the receding sovereign debt crisis, an increasingly favourable capital market setting and the announcement of the CSPP. In addition, through falling short-term interest rates and a flatter yield curve, accommodative monetary policy has made a key contribution to the falling returns on bonds, and thus to the search for yield.

Furthermore, the period since 2011 is of particular interest with regard to the functioning and stability of the market for corporate bonds. While yields have fallen on balance over the reporting period, they rose temporarily on several occasions. Three phases of increased yield fluctuations reflecting (abrupt) reassessments by investors can be identified. In addition, this study indicates that the importance of sector-specific information for the movement of corporate bond yields has diminished in recent years, which may have something to do with investors differentiating less between individual bonds. This points to a higher risk of the whole market being affected if there is a reassessment of corporate bonds in future. From a central banking perspective, it is essential that this risk be continuously monitored, particularly after the end of the CSPP.

■ Market trends

Strong growth in market for bonds of non-financial corporations

The market for bonds of non-financial corporations¹ in the euro area has seen strong growth in recent years. After an initial growth surge at the start of monetary union and a short period of stagnation in the wake of the severe economic crisis at the end of the last decade, growth once again accelerated following the financial and sovereign debt crisis when the availability of bank loans became limited in some member states and the financial markets subsequently experienced falling risk-free yields on benchmark paper. On the supply side, bonds presented enterprises with an alternative source of funding to bank loans in this environment, and enterprises used the more favourable financing conditions brought about by the low-interest-rate setting to increasingly raise funds by issuing debt securities. At the same time, on the demand side, non-financial corporate bonds, which mostly offered a positive yield due to their risk premium vis-à-vis risk-free government bonds, elicited avid interest among many (institutional) investors. According to the ECB's capital market statistics, from the start of 2011 to the end of the reporting period the outstanding volume of (euro-denominated) bonds issued by non-financial corporations domiciled in the euro area increased on balance by just under 50% to €1,020.4 billion.

Focus on bonds of non-financial corporations

The above figures do not include bonds issued via (foreign) financing subsidiaries. Many non-financial corporations do not tap the bond market directly, but via a financing subsidiary which then passes on the funds raised from the bond issuance to the parent company.² While securities issued by financing subsidiaries domiciled in the euro area are included in the ECB's capital market statistics, they are attributed there to financial enterprises. This makes it difficult to infer the issuance activity of non-financial corporations, which are the focus of this article. If a different classification were used and bonds issued by financing subsidiaries were also counted, the outstanding volume of non-financial corporate bonds in the reporting

period would also have risen,³ but market growth would have been significantly lower.

In contrast to non-financial corporate bonds, financial bonds have been redeemed in net terms since the start of 2011. The falling market-based borrowing by financial enterprises is attributable to significantly lower issuing activity by credit institutions, which are traditionally the most active enterprises in the bond market. Insurance companies and pension funds, by contrast, have stepped up their bond market borrowing. The change seen among banks is probably a reflection, among other things, of favourable financing via deposits, the unlimited access to collateralised central bank liquidity, ongoing balance sheet consolidation at many banks, and regulatory changes since the financial crisis.

Financial bonds redeemed on balance since start of 2011

By international standards, non-financial corporate bonds play a rather minor role as a financing and investment vehicle in the euro area, despite market growth. This can be seen in the market volume of these bonds in relation to gross domestic product (GDP), which stood at 11% in the euro area at the end of 2016 and was thus significantly lower than, say, in the United Kingdom or the United States (20% and 31%, respectively),⁴ where corporate bonds have a long-standing tradition as an important source of corporate financing.

Bond financing plays a rather modest role in euro area

The regional breakdown within the euro area shows that since the start of 2011, French enterprises, in particular, have issued bonds on a large scale in net terms (see the table on

High issuance activity by French enterprises in euro area

¹ Non-financial corporate bonds are bonds whose issuer is a private corporation that belongs neither to the banking sector nor to the insurance sector and is not a financial enterprise. Non-financial corporate bonds are therefore typically issued by enterprises in the real economy.

² Possible advantages of issuing bonds via a foreign financing subsidiary include a lower tax burden or lower regulatory requirements of the foreign capital market.

³ According to data of the Bank for International Settlements (BIS), between the beginning of 2011 and March 2017 the outstanding volume of euro-denominated bonds of non-financial corporations domiciled in the euro area has increased by just under 45% under this different classification (ultimate borrower data).

⁴ Source: BIS.

page 19). In France, the bond market traditionally plays an important role for enterprises. Italian, German and – starting at a relative low level – Spanish enterprises have also made a considerable contribution to (absolute) market growth. Dutch enterprises have expanded their net bond issuance only moderately.

Borrowers' notes an established alternative financing instrument for German enterprises

The figures in the adjacent table do not include borrowers' notes, which are an established alternative financing instrument for German enterprises, in particular. Borrowers' notes are geared to a relatively small group of selected investors such as banks and insurance companies. They thus assume an intermediary position between bonds and syndicated loans, implying lower costs for enterprises than issuing a bond. While bond financing usually entails medium to large volumes, borrowers' notes are more suitable for small to medium financing needs. According to market observers, the supply of capital on the borrowers' note market has grown recently. In the current market environment, it would appear that access to this market is also available to companies that had not previously tapped into it. Measured in relation to the market size, the rather moderate growth in the importance of bond financing for German companies is probably at least partly attributable to the intensified use of borrowers' notes.

Market dominated by long-term instruments ...

In terms of their maturity, the overwhelming bulk of the outstanding volume of corporate bonds over the entire reporting period were long-term instruments with an original maturity of more than one year. As enterprises have recently issued relatively few money market instruments while the issuance of long-term bonds has risen, this has further boosted the dominance of long-term bonds. At last count, long-term bonds made up 92% of the outstanding volume of debt securities.

... and investment-grade bonds

Broken down by qualitative criteria, roughly three-quarters of outstanding bonds have an investment-grade rating (see the chart on page 20). However, the outstanding volume of

Non-financial corporate bonds outstanding*

Region	Outstanding bonds in the market (€ bn)	Percentage share of total euro-area market	Market growth since end-2010 (€ bn)
Germany	146.6	14	28.7
France	489.1	48	204.5
Italy	117.9	12	34.1
Spain	32.6	3	19.1
Netherlands	59.9	6	7.0
Euro area	1,020.4	100	337.3

Source: ECB. * Denominated in euro. As at May 2017.
 Deutsche Bundesbank

non-investment-grade bonds has seen above-average growth in recent years. Since the start of 2011, the share of high-yield bonds in relation to all outstanding bonds has risen to just under one-fifth. The share of bonds not assessed by rating agencies has also gone up.

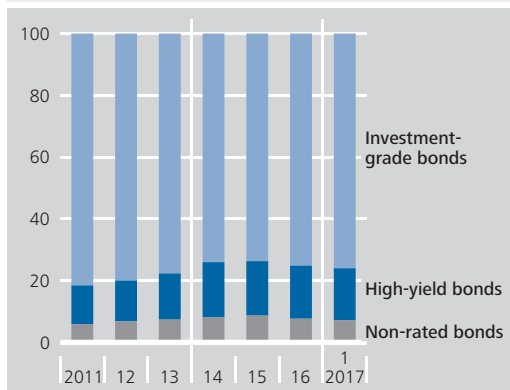
A contributing factor to the higher share of non-investment-grade bonds could be that in recent years – also in the light of the poorer ratings assigned to some euro-area member states – more outstanding bonds have been downgraded than upgraded. Moreover, data from the private data provider Dealogic show that issuance in the bond market by non-investment-grade enterprises has been above average. For example, since 2011, high-yield bonds have accounted for 26% of all bond issuance (net), which is considerably more than their 17% share (based on latest figures) of all outstanding bonds (see the chart on page 20). This suggests that the attractiveness of bond financing has risen particularly strongly for enterprises with a lower credit rating in comparison to alternative financing solutions. French enterprises in particular, but also those in Germany and – to a lesser extent – Italy and Spain, have contributed to the lively issuance of high-yield bonds.

Increasing significance of non-investment-grade bonds

The largest purchasers of non-financial corporate bonds are institutional investors, namely in-

Ratings of non-financial corporate bonds*

Share of total outstanding volume in %



Source: Dealogic. * Enterprises domiciled in the euro area. ¹ As at April 2017.

Deutsche Bundesbank

Insurance companies and other financial intermediaries constitute the key investors

insurance companies (including pension funds) and other financial intermediaries (OFIs) such as investment funds, which hold European corporate bonds to a similar extent.⁵ These two investor groups have significantly expanded their exposure in recent years. The increase in these holdings is at least partly related to portfolio reallocations involving a shift away from debt instruments of monetary financial institutions. This is likely to reflect, on the one hand, supply-side factors, such as the efforts of many banks to consolidate their balance sheets. On the other hand, demand-related effects are also likely to have played a role, with institutional investors also parting with covered bonds, selling them to the Eurosystem under the covered bond purchase programme.⁶ The freed-up funds have subsequently been invested in bonds of non-financial corporations instead.

Credit institutions, households and central banks as other investors

Besides insurance companies and OFIs, credit institutions (excluding central banks) and households (including non-profit institutions serving households) also hold a significant volume of corporate bonds, although they have markedly reduced their holdings in recent years. The Eurosystem also became a major investor in corporate bonds with the launch of its corporate bond purchases in June 2016 under the CSPP (see the box on pages 22 to 24).

Important causes of market growth

Substitution of bank loans boosts supply of corporate bonds

Results of the financial accounts and the national accounts show that earnings retained by non-financial corporations in the euro area swiftly recovered following the financial and sovereign debt crisis. In this environment, financing via retained earnings (internal financing) grew in relevance compared, say, to financing via bank loans and bonds (external financing). In terms of external financing, loans from non-banks, loans from abroad, and equity issuance dominated in the crisis years, while bank loans were scaled back on balance. Enterprises also increasingly turned to bond financing. This indicates that enterprises with capital market access partially substituted bank loans with debt instruments, thus supporting a higher volume of corporate bonds on the supply side.

Increased importance of financing via retained earnings

In the years dominated by the sovereign debt crisis, an important reason for such a substitution is likely to have been that bank loans were available on a reduced scale or at less favourable conditions.⁷ In periphery countries with closely intertwined public and banking sectors, such as Italy and Spain, banks' financing costs

Higher supply of corporate bonds through substitution of bank loans

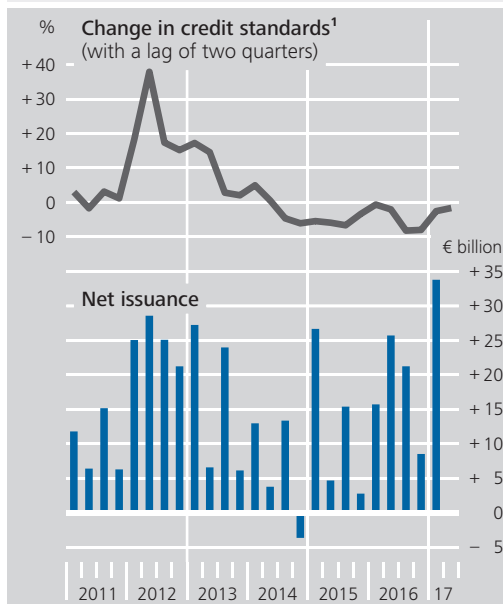
⁵ Source: The ECB's Securities Holdings Statistics by Sector.

⁶ The reporting period chosen here, which started at the beginning of 2011, covers the CBPP2, which was launched in November 2011 with a nominal purchase volume of €16.4 billion, and the CBPP3, which was launched in October 2014 without a stipulated overall purchase volume and under which the Eurosystem has thus far purchased covered bonds totalling €223.9 billion.

⁷ This conclusion is consistent with a study by Beschwitz and Howells. Their results indicate that enterprises issued more bonds after the financial crisis when their access to bank loans worsened. See B von Beschwitz and CT Howells (2016), Are euro area corporate bond markets irrelevant? The effect of bond market access on investment, International Finance Discussion Papers 1176, Board of Governors of the Federal Reserve System. Some studies show that the possibility of substituting bank loans through the issuance of corporate bonds was at least partially able to mitigate the negative effect of loan supply shocks on the real economy. See F de Fiore and H Uhlig (2015), Corporate debt structure and the financial crisis, Journal of Money, Credit and Banking, Vol 47 (8), 1571-1598.

increased significantly, dampening the loan supply in these countries. Data on bank loan standards collected by the European System of Central Banks (ESCB) via the Bank Lending Survey (BLS) confirm that these standards did worsen markedly at the time for large corporations – for which bond financing is conceivable. Assuming that credit standards impact net issuance of corporate bonds with a half-year delay, it can be shown that there was a close positive correlation between tightened credit standards and (net) issuance of corporate bonds from 2011 to 2014 (see the adjacent chart). In this period, enterprises increased the supply of bonds, which were evidently a relatively attractive source of funds despite the fact that market-based financing costs had also risen. Once credit standards then improved in a calmer financial market setting, the motivation for substituting bank loans with bonds is likely to have lost relevance. Bond issuance nevertheless continued to increase as of 2014, probably as a result, in particular, of the falling risk-free interest rates, the increasing search for yield among investors, and, more recently, also the CSPP (see pages 21 to 26).

Change in credit standards for large enterprises* and net issuance of corporate bonds



* According to the Bank Lending Survey. **1** In the Bank Lending Survey, the net percentage is defined as the difference between the sum of the percentages for “tightened considerably” and “tightened somewhat”, and the sum of the percentages for “eased somewhat” and “eased considerably”.
 Deutsche Bundesbank

particular, where supply-side conditions for bank loans have tightened. For French and German enterprises, by contrast, which on balance have expanded their volume of bank loans, the main driving factor is likely to have been the more favourable financing conditions on the corporate bond market compared with loan interest rates.

Impact of low-interest-rate environment and CSPP

With the sovereign debt crisis receding into the background and a very accommodative monetary policy in place not just in the euro area but worldwide, yields on European government debt securities have fallen markedly in recent years. Yields on ten-year Federal bonds (Bunds), which had already fallen to just under 2% at the end of 2013, saw an accelerated fall starting in 2014 (see the chart on page 26), dipping to historical lows on several occasions and even

Sharp drop in risk-free interest rates ...

Credit volume stabilised following decline in crisis years

Developments in bank lending volume support this presumption. While the lending volume to non-financial corporations in the euro area was scaled back between 2011 and 2014, in particular, and, after a period of stabilisation, began to nudge upwards again only recently, the volume of outstanding corporate bonds has grown continuously. In relative terms, the significance of market-based debt financing via corporate bonds has therefore increased markedly.

Relative increase in importance of bond financing in individual euro-area countries

The increased importance of bond financing in relation to financing via bank loans can be shown not only for the euro area as a whole, but also for the four largest euro-area countries. It can be seen above all for enterprises in France, but also for those in Germany, Italy, and, to a lesser extent, Spain. The substitution of bank loans with bonds is likely to have played a role for firms in periphery countries, in

The corporate bond purchase programme

On 10 March 2016, the Governing Council of the European Central Bank (ECB) adopted the corporate sector purchase programme (CSPP). The CSPP, under which corporate bonds of issuers domiciled in the euro area have been bought since 8 June 2016, therefore expanded the existing asset purchase programme which comprised the public sector purchase programme (PSPP), the covered bond purchase programme 3 (CBPP3) and the asset-backed securities purchase programme (ABSPP). The objective of the CSPP is to improve the financing conditions of the real economy and provide additional monetary accommodation, thus contributing to an inflation rate of below, but close to, 2% over the medium term.

Six national central banks make the purchases on behalf of the Eurosystem. Each national central bank is responsible, with no overlap, for market segments that are defined by region according to the location of the respective issuer's domicile (see the table on page 23). Accordingly, the Bundesbank purchases bonds of German enterprises and of enterprises domiciled in Germany as well as bonds of their Dutch financing subsidiaries. As such securities are generally risky, the central banks take risks onto their balance sheets when they purchase these bonds. Both the income as well as potential losses are distributed among all of the Eurosystem national central banks in proportion to their respective ECB capital shares.

Quality criteria for the purchase programme were defined which securities must meet to qualify for purchase. The bonds have to be eligible as collateral for monetary policy operations, have minimum ratings from external credit rating agencies that are accepted

by the Eurosystem and be denominated in euro. They must also satisfy further criteria such as minimum requirements for the remaining maturity. The criteria are checked before the purchases are made and apply to bonds purchased by the Bundesbank and by all other Eurosystem central banks which purchase corporate bonds under the CSPP. Additional precautions such as issue share limits are designed to mitigate the risks associated with the CSPP. Specifically, under the CSPP the Eurosystem purchases only fixed-income securities with an investment-grade rating,¹ with a remaining maturity of more than six months and less than 31 years, which are denominated in euro, whose yield at the time of purchase is above the deposit facility rate and which were issued by an enterprise domiciled in the euro area. Not more than 70% of any issue may be purchased. The buyable universe includes bonds of issuers domiciled in the euro area, even if these are subsidiaries of enterprises that are domiciled outside the euro area. On the other hand, bank bonds and bonds issued by enterprises whose parent company is a bank are excluded. Bonds issued by investment companies are likewise not eligible for the programme.² Under the CSPP the Eurosystem is active in both the primary and the secondary market. However, as with the PSPP, participation in primary market issues of public enterprises is not allowed, as purchases of this kind come under the prohibition of monetary financing pursuant to Article 123

¹ First-best rating of BBB- or better.

² This includes, for example, resolution agencies, also known as "bad banks".

of the Treaty on the Functioning of the European Union.³

On 20 July 2017, the Eurosystem's holdings under the CSPP reached a book value of €102.0 billion. Purchases by the Bundesbank together accounted for around 24% of this amount. The actual purchase volume was somewhat higher, however, as redemptions during the life of the programme are reinvested in full. Holdings saw a fairly steady increase, rising by an average of around €7 billion per month. Seasonal fluctuations in market liquidity, especially over the summer months and towards the end of the year, were taken into account when making purchases, however. This is because purchases are to be implemented with minimal market impact.

Up to 20 July 2017, the Eurosystem had purchased bonds worth €15.3 billion in the primary market. The Bundesbank accounted for €4.0 billion of that amount. The Bank's share of primary market purchases was 16%, which was in line with the share for the Eurosystem as a whole. Seasonal fluctuations in enterprises' issuance behaviour are likewise taken into account when making purchases. The first months of each year and the months following the summer break are considered to be the most active in enterprises' issuance calendar. In addition, enterprises are subject to bond issuance restrictions in connection with the announcement of their quarterly results. Thus, the share of corporate bonds purchased in the primary market as a percentage of the overall volume of CSPP purchases during the summer months of 2016 was between 4% and 8%, but in September 2016 stood at 20%.

In order to minimise the potential negative liquidity effects, the Bundesbank as a general principle makes holdings it has purchased under the monetary policy pro-

Distribution of market segments among national central banks

National central bank	Market segment
Banque Nationale de Belgique	BE, CY, GR, LU, MT, PT, NL, SI and SK
Deutsche Bundesbank	DE and NL ¹
Banco de España	ES and NL ¹
Suomen Pankki/ Finlands Bank	AT, EE, FI, IE, LT, LV
Banque de France	FR
Banca d'Italia	IT and NL ¹

¹ Bonds issued by Dutch issuers that are financing subsidiaries of enterprises domiciled in Germany, Spain and Italy.
 Deutsche Bundesbank

grammes available for securities lending. The Bundesbank has been a participant in Clearstream Banking Luxembourg's (CBL) Automated Securities Lending (ASL) programme since the beginning of April 2015. The ASL programme includes a fails lending service, which ensures that borrowers' trades do not fail. Since 18 July 2016, CSPP holdings have been available through both ASL and CBL's strategic lending facility ASLplus. ASLplus allows market participants to borrow these securities at a minimum spread above the current rate for general collateral. Lending transactions concluded under ASLplus are always cash-neutral, as collateral is only accepted in the form of securities. The maximum maturity of a securities lending transaction is 35 days.⁴

³ In this context, public undertakings are defined in accordance with Article 8 of Council Regulation (EC) No 3603/93 of 13 December 1993, under which all undertakings are deemed to be public in which the state, including regional and local authorities, may directly or indirectly exercise a dominant influence. Such influence may be wielded through ownership, financial participation or legal provisions. In addition to the ban on primary market activity, other provisions of the PSPP also apply such as a reduced maximum issue share limit of 33%.

⁴ The list of purchased corporate bonds and of corporate bonds made available through the lending facility may be found at https://www.bundesbank.de/Redaktion/EN/Dossier/Tasks/outright_transactions.html?https=1&docId=335702¬First=true under "Securities available via lending" on the Bundesbank's website.

Purchases should be as market-neutral as possible in order to minimise monetary policy-induced distortions. The purchases therefore take their bearings from both the liquidity of individual bonds in the secondary market and the structure of the market segment assigned to the Bundesbank. Here, the automotive sector makes up the largest share of the overall permissible market; this is reflected in the Bank's CSPP portfolio. The next-largest sectors comprise the enterprises of the chemical industry and utilities. The three main sectors have a combined market share of around 60% of the permissible market as a whole.

As CSPP holdings grow, so too does the importance of the Eurosystem as creditor. One important issue in this respect is the Eurosystem's behaviour with regard to creditors' meetings.⁵ If the Eurosystem – in its role as creditor – were to exercise influence on a

firm's business policy, this would violate the principle of neutrality in implementing monetary policy. The Eurosystem is therefore at pains to remain as neutral as possible in such cases.

⁵ At a creditors' meetings the issuer solicits the creditors' consent to amend key terms of a bond issue.

falling into negative territory for a while. In the second quarter of 2015 ("Bund tantrum") and in the second half of 2016 there were certain countermovements, but ultimately they did not last. Yields also rose again slightly towards the end of the reporting period. At roughly 0.4%, they are again above their record lows, but remain extraordinarily low by historical standards.

... impacts supply and demand in corporate bond market

In the market for corporate bonds the decline in yields is likely to have influenced both supply-side and demand-side factors. In order to check the extent to which the falling risk-free yields were accompanied by an increasing search for yield and thus an increase in demand, we examine the development of investors' risk appetite in the following. To this end, a principal component analysis is used to calculate an indicator that extracts a common time-variable determinant from several individual indicators presumed to be relevant for estimating risk.⁸ This common factor can then be interpreted as

a measure of risk aversion, which is set to the value of zero for the average of the reporting period – a period largely characterised by the financial and sovereign debt crisis as well as the low-interest-rate policy.

According to the indicator, in 2011 and 2012, in an environment dominated by the sovereign debt crisis, investors demonstrated very high risk aversion, though this subsequently subsided (see the chart on page 26). Since the fourth quarter of 2013 there has been below-average risk aversion (above-average risk appe-

Increased risk appetite indicates greater demand for corporate bonds

⁸ For more on the methodology of the principal component analysis, see the box in Deutsche Bundesbank, Constructing an aggregate risk appetite indicator with a principal component analysis, Monthly Report, August 2008, pp 38-39. The following individual indicators were factored into the analysis: the implied volatility of European shares (VSTOXX), the time-varying correlation between the returns on long-term Bunds and the Euro Stoxx, the spreads of European BBB-rated corporate bonds, CDS spreads of European investment-grade enterprises (iTraxx Europe) and CDS spreads of European high-yield enterprises (iTraxx Europe Crossover).

tite) for the vast majority of the time, with risk aversion exhibiting mostly sideways movements during this period. The development of risk appetite measured in this way indicates that the search for yield may have played an important role for investors since roughly the fourth quarter of 2013. Together with the falling risk-free interest rates, this points to stronger demand for risky investments that offer a higher return than safe government bonds. In the case of corporate bonds, this additional demand is likely to be attributable, above all, to key institutional investors such as insurance companies and investment funds.

Further indications of higher risk appetite

The finding of greater risk appetite is consistent with the market development described on pages 18 to 20. For example, the comparatively large proportion of high-yield instruments among all outstanding bonds since 2014 points to a higher risk acceptance among investors. A further indication of this is the increasing willingness in recent years to invest in long-term bonds, which imply a higher interest rate risk than bonds with a short maturity.

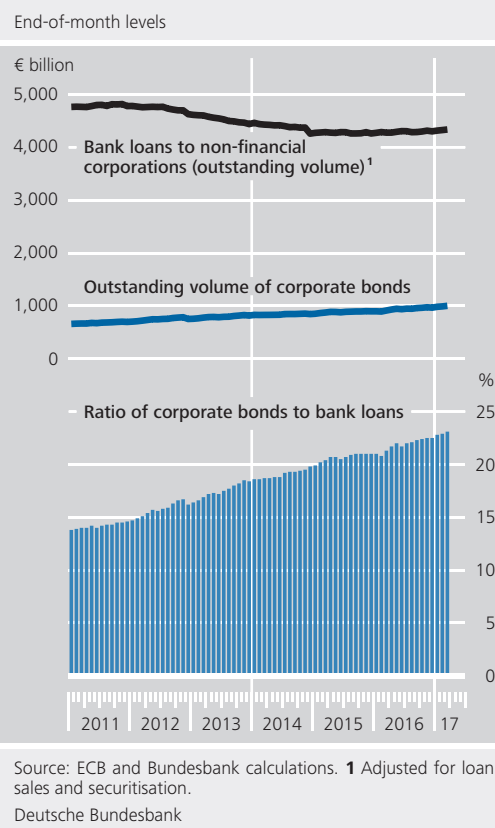
Favourable financing conditions boost supply of corporate bonds

By also leading to lower market-based financing conditions for enterprises (see page 26) and thus more favourable conditions for investment, the falling risk-free interest rates are also likely to have had a positive impact on the supply of corporate bonds. Following the height of the sovereign debt crisis, corporate mergers and acquisitions again picked up as of 2014 in a capital market environment that was once again more favourable on the whole. In this context, there was advancing consolidation both within industries and across sectors. The financing needs associated with this were met partially through the issuance of bonds.

CSPP creates additional scope for bond issuance ...

Issuing activity in the market for corporate bonds was also influenced by the CSPP (see the box on pages 22 to 24). Since 8 June 2016, the Eurosystem has purchased up to 70% of the issue volume of eligible corporate bonds. The programme, which is meant to positively influence economic activity and inflation develop-

Debt financing of euro-area non-financial corporations



ments, contributed to falling yields and a decline in risk premiums in the corporate bond market, particularly immediately following its announcement on 10 March 2016. Above all, however, it created additional scope for the issuance of bonds. In any case, it suggests that the subsequent rise in net issuance of non-financial corporate bonds is at least partly attributable to the CSPP.

Admittedly, the CSPP was implemented in the knowledge that there could possibly be undesirable side effects, one of which – irrespective of the currently relatively favourable bank lending terms – is the risk of a bias in favour of companies that are active on the capital markets. This is because, for a firm's bonds to be eligible for purchase under the CSPP, the firm has to be rated by an external credit assessment institution (ECAI) that is licensed to operate in the euro area. For large firms which are already active in the international capital markets, this is generally not an additional burden.

... but comes with side effects



However, for smaller and medium-sized enterprises which need lower funding volumes, the considerable costs of such an assessment are often not worthwhile. They therefore obtain most of their funding through bank loans and less in the capital markets. The Eurosystem thus influences firms' funding opportunities in this manner more than it does using conventional monetary policy instruments. As a creditor to firms, it also takes on a new role when changes to material bond issuing terms are to be adopted at creditors' meetings. This role can be at loggerheads with the principle that monetary policy should retain a maximum of neutrality, ie it should not impact on a firm's business policy. In addition, there are risks to the Eurosystem's balance sheet which, despite the envisaged risk mitigation measures, are greater than those involved in typical refinancing operations with credit institutions. Potential price distortions in the corporate bond markets are yet another undesirable effect, wherever central bank purchases do not affect all bond

prices equally and the prices that materialise no longer adequately reflect the risk inherent in the bonds.

Price aspects of market trends

The sale and acquisition of corporate bonds described above are closely intertwined with other market parameters such as yields, spreads and market liquidity. An estimate based on a regression analysis will therefore be performed to study the extent to which relevant financial market variables contribute to explaining yield movements. This study, which centres on the average change in yields over the reporting period, is subsequently augmented by a variance analysis which examines how strongly yields fluctuated over time and what these fluctuations were attributable to.

Movements in yields, spreads and market liquidity

Non-financial and financial corporate bond yields in the euro area fell sharply in the reporting period, mainly between autumn 2011 and spring 2015. Measured in terms of the Barclays broad indices, it was particularly yields on high-yield bonds, which had risen sharply in the crisis period, which went back down. However, yields on investment-grade bonds, having been as high as over 5% at the end of 2011, have likewise dipped perceptibly (see the chart on page 27).⁹ Factoring in the effects of the CSPP, among other things, yields have changed very little on balance since the spring of 2015; at last report, they stood at around 3.4% (high-yield bonds) and 0.8% (investment-grade bonds). These are exceptionally low yields by historical standards.

Corporate bond yields down sharply until early 2015, followed by sideways movements

⁹ The average residual maturity of bonds listed in both Barclays indices is between four and six years.

Narrowing of spreads indicates relatively high valuation

However, since yields on Bunds have likewise been falling and were negative up to the six-year segment at the end of the reporting period, the yield spreads of non-financial and financial corporate bonds over Bunds of the same maturity dropped less sharply than corporate bond yields. However, these spreads have also dipped perceptibly from their high levels of 2011, likewise particularly up until the spring of 2015. They currently stand at around 390 basis points for high-yield bonds and 95 basis points for investment-grade bonds. Along with the diminishing spreads for government bonds, the spreads of financial corporate bonds diminished more strongly than those of non-financial corporate bonds, leading to a perceptible narrowing of the yield gap between the two sectors. Both the spreads on investment-grade bonds and those on high-yield bonds were, at last report, below their respective five-year averages – a sign of relatively high valuation. All the same, the spreads are still above their respective early-2007, pre-crisis levels, which at the time had narrowed comparatively sharply in the light of much higher risk-free interest rates.

Comparison with a model-theoretical replicating portfolio

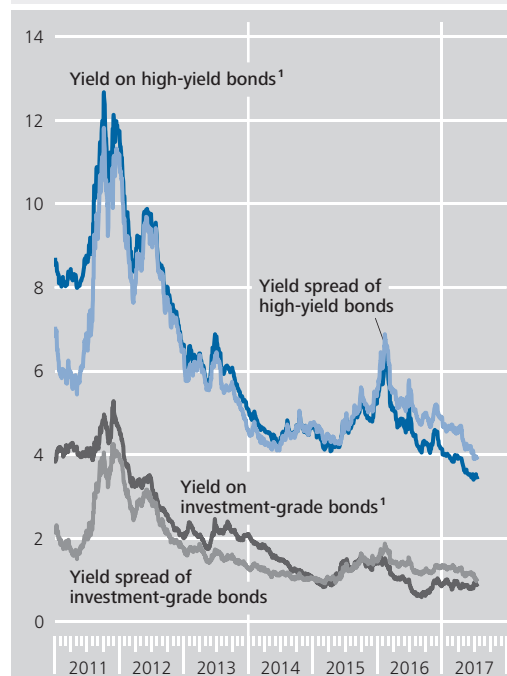
Another way to find out more about the relative valuation level of corporate bonds is to compare their valuation trajectory with that of a model-theoretical replicating portfolio composed of the enterprise's shares and risk-free bonds.¹⁰ Although such a comparison should be interpreted with caution because, among other things, the uncertainty of the model used needs to be factored in and some simplifying assumptions are made for calculating the replicating portfolio,¹¹ even despite this proviso, the relatively strong movements of the corporate bond valuations compared to a replicating portfolio (based on the Merton model) indicate that the relative valuation is more on the high side.

High valuation has risks

Given a high valuation, it is impossible to rule out the fact that particularly cautious private investors could be crowded out of the market if they no longer find such bonds attractive be-

European corporate bonds' yields and yield spreads*

In % or percentage points, daily data



Source: Thomson Reuters Datastream and Bundesbank calculations. *Yield spreads against Bunds with the same maturities. ¹ Indices of Barclays in each case. Deutsche Bundesbank

cause of the low level of yields. On the whole, this crowding-out manifests itself in a growing appetite for risk on the part of the remaining market participants. Market liquidity, too, ie the simplicity of trading without major price volatility, could tend to have been impaired by the crowding-out of some private investors. This could diminish the efficiency of capital allocation if less-relevant information were to be factored into prices as a result.

¹⁰ Such a replicating portfolio can be identified under the assumptions of the simple Merton (1974) model. In this model framework, the expected yield on a corporate bond corresponds to the safe yield, plus the equity risk premium weighted with the so-called hedge ratio. The hedge ratio is the sensitivity of the enterprise's debt to equity. For more on the relationship between corporate bonds, equities and safe bonds in the Merton model framework, see N Dötz, Decomposition of country-specific corporate bond spreads, Deutsche Bundesbank Discussion Paper No 37/2014.

¹¹ The model uncertainty results, for instance, from the (unrealistic) assumption that the markets for safe bonds, corporate bonds and equities are perfectly integrated. In addition, the Merton model only looks at the credit risk on a corporate bond, neglecting other empirically relevant factors such as liquidity premiums.

Bid-ask spreads of euro-area non-financial corporate bonds with a BBB rating*

Percentage points, daily data



Source: Bloomberg. * Mean bid-ask spreads of yields on senior non-financial corporate bonds with a BBB rating in the euro area contained in the BofA Merrill Lynch BBB Euro Corporate Index.
 Deutsche Bundesbank

Corporate bond bid-ask spreads declining

Corporate bond bid-ask spreads have been moving largely in sync with yield spreads (see the chart above). Bid-ask spreads are commonly interpreted as a measure of trading costs and an indicator of market liquidity. Seen in those terms, corporate bonds issued by euro-area enterprises appear considerably more liquid than in mid-2011, albeit somewhat less liquid than prior to the outbreak of the financial crisis in 2008.

Impact of asset purchase programmes

However, when interpreting bid-ask spreads by historical standards, one must take into account the Eurosystem's recent asset purchase programmes, which have made up a substantial portion of the demand for corporate bonds – directly via the CSPP and indirectly via investors' portfolio shifts from safe government bonds to higher-risk instruments. The Eurosystem's demand is being driven in particular by the desire to enlarge its balance sheet and is therefore more price-inelastic than demand on the part of private investors. This could have potentially contributed to compressing bid-ask spreads in those cases where dealers, confident that they could sell instruments to the Eurosystem, took them into their portfolios (temporarily) even at relatively narrow spreads. Such behaviour is plausible from an economic point of view because the asset purchase programmes mitigate the dealers' resale risk. What this im-

plies is that the currently relatively low bid-ask spreads could be painting a comparatively positive picture of market liquidity which, however, might vanish quickly at the end of the asset purchase programmes and under market stress.¹² Thus, for instance, there are indications that specialised bond dealers, known as "market makers", cut back their trading activities following the financial crisis. Market liquidity could, in the process, have shifted away from relatively illiquid corporate bonds to liquid instruments such as benchmark sovereign bonds.¹³

Determinants of yield movements

Corporate bond yields and relevant financial market variables (risk-free interest, interest rate uncertainty, European equity prices, sovereign CDS premiums, liquidity premiums, CSPP announcement) share a certain relationship with one another. This relationship can be captured statistically by means of a regression. The procedure therefore provides information on important reasons for yield movements over the reporting period. The yields on investment-grade bonds and high-yield bonds are estimated separately. For risk-free interest rates, two alternative measures which are a standard feature in the literature are used: EONIA swap rates and Bund yields.¹⁴ Both the short-term two-year interest rate and the slope of the yield curve are incorporated into the regression.

Regression of corporate bond yields

¹² See Bank for International Settlements, Annual Report 2015, pp 37-38.

¹³ See Committee on the Global Financial System, 2016, Fixed income market liquidity, CGFS Paper No 55, p 9.

¹⁴ Bund yields and EONIA swap rates generally move in sync. In the light of very strong demand for Bunds, the yields on this instrument, especially in the short-term maturity category, were recently lower than EONIA swap rates in the same maturity category. For detailed information on measuring the risk-free interest rate in the euro area, see European Central Bank (2014), Euro area risk-free interest rates: measurement issues, recent developments and relevance to monetary policy, Monthly Bulletin, July 2014, pp 63-77.

Falling yields explained by drop in sovereign CDS premiums, improved capital market setting and falling risk-free interest rates

For both investment-grade bonds and high-yield bonds, the results of the estimations show that the falling yields can be explained in key measure by the following important factors: the diminishing effects of the sovereign debt crisis (falling sovereign CDS premiums), an increasingly favourable capital market environment (rising equity prices and falling interest rate uncertainty) and the announcement of the CSPP. For instance, the announcement of the CSPP in March 2016 was enough to dampen yields by an estimated 7 to 9 basis points (see the adjacent table).¹⁵ The impact of the risk-free interest rate on yields was particularly strong. This applies to both measures of the risk-free interest rate: EONIA swap rates (estimation 1 in the adjacent table) and Bund yields (estimation 2). In this context, the overall impact encompasses the significant positive effects exerted, separately, by the short-term interest rate and the slope of the yield curve.

Contribution by expansionary monetary policy

According to the results, the expansionary monetary policy contributed to more favourable market-based funding conditions through two channels: falling short-term interest rates and a flatter yield curve for all observed enterprises. The falling slope of the yield curve reflects, to a degree, the Eurosystem's sovereign bond purchases. At the same time, it also reflects the economic outlook and international interest rate linkages such as the transatlantic interest rate relationship. The yield-reducing effect of the CSPP on high-yield bonds, which were exempted from this asset purchase programme, could have been caused by substitution effects (portfolio rebalancing) on the part of investors, which also put pressure on the yields of assets that were not eligible for purchase.

Bund yields are central benchmark of risk-free interest rate when valuing corporate bonds

For investment-grade corporate bonds, moreover, a particularly good way of explaining their yields is in terms of the risk-free Bund yield as opposed to EONIA swap rates. This is reflected by the fact that the adjusted coefficient of determination of Estimation 2 is higher than for Estimation 1.¹⁶ Corporate bond market invest-

Results of estimations of yields on European investment-grade corporate bonds^o

Explanatory variable	Estimation 1		Estimation 2	
	Coefficient	p-value	Coefficient	p-value
C	-0.001	0.21	-0.001	0.37
d(EONIA_2y)	0.713*	0.00	-	-
d(Slope_EONIA)	0.312*	0.00	-	-
d(Bund_2y)	-	-	0.823*	0.00
d(Slope_Bund)	-	-	0.382*	0.00
dlog(Euro_Stoxx)	-0.186*	0.01	-0.399*	0.00
d(Sovereign_CDS)	0.061*	0.01	0.149*	0.00
CSPP	-0.091*	0.00	-0.075*	0.00
d(Vola_Bund)	0.013*	0.00	0.008*	0.00
d(Spread_Agencies)	0.172*	0.00	0.137*	0.00
Adjusted R ²	0.39		0.52	

^o The regression (estimated in differences) is based on daily data from 3 January 2011 to 7 July 2017. The dependent variable, the corporate bond yield, is measured in a broad index (Barclays Euro-Aggregate Corporates). EONIA_2y and Bund_2y are the two-year EONIA swap rates and 2-year Bund yields, respectively. Slope_EONIA and Slope_Bund denote the respective slope of the yield curve, calculated as the ten-year interest rate minus the two-year interest rate. European stock prices and interest uncertainty are measured, respectively, by the Euro Stoxx (Euro_Stoxx) and the implied volatility of options on the Bund future (Vola_Bund). AGDP-weighted value of CDS premiums for key euro-area member states (Sovereign_CDS) functions as a measure of sovereign CDS premiums. The announcement of the CSPP is captured through a dummy variable (CSPP). The liquidity premium is measured as the yield spread between AAA bonds issued by European public sector authorities (Agencies) and Bunds (Spread_Agencies). * Significant at the 5% level.

Deutsche Bundesbank

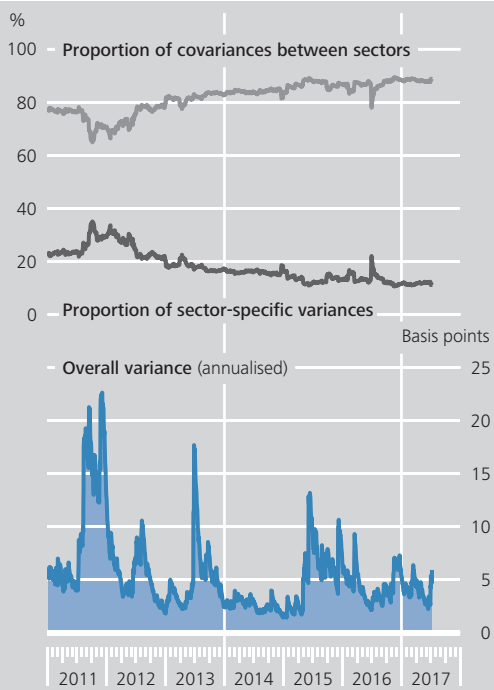
ors are apparently favouring Bunds, a low-risk alternative investment vehicle, as a benchmark of the risk-free interest rate. This underlines the Bunds' prominent role in the valuation of these relatively high-quality corporate bonds. Add-

¹⁵ This estimated impact on yields relates only to the announcement of the CSPP, excluding any additional effects of the actual corporate bond purchases.

¹⁶ An additional estimation provides further evidence of Bund yields' greater explanatory power. This involves augmenting Estimation 1 with two regressors which reflect the difference between short-term EONIA swap rates and Bund yields and the difference between the EONIA swap rate-related and Bund yield-based slope of the yield curve. In this expanded estimation equation, both additional regressors are significant, and the adjusted coefficient of determination rises to 0.52.

Yield variance on the market for corporate bonds

Daily data



Source: Bloomberg (Bank of America/Merrill Lynch) and Bundesbank estimates.
 Deutsche Bundesbank

information on the functional viability and stability of the corporate bond market.

In the analysis below, the yield variance of a broad index of financial and non-financial European corporate bonds will be estimated in a time-varying manner. This index (source: BofA Merrill Lynch Euro Corporate Index) is composed of 18 sector-specific sub-indices.¹⁸ In order to identify key drivers of variance trends, it will also be decomposed into individual components based on the sub-indices of the overall index.

Decomposition of the overall variance based on sector-specific sub-indices

At last report, yield variance was relatively low (see the adjacent chart). Throughout the reference period, three phases of heightened variance were identified: autumn to winter 2011, summer 2013 and summer 2015 to March 2016, reflecting temporary (abrupt) repricing. Higher liquidity premiums may have also played a role in the rising yields at the time. One sign of this is that bid-ask spreads moved largely in sync with yields (see the chart on page 28). An initial decomposition is run in order to ascertain to what degree the (weighted) variances of the individual sectors and the (weighted) covariances between these sectors each contributed to the increase in variance.¹⁹ The impact of the covariances provides information on the extent

Three phases of heightened variance during the reporting period

ditional estimations appear to indicate that this could also be the case for bonds issued by German, French, Italian and Spanish enterprises.¹⁷ The choice of metric for the risk-free interest rate, however, is of only minor relevance to explaining the yields on high-yielding corporate bonds. This might reflect the fact that credit risk is a much more important factor in the valuation of these bonds.

Analysis of the yield variance in the corporate bond market

The period following 2011, characterised overall by falling yields, also encompasses episodes in which yields spiked multiple times, often severely. Although these phases were ultimately only temporary, such yield fluctuations, which manifest themselves in the yield variance, do indicate the possibility of abrupt repricing. Analysing this variance can therefore provide key

Variance analysis provides information on functional viability and stability of the market

¹⁷ To this end, Estimations 1 and 2 are additionally run for four country-specific Barclays corporate bond indices: those for Germany, France, Italy and Spain. These estimations largely produce similar results. For all four individual countries, Bund yields prove to make a stronger contribution to explaining corporate bond yields than EONIA swap rates.

¹⁸ Three of the 18 sub-indices of the overall index comprise financial sectors: banks, financial service providers and insurers. The other 15 sub-indices represent the following sectors: automotive industry, commodities, capital goods, consumer goods, energy, healthcare, leisure, media, real estate, retail, services, telecommunications, technology, transportation and supply.

¹⁹ For overall variance (σ_{GESAMT}^2),

$$\sigma_{GESAMT}^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_{ij},$$

where $n = 18$ denotes the number of sectors and w_i and w_j represent the weights of sectors i and j . The time-varying sector-specific variances and covariances between the sectors, σ_{ij} , are estimated using a multivariate diagonal Garch BEKK model. For an explanation of this model, see R Engle and K Kroner (1995), Multivariate Simultaneous Generalized ARCH, *Econometric Theory*, 11, pp 122-150.

to which bond price movements in a sector or a small group of sectors can affect the entire market.

in the financial sector will spill over to the market as a whole.

Overall variance largely reflects covariances between sectors

The decomposition shows that the covariances between the sectors consistently made the greatest contribution to explaining overall variance. Although they made only a relatively minor contribution to the phase of high volatility between autumn and winter 2011-2012, which especially reflected higher volatility of bank bonds, they subsequently made a relatively large contribution to explaining the periods of high volatility in summer 2013 and between summer 2015 and March 2016. The increased correlation between corporate bonds from various sectors reflected in these two episodes indicates, first of all, that sector-specific information, such as economic and profit expectations, have receded into the background with regard to price movements in the sub-indices. One possible cause is that the importance of sector-specific developments took a back seat to aggregate economic developments. What it also indicates, however, is that investors have become less discriminating in their investment decisions. This could have been caused by a search for yield given the low-interest-rate setting and market-wide “safe haven” flows during periods of heightened uncertainty. Price spreads between real sector corporate bonds could, lastly, also have been caused by the Eurosystem’s CSPP.

On the whole, however, the rise in the correlation between corporate bonds from various sectors reflects a higher risk that a potential repricing of corporate bonds could result in the entire market being affected. It is essential that this risk be continuously monitored, particularly after the end of the CSPP.

Risk of market-wide repricing especially relevant after end of CSPP

■ Summary and conclusions

Both supply and demand factors contributed to the strong growth in the market for European corporate bonds over the past few years. One of the supply factors is that, particularly in some periphery countries, a host of non-financial corporations probably diversified their sources of funding during the crisis years by substituting bank loans with bonds. This was one way in which the bond market helped to cushion the adverse impact of the financial and sovereign debt crisis for the real economy. As the crisis subsided, enterprises continued their brisk bond issuance activity; one key reason for this was that, as risk-free interest rates fell, market-based funding conditions improved significantly. On the demand side, there are some signs that investors’ risk appetite has been rising in the past few years. This, along with the corporate sector purchase programme (CSPP) launched by the Eurosystem in 2016, has stoked demand for corporate bonds.

Central bank must keep efficiency of capital markets in mind

Financial enterprises less relevant to overall variance

A further decomposition of the overall variance into contributions by financial and non-financial enterprises shows that financial corporate bonds made a significant contribution to the high-volatility period between autumn and winter 2011. Their explanatory contribution to the overall variance, however, has been diminishing distinctly since mid-2012. On that note, the high-volatility periods in summer 2013 and especially between summer 2015 and March 2016 are more readily attributable to real sector corporate bonds. This implies a declining impact of financial corporate bonds on the overall variance and thus a lower probability that risks

As the sovereign debt crisis has faded into the background, risk-free interest rates have fallen and the capital market environment have become increasingly favourable, yields and spreads have diminished considerably and are currently indicating a relatively high valuation level. At the same time, the correlation between corporate bond yields from a variety of sectors has increased, which could be a sign that investors are being less discriminating in how they choose individual bonds. From a central bank perspective, the risk that this behav-

our will ultimately impact negatively on the efficiency of the capital markets and capital allocation will require ongoing analysis.

*Market could
growth further*

There are some factors which point to further market growth going forward. For instance, enterprises which went to the trouble – such as by creating the conditions for a rating – for the first time to issue a bond in the past few years

could be encouraged to replace bank lending by bonds in the long haul. Ongoing balance sheet consolidation in the banking sector could amplify such disintermediation. In addition, political efforts by the EU, such as moves to dismantle barriers to European bond market integration and to improve transparency between different sets of national rules, could also support market growth.