2 Financial markets

The strong reflationary expectations that contributed to higher US and global bond yields around the turn of the year abated during 2017. This notwithstanding, since May global financial market sentiment has remained fairly favourable on the back of higher and more synchronised growth prospects, solid corporate profitability and still accommodative monetary policy conditions. As a result, risk premia embedded in most global asset prices remained depressed and asset price gyrations were contained. Some short-lived bouts of volatility were observed related to increased tensions on the Korean peninsula and growing uncertainty regarding the expected timing and speed of the normalisation of the accommodative monetary policy conditions in advanced economies.

Apart from being influenced by external factors, euro area market sentiment was further boosted by the improved outlook for domestic growth prospects. Sovereign bond spreads across euro area countries remained fairly stable at low levels, indicating a benign market assessment regarding countries' debt sustainability prospects. Risk premia on lower-rated euro-denominated debt securities remained fairly low by historical standards. In contrast to the limited movements in the prices of most euro area financial assets, the euro exchange rate appreciated strongly, reflecting the better domestic growth prospects, expectations of an associated eventual normalisation of the ECB's monetary policy stance and a shift in investor appetite in favour of euro-denominated assets.

As for the euro area risk outlook, yields and spreads for lower-rated debt securities are low and susceptible to repricing. At the same time, improved domestic growth prospects are dampening the likelihood of an abrupt repricing of risk premia in bond markets. That said, euro area financial markets may be adversely affected by external factors. A number of central banks in advanced economies have begun preparing to withdraw policy accommodation. Potential changes in monetary policy conditions could generate greater market uncertainty and push asset price premia higher. In addition, geopolitical uncertainty may increase further, which could accentuate market gyrations. Finally, stock market valuations in the United States look stretched by a number of standard metrics, and a potential correction could spill over to other major markets, including the euro area.

Favourable global financial market sentiment owing to improved economic growth prospects

Financial market sentiment has been supported by improving global growth prospects. As a result, several central banks in advanced economies have begun preparing financial markets for the possibility that monetary policy may become less accommodative, should the recovery gain further momentum. Better growth prospects and a gradual adjustment in monetary conditions would also improve the financial stability outlook. Such developments would reduce incentives to take on

excessive risk, support a gradual adjustment in asset price premia, enhance the capacity of governments and private sector entities to service their debt, and have a positive net impact on bank profitability.

Despite the improved macro outlook, risk premia in financial markets are susceptible to an abrupt reversal. Some segments of global bond markets seem to be highly vulnerable to repricing amid low levels of risk premia and subdued volatility. In the first part of this section, developments in key global financial market segments over the past six months are discussed. The section then describes relevant issues in the euro area money market and ends by examining the main triggers and vulnerabilities that could expose financial market risks over the FSR risk horizon of 24 months.

Chart 2.1

Overall stable global bond yields and equity price movements in a low-volatility environment

Developments in global bond yields and EUR/USD exchange rate (left panel), stock prices (middle panel) and implied bond/stock volatility (right panel)

(left panel: Jan. 2017 – Nov. 2017, daily data, percentages per annum (left-hand scale) and exchange rate (right-hand scale); middle panel: Jan. 2017 – Nov. 2017, daily data, stock prices indexed to 100 on 1 Jan. 2017; right panel: Jan. 2015 – Nov. 2017, daily data, implied volatility for US and euro area stock markets and US and German ten-year bond markets, annualised volatility in percentage points)

Sources: Bloomberg and ECB calculations.
Notes: Implied volatility for the S&P 500 index, the EURO STOXX 50 index, and US and German ten-year bond futures. The vertical lines in the left and middle panels refer to the publication date of the May 2017 FSR (24 May).

US bond yields have remained broadly stable since May (see Chart 2.1). In the earlier part of the period, bond yields edged down. The downward movement reflected mixed data releases and growing reservations in the markets about the US administration's ability to push through growth-friendly reforms in the near term. In addition, higher geopolitical risks (mainly stemming from concerns about North Korea's foreign policy) occasionally contributed to portfolio shifts towards highly rated US debt instruments. Market-based inflation expectations in the United States have been revised downwards somewhat, partly as a response to low actual inflation outcomes. Furthermore, these reductions may also reflect an assessment in markets that inflation has become less responsive to changes in economic slack in the recent past (see also Section 1.1). Bond market sentiment was partly reversed in the latter

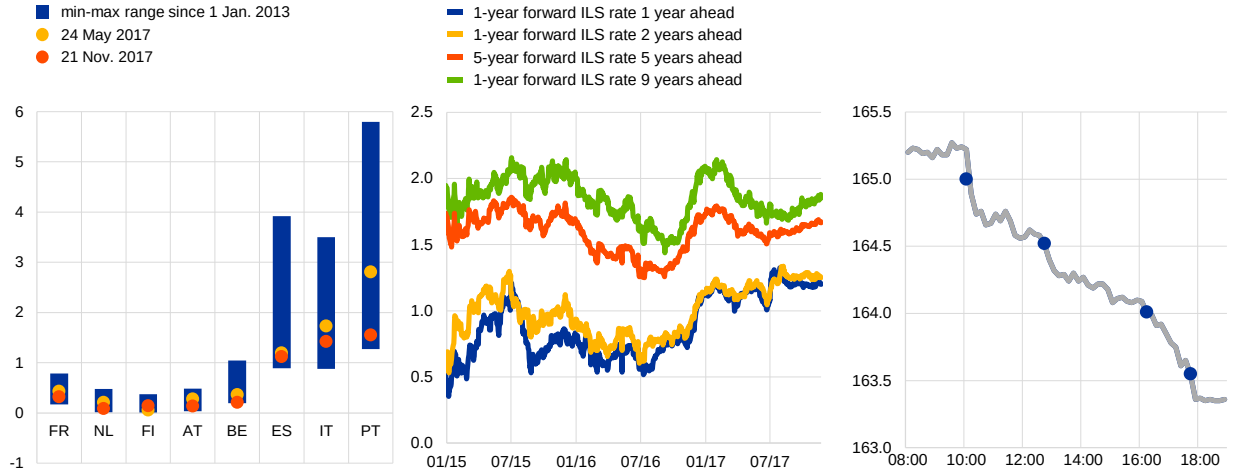
part of the review period and US bond yields rose, partly on account of better than expected macroeconomic news.

Chart 2.2

Broadly stable euro area sovereign spreads, a reduced gap between long and short-term inflation expectations and a sharp but short bond market sell-off at the end of June

Sovereign bond spreads (left panel), euro area inflation-linked swaps (ILS) (middle panel) and intraday prices of German long-term bond futures on 27 June (right panel)

(left panel: 1 Jan. 2013 – 21 Nov. 2017, daily data, percentage points; middle panel: Jan. 2015 – Nov. 2017, daily data, percentages per annum; right panel: intraday prices, blue dots represent option strike prices)



Sources: Bloomberg and ECB calculations.
Note: The left panel shows spreads between ten-year sovereign bond yields of selected euro area countries and ten-year German bond yields.

In the euro area, bond yields remained broadly stable overall across jurisdictions. As a result, bond spread movements were also muted and hovered at low levels, indicating that market participants currently factor in little likelihood of future debt sustainability concerns arising across euro area countries (see **Chart 2.2)**. Longer-term inflation expectations embedded in bond yields remained broadly stable over the review period. However, short-term expectations increased somewhat on the back of the improved cyclical outlook. At the same time, some intra-period volatility in euro area bond markets could be observed. In late June, the prices of longer-dated bonds fell sharply. Technical factors may have exacerbated the sell-off in the bond markets. As an illustration, **Chart 2.2** (right panel) shows the sharp intraday drop in prices of German ten-year futures on 27 June. Options are traded on this futures contract. As shown in the chart, the price declines (i.e. higher bond yields) intensified when futures prices crossed the strike prices at which the option contracts are available. Market intelligence suggests that technical factors may have been the main explanation for this behaviour.[16] It is difficult to quantify exactly how much of the total sell-off can be attributed to such activities, but this illustration serves as a reminder that such factors have the potential to amplify volatility and exacerbate market movements.

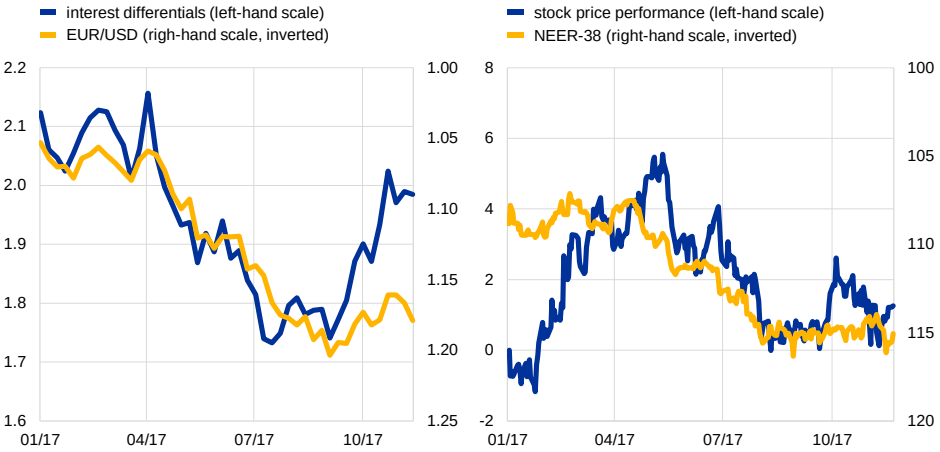
[16] When pursuing so-called “dynamic hedging” strategies, the seller of a put option must sell the underlying asset when the asset price falls, and must buy the asset when the price goes up. In other words, these strategies can amplify price changes in the underlying asset. This may create gaps in the otherwise near-continuous asset price process.

Chart 2.3

The strong appreciation of the euro in 2017 has also been reflected in bond and stock markets

EUR/USD exchange rate and interest rate differentials (left panel), stock price performance conditional on company revenues generated abroad and the euro nominal effective exchange rate (right panel)

(left panel: Jan. 2017 – Nov. 2017, percentage points for US/euro area interest rate differential (based on ten-year sovereign bond yields) and exchange rate; right panel: Jan. 2017 – Nov. 2017, cumulative percentages per annum for stock price performance (indexed to zero on 1 January 2017) and index values for the NEER-38)



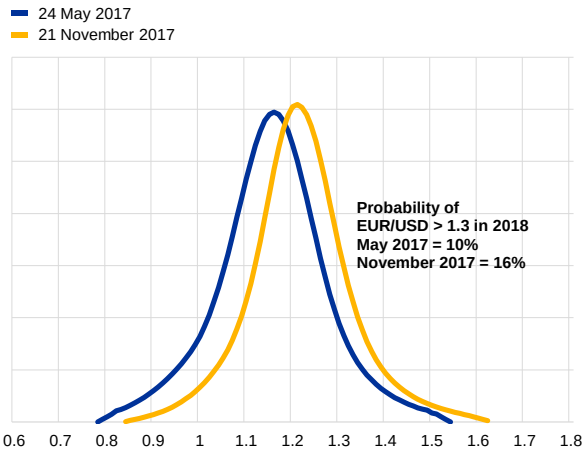
Sources: Bloomberg and ECB calculations.
Notes: In the right-hand panel, the stock price performance is the performance of EURO STOXX companies with more than 60% of revenues generated outside the euro area relative to those with 60% of revenues generated inside the euro area. NEER-38 is the nominal effective exchange rate (NEER) of the euro against the currencies of 38 of the euro area's main trading partners.

Chart 2.4

Option markets indicate a reasonably high likelihood of a further strengthening of the euro

EUR/USD exchange rate expectations for 2018 derived from option markets

(expectations prevailing on 24 May 2017 and 21 November 2017)



Sources: Bloomberg and ECB calculations.

The euro exchange rate has strengthened materially over the past six months. A further possible significant strengthening of the euro exchange rate could pose financial stability risks via macro channels (i.e. lower than expected nominal growth) and asset price channels (possibly triggering higher volatility in asset price premia on euro-denominated assets). Overall, the strengthening of the euro has been broadly based (as reflected in the 3% appreciation of the euro area nominal effective exchange rate since May). The euro's strengthening against the US dollar was partly related to relative movements in US and euro area bond markets (see **Chart 2.3**). More generally, the euro's strength against the US dollar is likely to reflect expectations of relatively stronger euro area growth and an associated eventual normalisation of the ECB's monetary policy stance, as well as a shift in investor appetite in favour of euro-denominated assets. In euro area stock markets, as the euro strengthening gained momentum, firms with limited revenues from abroad outperformed export-dependent firms. Looking ahead, investors see a possibility that the euro could remain strong for the foreseeable future (see **Chart 2.4**).

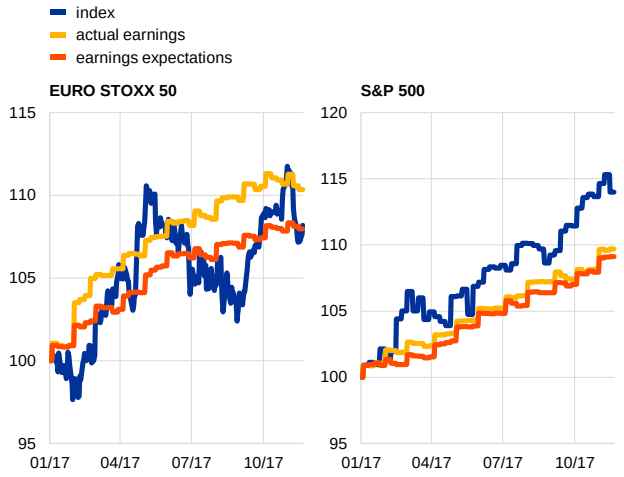
Actual and expected earnings supported stock prices in 2017. Overall brighter macro outlooks provided support for firms' actual and expected earnings in the euro area and in the United States (see **Chart 2.5**). Despite this support, the upward trend in euro area stock prices came to a halt in the early part of the review period. This may be related to the above-mentioned strengthening of the euro, coupled with a perception by market participants that the discount factor used to price stocks may increase in the future as the economy improves. In the United States, the continued increase in stock prices relative to earnings has contributed to a further stretching of valuations from already elevated levels (see also **Chart 2.17**).

Chart 2.5

Overall improved earnings outlook supported global stock prices in 2017

EURO STOXX 50 index, S&P 500 index, and actual and expected earnings

(Jan. 2017 – Nov. 2017, all series indexed to 100 in Jan. 2017)



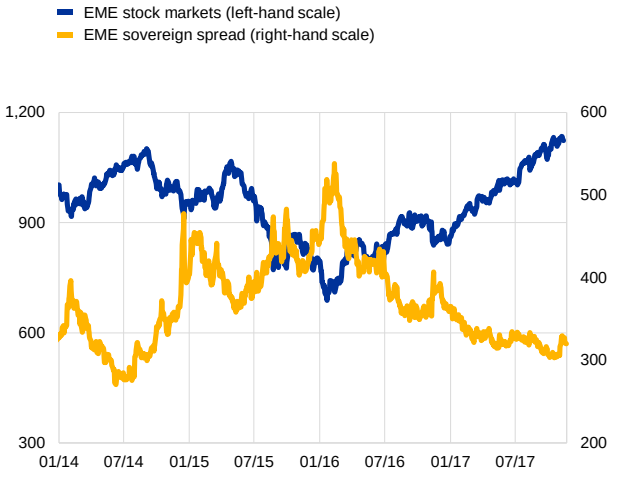
Sources: Thomson Reuters Datastream and ECB calculations.
Note: Earnings expectations are 12 months ahead.

Chart 2.6

EME stock prices higher and bond spreads lower

EME stock markets and sovereign bond spreads

(Jan. 2014 – Nov. 2017; left-hand scale: index values; right-hand scale: basis points)



Source: Bloomberg.
Notes: "EME stock markets" refers to the MSCI Emerging Markets Index. "EME sovereign spread" refers to the JP Morgan Global Spread Index.

Asset prices and portfolio flows to emerging market economies (EMEs) have continued to recover from their troughs in 2015 and early 2016. Positive investor sentiment towards EME assets was reflected in robust inflows and appreciating asset prices. EME equity prices have, on aggregate, returned to levels last seen in spring 2015 and the spreads between EME and US sovereign bonds have narrowed by roughly 200 basis points over the past two and a half years (see **Chart 2.6**). These positive market developments reflect both domestic factors in EMEs and external ones. On the domestic side, growth has picked up recently and measures of macro-financial vulnerabilities have continued to improve for the majority of EMEs. On the external side, the recovery in oil prices and the bright global demand environment have boosted the outlook for exporters among EMEs. Moreover, the very benign global financial conditions, manifested in historically low levels of equity market volatility and yields in advanced economies, have further supported the appetite for EME financial assets by encouraging a search for yield and bolstering risk tolerance.

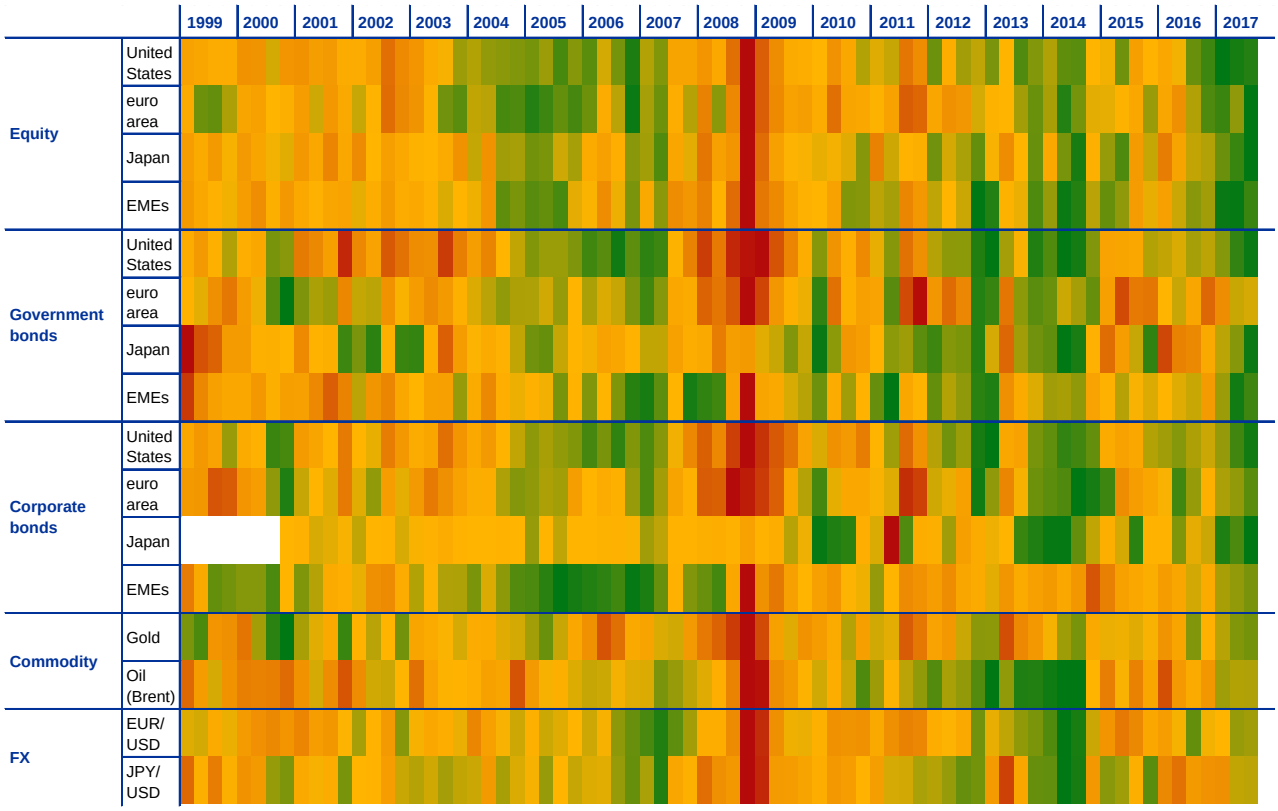
The overall favourable market developments across global economies and asset classes over the past six months have been accompanied by low volatility. A closer look at realised volatility in equity, bond, commodity and foreign exchange (FX) markets for the United States, the euro area, Japan and EMEs suggests that, since the peaks observed in 2008-09 and in 2011 (for the euro area), global asset price volatility has hovered at low levels (see **Chart 2.7**). Only euro area government bond markets have recorded a medium volatility level over the last few quarters. As discussed in **Special Feature D**, a sudden increase in volatility could trigger a demand for higher premia on riskier assets and thereby lead to mark-to-market losses, prompt outflows from riskier asset classes and regions, and potentially pose risks to financial stability.

Chart 2.7

Low volatility across economies and asset classes

Volatility heat map for global equity, bond, commodity and FX markets and evolution of implied volatilities across different markets

(Q1 1999 – Q3 2017)



Sources: Bloomberg and ECB calculations.
Notes: Volatility estimates are derived from a non-overlapping quarterly sample of daily price data. The colour codes are based on the ranking of the estimates. Red, yellow and green indicate, respectively, high, medium and low volatility estimates compared with other periods. For further details, see the box entitled "Financial market volatility and banking sector leverage", *Financial Stability Review*, ECB, November 2014.

Rates on repos collateralised by euro area sovereign bonds show signs of normalisation on balance sheet reporting dates

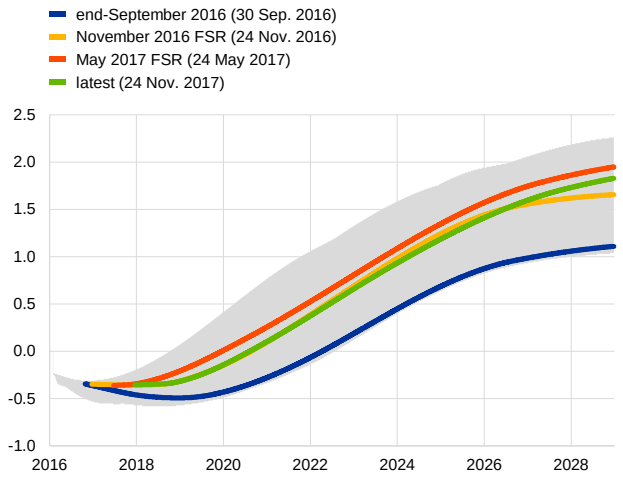
By the end of the review period, market participants expected the initiation of policy rate hikes to take place slightly later compared with their assessment in May. These revisions led to a slight downward shift in the euro overnight index average (EONIA) forward swap rates over the past six months (see **Chart 2.8**). The debate about an eventual exit from the asset purchase programme and the sequencing of monetary policy measures added some intra-period volatility to market expectations. The revisions since May have, however, been small compared with the significant changes that have taken place since the autumn of 2016, when the front end of the EONIA forward curve was still inverted. Over the past year, better economic data have led to higher market expectations concerning the magnitude of ECB policy rate increases and have also brought forward the expected start of the tightening cycle.

Chart 2.8

Market expectations of increases in ECB policy rates have been pushed slightly into the future since May

EONIA forward curve

(percentages per annum, the grey area represents the min-max range since Jan. 2016)



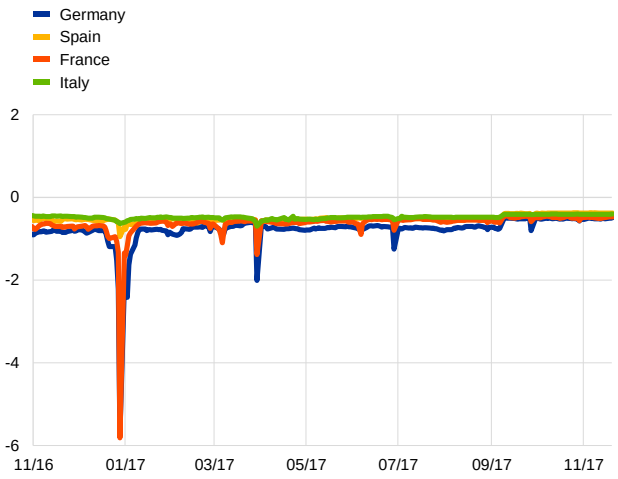
Sources: Thomson Reuters Datastream and ECB calculations.
Note: The forward curve is estimated using EONIA overnight index swap (OIS) spot rates.

Chart 2.9

Milder declines in euro area government bond repo rates around reporting dates

Repo funding rate for collateral issued by Germany, France, Spain and Italy

(Nov. 2016 – Nov. 2017, percentages per annum)



Sources: BrokerTec and MTS.

Developments in the secured money market segment have stabilised in 2017. Fluctuations in the daily reported volumes were relatively muted, while the declines in repo rates and volumes on balance sheet reporting dates have become milder in 2017 compared with the end of 2016 (see **Chart 2.9**). Several factors have reportedly contributed to this normalisation: First, dealer banks have continued their efforts to become more efficient in the management of high-quality liquid assets (HQLAs) by (i) re-designing collateral desks in an effort to concentrate and manage the HQLA portfolio in one place; (ii) investing in technology in order to facilitate the internal transfer pricing of HQLA consumption; (iii) increasing collateral fungibility by gaining access to more trading venues; and (iv) investing in human capital in order to

acquire skills related to the efficient handling of collateral. Second, anecdotal evidence suggests that over time banks have gained experience in preparing for the critical balance sheet reporting dates. For instance, some banks actively advise clients with regard to the balance sheet capacity that can be made available to them on an ongoing basis. This helps to steer client flows in a way that reduces their underlying volatility and their ultimate impact on the balance sheet. Third, subsiding political risk in Europe, in particular following the outcome of the French elections, helped to relieve the demand pressure for high-rated issuers. Fourth, the recent changes and flexibility in the Eurosystem's securities lending of holdings under the expanded asset purchase programme (APP) have also contributed to reducing money market tensions. That said, some tensions may still persist at the end of the year as a consequence of costs and levies that are directly linked to the size of banks' year-end balance sheets. As discussed in **Special Feature C**, the volatility around reporting dates calls for further analysis of whether some regulatory and other metrics could be calculated on the basis of average balance sheet size over a reporting period, rather than the size on the last day of the period. This could help reduce the volatility observed and contribute to a smoother functioning of markets around these dates.

On the regulatory side, money market interest rate benchmarks are undergoing in-depth reforms. Sound benchmarks are needed for the functioning of the financial system, since they play an anchoring role for contracts in financial markets (e.g. for derivatives or mortgages). In addition, benchmark rates play a pivotal role in the operationalisation and monitoring of the transmission of the ECB's monetary policy. **Box 2** provides an update on the state of current reforms in the euro area.

Box 2
Update on reference rate reforms in the euro area

Sound benchmarks are necessary for the efficient functioning of the financial system. Benchmark rates are important because of their anchoring role for contracts in financial markets. In addition, benchmark rates play a pivotal role in the operationalisation and monitoring of the transmission of the ECB's monetary policy.[17] Benchmark rates have been undergoing in-depth reforms over the last few years. These reforms have been largely guided by a set of principles[18] issued by the International Organization of Securities Commissions (IOSCO) in 2013 as a response to the scandals related to the manipulation of LIBOR. As a result of those reforms, market practices and contracts might need to be adapted to a new environment in the years to come.

In the euro area, the euro interbank offered rate (EURIBOR), which is the interbank unsecured benchmark in euro published for maturities ranging from 1 week to 12 months, has been gradually reformed in order to anchor its methodology in transactions rather than in quotes. The feasibility of a fully transaction-based methodology was tested by the EURIBOR

17 For example, in August 2016 the European Commission estimated the total value of contracts indexed on EURIBOR at around €180 trillion for derivatives markets and around €1 trillion for mortgages. The figure for EONIA, as reported by the European Commission in June 2017, is in excess of €5 trillion, the majority of which is in the overnight index swap market.

18 "Principles for Financial Benchmarks", IOSCO, July 2013.

administrator, the European Money Markets Institute (EMMI). However, the conclusion of this test, published in May 2017, was that the volume of unsecured money market transactions was insufficient to build a robust benchmark fully based on the current flow of daily market transactions. Consequently, EMMI is working with market participants on a possible hybrid methodology for EURIBOR which would combine transaction data with expert judgement. In the meantime, the current quote-based methodology will continue to be used to calculate EURIBOR. EMMI has indicated that the development of the hybrid methodology and impact assessment should take until the first half of 2018 and will be followed by a stakeholder consultation.

EMMI, which is also the administrator of the euro overnight index average (EONIA – an overnight benchmark based on actual interbank transactions), is leading a reform process for EONIA with the aim of making it compliant with the Benchmarks Regulation.[19] This Regulation will apply fully from 1 January 2018. EMMI has already defined a new governance framework compliant with the new regulatory requirements, which should come into effect in 2018. EMMI has now undertaken the second phase of the EONIA review, which relates to the analysis of the market underpinning EONIA, to ensure that the benchmark's design is adapted to the economic reality it is intended to capture.

The robustness of both EURIBOR and EONIA, which rely on the voluntary contributions of banks, is becoming a growing source of concern as the support of the contributing banks has been waning over time. These banks are expected to report daily either quotes based on expert judgement (in the case of EURIBOR) or their overnight unsecured interbank lending transactions (in the case of EONIA). However, recently several banks have left one or the other panel, citing that the reform process is overburdening their procedures as the main reason for their departure, while involvement in benchmarks carries liability and reputational risks.

On 11 August 2016 and 28 June 2017, respectively, EURIBOR and EONIA were designated as "critical benchmarks" by the European Commission under the Benchmarks Regulation in the light of their crucial importance for markets and the high number of contracts referencing them. Special provisions of the Regulation apply to a benchmark that is designated "critical", notably that the regulator, which in the case of EONIA and EURIBOR is the Belgian Financial Services and Markets Authority (FSMA), can require mandatory contributions to the benchmark if its representativeness is threatened, e.g. by the departure of panel banks. While this mechanism might provide a backstop solution, its application is limited to a maximum two-year period (initially only one year, which can be extended once by a further period of one year), and hence cannot be considered a long-term solution if the viability of such a benchmark is threatened.

In the secured money market, Eurepo had served as a reference rate for the euro-denominated general collateral market until its discontinuation in January 2015 in view of its limited use and the repeated departures of panel banks contributing to the benchmark. Since then, the launch of a new repo benchmark in euro has been examined by the private sector. EMMI and the European Repo and Collateral Council have been working on a repo benchmark based on the data captured by three of the most active automatic trading systems in Europe. An in-depth analysis of repo data since 2006 commissioned by EMMI highlighted that activity in the

[19] Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds and amending Directives 2008/48/EC and 2014/17/EU and Regulation (EU) No 596/2014 (OJ L 171, 29.6.2016, p. 1).

electronically traded repo market in euro is concentrated on very short-dated transactions, thus allowing the development of a purely transaction-based benchmark for a one-day tenor only. While the project is now at an advanced stage, the timeline for implementation has not yet been communicated by EMMI.

For the unsecured money market, on 21 September the ECB announced that it will publish an overnight unsecured rate before 2020 on the basis of data collected under the Money Market Statistical Reporting (MMSR) Regulation.[20] The interest rate would complement existing benchmark rates produced by the private sector and serve as a backstop reference rate. The high-level features of the benchmark will be communicated in the course of 2018 in the form of public consultations.

Beyond the euro area, the question of the long-term viability of the London interbank offered rate (LIBOR) has similarly gained prominence. In July 2017 the Financial Conduct Authority (FCA), as the UK regulator in charge of LIBOR supervision, argued that the underlying market that LIBOR seeks to measure – the market for unsecured wholesale term lending to banks – was no longer sufficiently active and therefore the transition to a transaction-based methodology was no longer possible. Consequently, the FCA announced its intention to withdraw its support for LIBOR by 2021, possibly triggering a discontinuation of this widespread interest rate benchmark. Work on planning a transition to alternative reference rates based on transactions has therefore commenced in some jurisdictions, undertaken by private sector working groups on alternative risk-free reference rates. Such groups are usually supported by public sector participation and are tasked to look into available alternative rates and to put forward transition plans.

A similar initiative has also been launched in the euro money market, and the alternative rates to EURIBOR will also be debated within a newly established working group on euro risk-free rates, which will be in charge of fall-back rates and issues related to the transition to possible euro short-term alternative rates. The work of this group is aimed at following up on the recommendation of the Financial Stability Board's Official Sector Steering Group (OSSG) of July 2014 to identify and adopt one or more risk-free rates in each main currency area. The working group on euro risk-free rates will be composed of private sector entities and chaired by a representative of the private sector. It will be supported by public authorities and its secretariat will be provided by the ECB.

Risks of a repricing of risk premia in global financial markets

A key risk in financial markets is that bond yields may increase in an abrupt manner. The main triggers for the materialisation of this risk include an abrupt reassessment by markets of future macro conditions, markets misjudging the guidance about the future stance of monetary policy or further increases in (geo-political uncertainty (see **Chart 10** in the Overview). In addition, a sudden

[20] Regulation (EU) No 1333/2014 of the European Central Bank of 26 November 2014 concerning statistics on the money markets (ECB/2014/48) (OJ L 359, 16.12.2014, p. 97). Daily data collection by the ECB, conducted with the support of several national central banks, started in July 2016. Its main purpose is to provide the ECB with comprehensive, detailed and harmonised statistical information on money markets in the euro area. This is a necessary set of statistics for monetary policy purposes.

normalisation of term premia or market volatility – both of which are currently depressed by historical standards – would put upward pressure on bond yields. Overall, also taking into account the improved macro outlook over the review period, the level of financial stability risk stemming from financial markets has remained broadly unchanged since the May 2017 FSR.

Chart 2.10

Low term premia embedded in global long-term rates

Decomposition of euro area and US ten-year interest rates

(Jan. 2006 – Nov. 2017, percentages per annum)

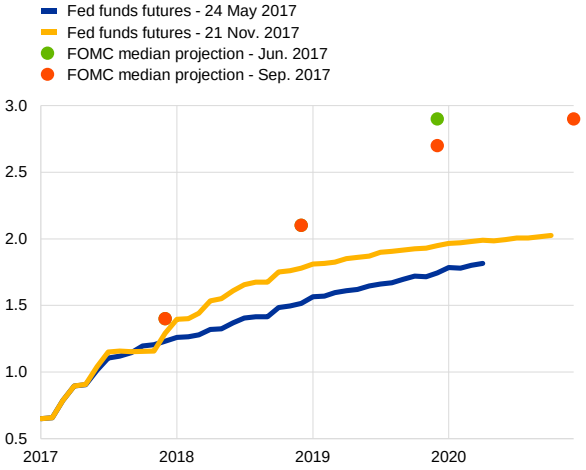
Sources: Thomson Reuters Datastream, Federal Reserve Bank of New York and ECB calculations.
Notes: For the US decomposition, see Adrian, T., Crump, R., Mills, B. and Moench, E., "Treasury Term Premia: 1961-Present", *Liberty Street Economics*, Federal Reserve Bank of New York, May 2014, available at http://libertystreeteconomics.newyorkfed.org. The euro area decomposition (on ten-year OIS rates) is based on an affine term structure model following the methodology used by Joslin, S., Singleton, K.T. and Zhu, H., "A New Perspective on Gaussian Dynamic Term Structure Models", *Review of Financial Studies*, Vol. 24(3), March 2011, pp. 926-970.

Chart 2.11

An alignment of market expectations with those of the FOMC may trigger higher bond yields

US federal funds rate forecasts by the FOMC and financial markets

(FOMC median projections and Fed funds futures, percentages per annum)



Sources: Bloomberg, Federal Reserve System and ECB calculations.

Bond yields around the globe remain at low levels amid depressed risk premia and subdued volatility. Despite recent declines, sovereign bond yields in the United States continue to fluctuate at higher levels than those in the euro area, reflecting the more advanced stage of the business and monetary policy cycle. In both areas, however, the term premium component continues to hover at very low levels from a historical perspective and risks of a repricing in bond markets therefore remain material (see **Chart 2.10**). A normalisation (or even overshooting) of global term premia in the sovereign sector could be triggered by an abrupt reassessment in markets of future macro conditions, with possible repercussions on expectations about monetary policy. This possibility seems particularly relevant in the United States, given the continued divergence of views between financial markets and the Federal Reserve System. Markets are pricing in a slower path of policy rate increases compared with the views expressed by Federal Open Market Committee (FOMC) members (see **Chart 2.11**). As long-term rates can be viewed as an average of current and expected short-term interest rates, a rapid upward adjustment of the expected tightening path by the markets can result in higher yields and volatility for longer-dated securities. Higher interest rates in the United States

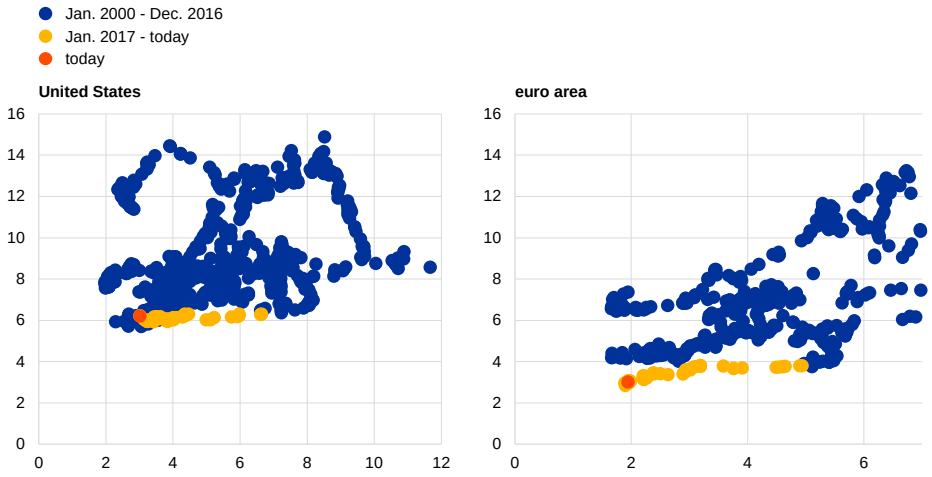
have the potential to also spill over to the euro area. While the euro area itself is considerably less advanced than the United States along the path towards monetary policy normalisation, a market misjudgement about the pace at which this will occur could also trigger an abrupt increase in term premia.

Chart 2.12

Higher interest rates would have an uneven impact across sectors

Corporate bond yields and volatility for US and euro area high-yield segments

(Jan. 2000 – Nov. 2017; y-axis: percentages per annum; x-axis: annualised price volatility)



Sources: Thomson Reuters Datastream and ECB calculations.

Risk premia on corporate bonds are low compared with underlying fundamentals. Global corporate bond yields have continued to drift lower in 2017. The favourable market sentiment, a continued search for yield and subdued asset price volatility have supported corporate bond prices. In some of the lower-rated segments, yields remain exceptionally low by historical standards (see **Chart 2.12**). In the United States, corporate bond spreads have continued to compress despite increases in firm leverage.[21] Such a "disconnect" between fundamentals and market valuations can quickly unwind should the macro environment deteriorate or market sentiment reverse. Similarly, there are also some indications that the degree of price discrimination across US corporate issuers has deteriorated. In fact, the gap between firms with high and low interest coverage (which measures the number of times a company could make the interest payments on its debt with its earnings) has been reduced significantly in 2017 (see **Chart 2.13**). In the euro area, corporate bond spreads have continued to narrow across the credit spectrum. High corporate indebtedness is also a concern in the euro area, but this vulnerability has been reduced in recent quarters owing to continued deleveraging (see Section 1.3 and Box 1). Further evidence that risks are tilted towards an increase in corporate bond spreads comes from valuation metrics which suggest that the excess bond premium (EBP) in the euro area is negative (the EBP is the deviation of corporate credit

[21] This was also discussed in Section 2 of the May 2017 FSR (see Chart 2.13).

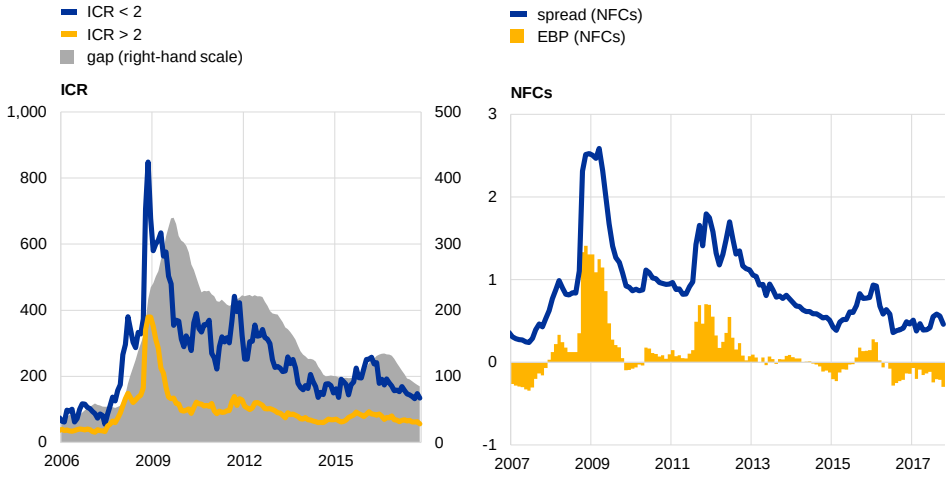
spreads from the measured default risk of the issuer and the duration risk of the bond).[22]

Chart 2.13

Reduced price discrimination in the US corporate bond markets, while bond spreads in the euro area are compressed

US bond spreads for firms with high/low interest coverage ratios (ICRs) (left panel); spreads and excess bond premia (EBP) for euro area non-financial corporations (NFCs) (right panel)

(left panel: Jan. 2006 – Oct. 2017, basis points; right panel: Jan. 2007 – Oct. 2017, percentage points)



Sources: Bank of America Merrill Lynch, Bloomberg and ECB calculations.
Notes: Left panel: sample of 278 firms, containing both investment-grade and non-investment-grade firms. Right panel: the EBP is the deviation of corporate credit spreads from the measured default risk of the issuer. For more details, see De Santis, R., "Credit spreads, economic activity and fragmentation", *Working Paper Series*, No 1930, ECB, July 2016.

A potential repricing in global bond markets may unearth vulnerabilities for both the non-financial and the financial sectors. Relative to the size of their balance sheets, insurance corporations and pension funds (ICPFs) and investment funds are the two sectors most exposed to a sudden increase in interest rates (see **Chart 2.14**). In terms of dynamics, these sectors have increased their debt securities holdings in recent years and the residual maturity of their holdings is long. Vulnerabilities related to higher interest rates are particularly relevant for the investment fund sector, as inflows/outflows can be highly sensitive to changes in market sentiment. Insurance corporations and pension funds, on the other hand, tend to engage in "buy and hold" strategies and are thus less likely to be an originator of negative feedback loops in markets.[23] A mechanical calculation of the immediate impact of a hypothetical 100 basis point interest rate increase on these sectors' debt securities holdings reveals losses of 3% for the ICPF sector and 2.5% for the investment fund sector (both measured as a percentage of total assets). Banks' direct exposure (as a percentage of total assets) and the imputed capital losses are lower than for the above-mentioned sectors.

22 The excess bond premium is obtained by estimating the asset swap spreads of the individual bonds on the basis of the individual duration, the coupon, the outstanding amount, credit ratings and sectoral expected default frequency, using panel fixed-effect methodology. See De Santis, R., "Credit spreads, economic activity and fragmentation", *Working Paper Series*, No 1930, ECB, July 2016.

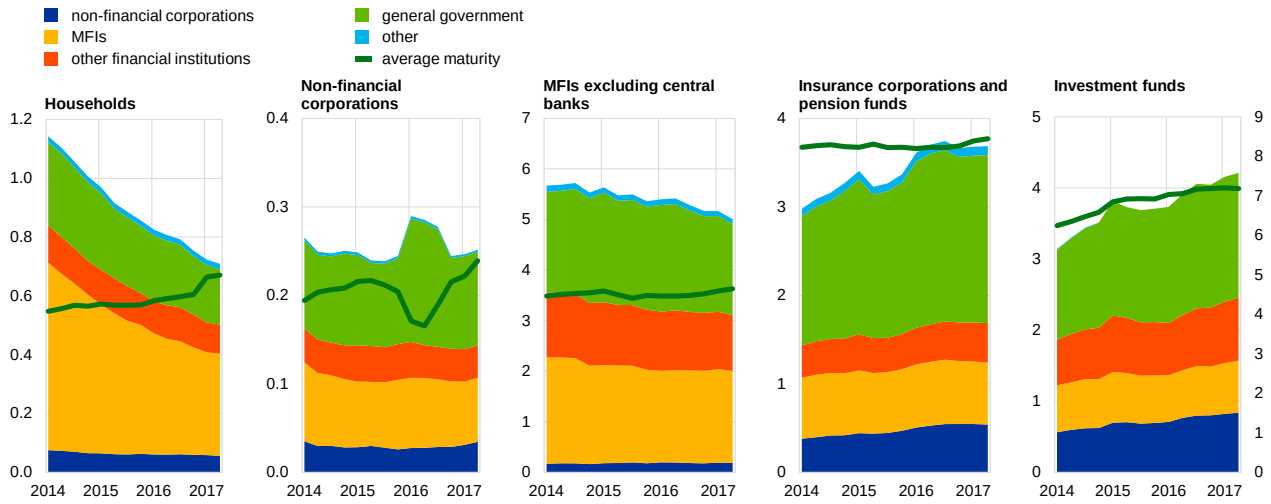
23 See also Box 5, which discusses recent studies that challenge this view.

Chart 2.14

Rising debt securities exposure across a number of sectors

Debt securities holdings across sectors and average residual maturity

(Q1 2014 – Q2 2017; left-hand scale: holdings in € trillions (market values); right-hand scale: maturity in years)



Sources: ECB Securities Holdings Statistics, euro area financial accounts and ECB calculations.
Notes: Total debt as a percentage of total assets (Q1 2017): households: 3%; non-financial corporations: 1%; MFIs: 15%; insurance corporations and pension funds: 38%; investment funds: 39%.

Households' and non-financial corporations' vulnerabilities to an increase in interest rates seem manageable (see Chart 2.15). That said, the household sector has shifted some of its direct holdings of debt securities into investment funds. Given the observed increase in investment funds' risk-taking (see Section 3.1.3), these portfolio shifts may imply a net increase (albeit from low levels) in household vulnerabilities to an abrupt increase in bond risk premia (see **Chart 2.16**).

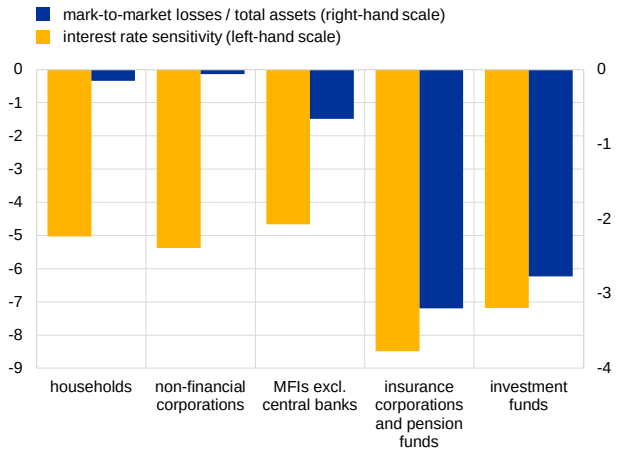
Valuation losses in stressed bond market conditions could be further amplified by a deterioration in market liquidity. Box 3 explains various approaches available to construct market liquidity indicators. Conditions during the period of the ECB's public sector purchase programme (PSPP) and developments in France are used as examples.

Chart 2.15

A rise in interest rates would have an uneven impact across sectors

Mark-to-market capital losses over (i) total debt securities holdings and (ii) total assets stemming from a 100 basis point increase in interest rates

(Q2 2017, percentages)



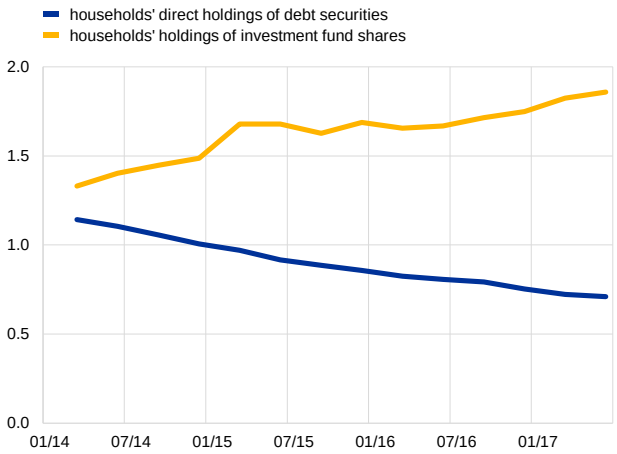
Sources: ECB Securities Holdings Statistics and ECB calculations.
Notes: The computations are static and do not reflect a complete impact from higher interest rates. For instance, the potential offsetting impact stemming from hedging is ignored. Furthermore, for insurance corporations and pension funds, higher interest rates will reduce the value of longer-dated liabilities, and for banks, higher interest rates will probably support banks' margins. For further details, see Sections 3.1.1 and 3.1.3.

Chart 2.16

Increased preference for investment funds over direct holdings in the euro area household sector

Euro area households' direct holdings of debt securities and holdings of investment funds

(Q2 2014 – Q1 2017, € trillions (market values))



Sources: ECB Securities Holdings Statistics and ECB calculations.

Box 3

Bond market liquidity indicators – an overview

An accurate assessment of bond market liquidity conditions is a crucial input for financial stability risk analysis. As commonly defined, "liquidity" measures how much trading volume a financial market can absorb for a given change in price or what the price impact of a given trade volume will be. More elusively, liquidity may indicate how well market prices revert to their fundamental values. Lower bond market liquidity could amplify market price swings, impair the conversion into cash, and thus create financial stability risks.

This box briefly explains the approach taken in constructing liquidity indicators at the ECB and some conclusions that can be drawn from the data. Conditions over the lifetime of the public sector purchase programme (PSPP) to date and developments in France are used as examples.

The concept of liquidity implies a comparison of factual and counterfactual information, namely market pricing with and without a trade being executed. Actual market prices, as opposed to mere quotes or indications, are generally only measurable by actual trading. The executable price for a given trade at a given time also depends not only on the trade details, but also on the particular customer and trading venue. In most bond markets, it is generally also impossible to observe every trade that is being conducted. Commercial data providers and trading platforms offer trading datasets that cover certain sub-segments of the total trade universe, with varying degrees of coverage and sample bias.

The design choices for liquidity indicators reflect trade-offs between various fundamental limitations. ECB staff utilise multiple data sources to produce a range of internal liquidity indicators, and comparisons across indicators provide insights into market developments. The asset purchase programme (APP) in particular provides some post-trade information that would not normally be available to a central bank. By executing market purchases on a daily basis, the ECB can collect information on quoting behaviour that is not visible from screen indications, such as the dispersion of firm offers, time to quote, probability of no quote responses, etc.

Market liquidity indicators can be grouped into three categories according to the type of trade information on which they rely (pre-trade, post-trade and indirect). Pre-trade indicators rely on information that is observable before a trade takes place. This could be indicative price quotes posted by traders, or the order book structures of public exchanges. These indicators are comparatively easy to produce but are reliable only to the extent that indications correlate with executable prices, and that order books reflect true trade interest. Post-trade indicators are based on actual transaction prices and volumes. While the price information is informative, observed volumes are usually incomplete. In addition, the observed trading activity may be – and to the extent that traders seek out pockets of liquidity will be – a biased sample of total market activity. Sample bias is most likely to be significant at higher observation frequencies because higher frequencies imply, ceteris paribus, a smaller trade sample. Indirect indicators rely on secondary features of liquid markets, such as the absence of near-arbitrage opportunities. Such indicators sidestep the observational problems of the other two categories, but the definition and quantification of suitable secondary features is non-trivial.

Market liquidity has both microscopic and macroscopic aspects. At a given time, dealers may quote very tight bid-offer spreads and the market may be able to absorb single trades with a very low price impact, implying high liquidity at the microscopic, single-trade level. However, correlated trades in related instruments may degrade pricing at a more macroscopic level in the sense that the overall market levels move away from fundamentals. Partly as a result of this, trading volumes can be poorly correlated with other liquidity indicators.

This idea can be illustrated with developments in the French government bond market during the period between November 2016 and May 2017. At the time, political risk factors were being cited by a number of market participants ahead of the two rounds of the French presidential election that took place in April and May 2017. **Chart A,** based on ECB data shows that, at a microscopic level, average indicative bid-offer spreads had widened in November but then corrected around the year-end, before widening again in the spring. The price dispersion seen in PSPP execution was elevated sometimes, but not in a way that is correlated with the overall bid-offer measure, possibly indicating sample bias due to the bond selection strategy of ECB portfolio managers. At a macroscopic level, the evolution of an indicator based on spline spreads would be consistent with illiquid conditions, even over the year-end. All three indicators show an improvement in market liquidity after the election.[24]

Taking a longer-term perspective, Chart B shows how bid-offer measures in the government bond market have evolved since the early days of the PSPP. What stands out is that for the two

[24] Spline spreads are produced by first fitting a smooth discount curve to observed yields and then calculating the difference between the market price and the present value of each bond according to this curve (z-spreads). These spreads are therefore indicators of relative value between similar bonds after correcting for coupon effects.

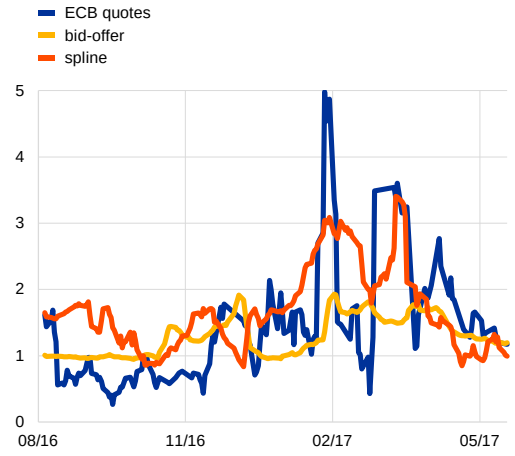
markets shown, liquidity diverged significantly over certain periods. Although there is no general trend for either market towards better or worse liquidity, investors' responses to market movements (e.g. the sharp yield rise in 2015 and the movements at the time of the French presidential elections this year) can have noticeable and diverging effects across different markets.

Chart A

Bid-offer, spline spread and price dispersion measures of liquidity for the French market

Three indicators of liquidity for French government bonds of 4 to 7-year maturity

(1 Nov. 2016 = 1; five-business-day moving averages; higher values indicate lower liquidity)



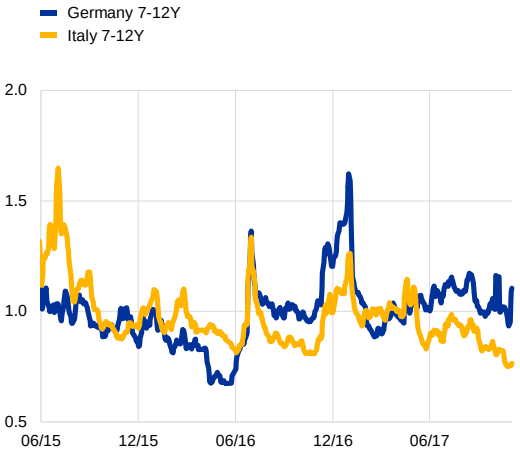
Sources: Bloomberg LP, ECB, MTS and ECB calculations.
Notes: All indicators are indexed to 1 November 2016. "Bid-offer" refers to an average bid-offer spread (pre-trade indicator), while "spline" measures the sum of absolute spline spread values (indirect indicator). "ECB quotes" is an indicator based on the dispersion of price quotes received in PSPP execution (post-trade indicator).

Chart B

Evolution of bid-offer measures over the last two years in Germany and Italy

Bid-offer-based liquidity indicator for the German and Italian government bonds of 7 to 12-year maturity

(average normalised to 1; five-business-day moving averages; higher values indicate lower liquidity)



Sources: Bloomberg LP and ECB calculations.
Note: Bid-offer spreads are averaged across relevant bonds (pre-trade indicator).

In conclusion, the joint analysis of multiple imperfect liquidity indicators provides a useful insight into how market conditions evolve. Instead of focusing only on a single measure, a portfolio of quantitative indicators which can be monitored daily should be used.

Vulnerabilities may also arise in stock markets amid elevated valuations in some areas. In line with the improved outlook for economic activity, euro area cyclical stocks have outperformed defensive equities. Furthermore, the level of stock prices in the euro area is not deviating significantly from what would be consistent with fundamentals (see **Chart 2.17**). Stock prices in the United States have continued to increase in recent quarters, partly driven by the information technology sector. Among individual stocks, the "FAANG" stocks (Facebook, Apple, Amazon, Netflix and Alphabet's Google) currently make up around 11% of the total market capitalisation of the S&P 500 index. The strong increases in this sector may partly reflect some over-optimism on the part of investors, but the situation cannot be compared with that around the turn of the century when price/earnings ratios reached close to 80. Nevertheless, as highlighted in the past issues of the FSR, the overall level of valuations in the United States continues to appear stretched by historical standards. A potential trigger for a stock market correction could be the

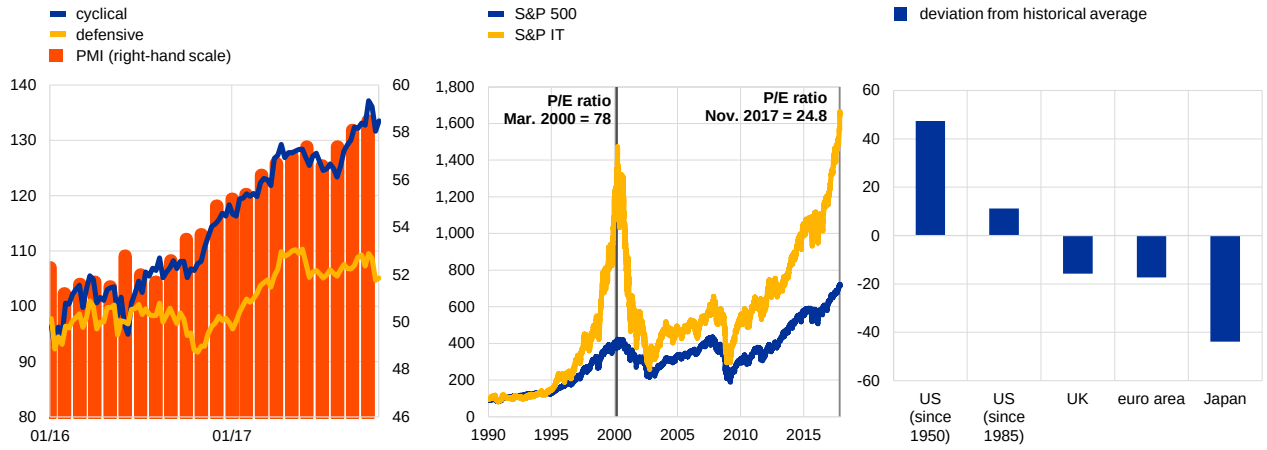
above-mentioned risk of a further repricing of bond yields, particularly if interest rate increases take place without concomitant upward revisions in firms' expected earnings growth. A potential correction could spill over to other major markets, including the euro area.

Chart 2.17

Mixed valuations in global markets

Euro area cyclical/defensive stock performance and euro area Purchasing Managers' Index (PMI) (left panel), US S&P 500 index and the S&P 500 information technology (IT) index (middle panel) and global cyclically adjusted price/earnings ratios (CAPE) (right panel)

(left panel: Jan. 2016 – Nov. 2017, stock prices indexed to 100 in Jan. 2016, PMI index values; middle panel: Jan. 1990 – Nov. 2017, monthly data, stock prices indexed to 100 in Jan. 1990; right panel: deviation from historical averages, percentages)



Sources: Robert Shiller, Bloomberg and ECB calculations.
Notes: Left panel: the cyclical index consists of basic materials, industrials, auto & parts, technology, retail & travel and leisure stocks; the defensive index consists of food & beverage, healthcare, telecom and utilities stocks. Right panel: the CAPE ratio for the United States is taken from Robert Shiller's homepage; the CAPE index series for the United Kingdom, the euro area and Japan start in 1985.