

2 Financial markets

Global financial markets have continued to experience intermittent bouts of volatility. Related sell-offs have been increasingly linked to emerging market concerns, which, however, have been rather pervasive in their impact across several market segments including equities, currencies and commodities. Equity markets, in particular, witnessed substantial losses and sharp intraday movements of a magnitude not dissimilar to those witnessed during the recent global financial crisis, albeit less persistent. Developments in euro area financial markets were largely influenced by the weakening international growth outlook and falling oil prices, in an environment of increased volatility. Within the euro area, developments in Greece had a contained and temporary impact on equity and sovereign bond markets. While money and bond markets were largely resilient to these various episodes of global market turmoil, rising global risk aversion and idiosyncratic events did contribute to a further widening of corporate credit spreads. Moreover, while equity prices fell sharply during the summer turbulence, losses on euro area exchanges were of a smaller magnitude than those witnessed in other markets.

In general, the above developments suggest a pattern in global financial markets where asset prices trend steadily upwards, sometimes to extreme levels, and then correct suddenly and sharply. In this vein, the correction with roots in China appears similar in impact to previous periods of volatility over the last years, including the so-called “taper tantrum” in the summer of 2013, the US Treasury “flash crash” in October 2014 and the recent Bund sell-off in May 2015. To date these adjustments have proven short-lived in the context of an ongoing search for yield. They nonetheless demonstrate three concerning developments in markets: investor behaviour has become increasingly correlated, sentiment is fickle and market liquidity is prone to insufficiency during episodes of market tension. Indeed, changing sentiment towards financial asset valuations has tended to stem from a recurrent set of themes, most notably concerns regarding weakening global economic prospects (mainly in emerging markets) and adjustments – sometimes sharp – in market expectations regarding the future path of monetary policy across major economies.

2.1 Bouts of volatility in global financial markets amid growing emerging market concerns

Global financial markets continue to be hit by bouts of volatility – short-lived but with an apparent increase in potency. Over the last six months, this volatility has shifted towards emerging markets as major events in China – ranging from sharp yuan devaluation¹⁸ to strong equity market corrections – triggered turmoil there

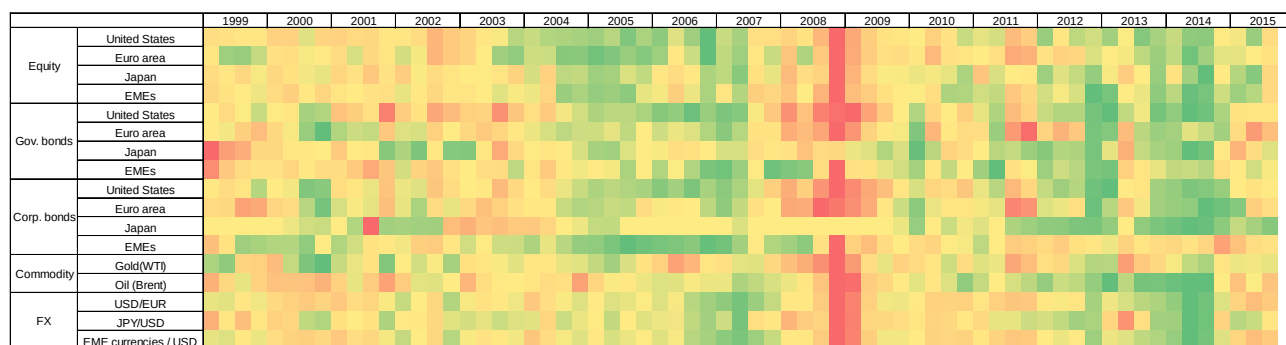
¹⁸ In mid-August, the Chinese authorities changed their methodology for setting the central fixing rate of the Chinese yuan and devalued the currency by 1.9%, the biggest daily move since 1994. Global markets reacted sharply as many viewed the move as a signal of weakness in the Chinese economy.

initially, with ensuing contagion to global asset markets. Emerging market currencies, global equities and commodity markets registered substantial losses and sharp spikes in volatility as fears of a global slowdown and disinflation intensified (see [Table 2.1](#) and Box 1).

Table 2.1

Volatility remains elevated across a number of markets including foreign exchange, commodity and equity markets

(quarterly data; Q1 1999 – Q3 2015)



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. A red, yellow and green colour code indicates, respectively, a high, medium and low volatility estimate compared with other periods. For further details, see Box 3 entitled "Financial market volatility and banking sector leverage", *Financial Stability Review*, ECB, November 2014.

Global equity markets witnessed a broad-based fall in prices and sharp spikes in measures of volatility amid growing concerns regarding the global growth outlook. An unexpected yuan devaluation triggered a slide in global equity markets that gathered significant pace following the release of the weakest PMI report for China in over six years and a substantial correction in Chinese equities, which reverberated globally (see Box 1 in Section 1.1 and [Chart 2.1](#)). While equity markets recovered in subsequent weeks, the summer turmoil significantly eroded the year-to-date returns for most exchanges and contributed to a sharp spike in measures of equity market volatility.

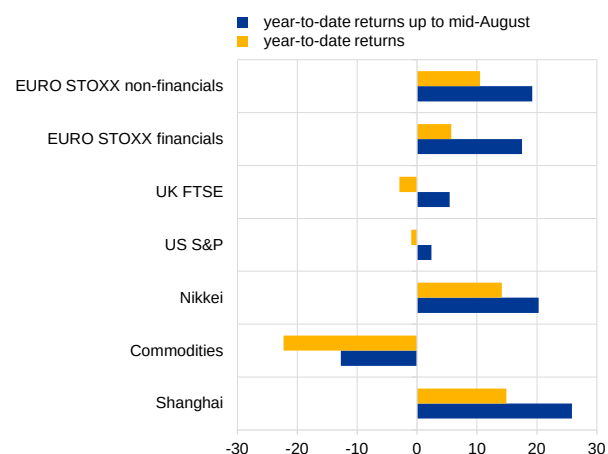
In this environment, a key trend emerging in **global bond markets** has been one of divergence, as risks are seen to rotate from advanced economies to emerging market economies (EMEs). A combination of factors including falling commodity prices, sharp currency depreciations, declining world trade and expectations of US rate increases have triggered significant generalised outflows from EME debt markets, while country or sector-specific vulnerabilities have led to some differentiation (see [Chart 2.2](#) and [Chart 1.10](#) in Section 1.1). Spreads for many EMEs have risen significantly in recent months and did so sharply for certain countries, such as Brazil, with large external financing needs and concerns regarding domestic imbalances. Growing credit risk concerns have contributed to significant outflows from emerging sovereign and, more recently, corporate debt markets. Foreign ownership has risen sharply in many EME local-currency debt markets. While this is a sign of confidence in the economies, it also represents a vulnerability as foreign investors tend to move in line with global risk sentiment and expectations regarding US monetary policy. Moreover, it highlights an additional channel through which difficulties in emerging markets could spill over to advanced economies.

Chart 2.1

Chinese growth concerns triggered a sharp adjustment in domestic equities which reverberated across global equity and commodity markets

Year-to-date returns for major global equity and commodity indices

(Jan. 2015 – Nov. 2015; percentages)



Sources: Bloomberg and ECB calculations.

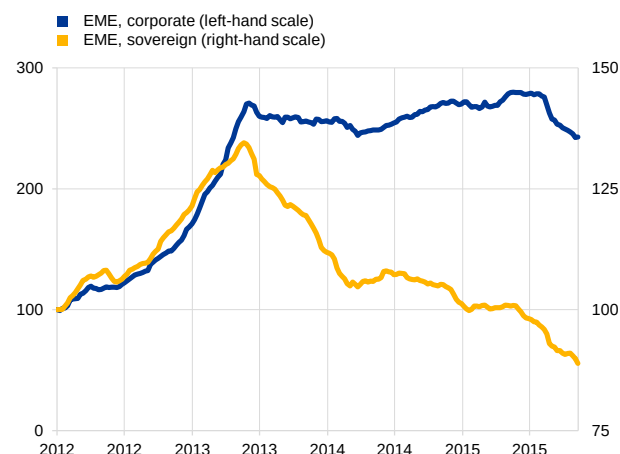
Note: Year-to-date returns are calculated for the period from 1 January 2015 to date and also for the period prior to the yuan devaluation on 12 August 2015 which triggered a slide in global equities that gathered significant pace on China's "Black Monday" (24 August).

Chart 2.2

Growing credit concerns are contributing to a withdrawal of foreign investment from emerging sovereign and, more recently, corporate debt markets

Cumulative global flows to emerging market bond funds since January 2012

(Jan. 2012 – Nov. 2015; index: Jan. 2012 = 100)



Sources: EPFR and ECB calculations.

Note: Indices are constructed based on relative flows expressed as a percentage of total net assets in order to control for valuation effects and sample changes.

While markets have recovered somewhat from the summer turmoil, further volatility could be triggered by ongoing EME concerns and changing market expectations regarding the path of global monetary policy. One propagating factor that could bring otherwise confined regional asset market distress to the global level is continued **low underlying secondary market liquidity** across a broad range of markets, which is somewhat latent amid ample monetary liquidity. This could lead to market selling panics amid emerging market pressures and unexpected divergences in monetary policy expectations across major advanced economies. Market liquidity can be defined as the ability to rapidly (immediacy) execute large financial transactions with a limited price impact, meaning that in liquid markets the marginal transaction should not impact the overall market price, the supply of buying and selling orders (breadth and depth), the transaction cost (tightness) or the ability of new buyers to transact (market resilience). The US Treasury "flash crash", the Bund correction in May and recent equity market turmoil all raise the concern that liquidity can disappear during periods of market tension, thereby amplifying price movements. Evidence gathered in a recent study points to a measurable reduction in global financial market liquidity over the past five years.¹⁹ The reduced liquidity is a product of many factors, including but not limited to the massive and rapid expansion of debt markets, less market heterogeneity, a reduced willingness of banks to act as market-makers during bouts of market stress and other changes in market microstructure (for

¹⁹ See *Global Market Liquidity Study*, PwC, 2015.

example, the growth of algorithmic trading and alternative trading venues, see Box 4).

In an environment of low volatility and high returns on riskier assets, strong correlations across asset classes suggest that investor behaviour has become increasingly homogeneous. The increased correlation of global asset price movements over the past two years may be symptomatic of herding behaviour (see Overview [Chart 5](#)). This creates markets which trend steadily, often to extreme levels, but then correct very suddenly and sharply, as fewer participants are willing to take the other side of the trade.

2.2 Strong role of international developments in euro area financial markets

Developments across various asset classes in **euro area financial markets** have been largely influenced by international factors, including a weakening global growth outlook and falling commodity prices, in an environment of intermittent bouts of volatility. Domestic factors have also played a role, notably uncertainty associated with developments in Greece, which peaked during the summer, and idiosyncratic shocks to certain large corporates. Looking at various market segments, the impact on equity markets has been the strongest, although overall the financial impact was contained and temporary. This sensitivity of equity markets to developments was also witnessed in the aftermath of the events in China later in the summer and in the related spike in global uncertainty. Conditions in money markets, in contrast, have remained calm throughout various episodes of market tension. Short-term rates continued their steady decline in an environment of high excess liquidity. Long-term nominal government bond yields remained relatively stable during the periods of market turbulence, while corporate bond spreads increased slightly. Similar to global markets, low secondary market liquidity and a growing correlation of asset price movements are of concern for euro area markets. Broad measures indicate that secondary market liquidity is low across euro area bond markets compared with the pre-crisis era.²⁰ Moreover, the latest results from the ECB's SESFOD survey note a generalised decline in liquidity across a range of euro area markets (for bonds, equities, convertibles and asset-backed securities).²¹

Conditions in **euro area money markets** remained stable throughout the various bouts of market tension over the last months. While low volatility in an environment of heightened global risk aversion in part reflects the increased resilience of the market, it is also symptomatic of the sharp decline in activity over the past year and persistent fragmentation within this market segment.

²⁰ See the box entitled "Commonality of bid-ask spreads in euro area bond markets", *Financial Stability Review*, ECB, May 2015.

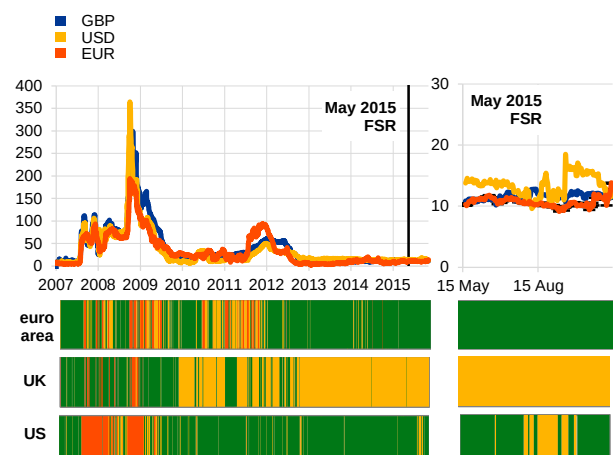
²¹ See the *Survey on credit terms and conditions in euro-denominated securities financing and over-the-counter derivatives markets*, ECB, September 2015.

Chart 2.3

Market-based measures of money market stress were relatively stable during the bouts of market tension

Spreads between unsecured interbank lending and overnight index swap rates

(Jan. 2007 – Nov. 2015; basis points; three-month maturities)



Sources: Bloomberg and ECB calculations.

Notes: Red indicates rising, yellow moderating and green falling pressure in the respective money markets. For more details, see Box 4 entitled "Assessing stress in interbank money markets and the role of unconventional monetary policy measures" in *Financial Stability Review*, ECB, June 2012.

Overall money market rates have been insulated from volatility episodes by a growing liquidity surplus in euro money markets. The increased resilience of money markets was evident during episodes of market tension stemming from domestic euro area issues, in particular those relating to Greece, namely the implementation of capital controls and the temporary closure of Greek banks in July. Market-based measures of stress for the euro area remained relatively stable throughout the periods of heightened risk aversion (see [Chart 2.3](#)). Moreover, while limited market access for lower-rated banks and increased recourse to Eurosystem funding had been a feature of previous episodes of Greece-related stress, banks' access to money markets was not hampered and recourse to the ECB's main refinancing operations fell during the summer turmoil. This contrasts with the experience of sovereign and corporate bond markets which were impacted, albeit temporarily, by Greek events.

Persistently low volatility can also manifest itself in an environment of lower activity among fewer participants. The latest Euro Money Market Survey indicates that market turnover has fallen by 12% over the past year, bringing activity back to 2012 levels (see [Chart 2.4](#)).²²

In contrast to earlier years when low activity reflected significant credit risk concerns, the recent reduction has been driven by a number of other factors. These include a shift of funding and investment activity towards longer maturities, increased availability of funding from non-market sources, and a reduced willingness among banks to transact in an environment of high excess liquidity, low returns and increased regulation. Developments in market activity have varied across money market segments (see [Chart 2.5](#)). While turnover has fallen in most segments, activity in foreign exchange and interest rate swaps has increased owing to increased hedging needs, amid higher volatility in longer tenors, and to arbitrage opportunities, linked to diverging spreads between euro area and US rates.

While banks attributed the sharp decline in unsecured activity to more cyclical factors, structural factors are seen as the main drivers of the fall in turnover in secured markets. The decline in activity within money market segments has been most pronounced for the **unsecured segment**, where turnover is estimated to have fallen by over a third from the second quarter of 2014 to the second quarter of 2015. In their qualitative feedback for the recent Euro Money Market Survey, banks noted two key drivers of the sharp decline. For unsecured lenders, trading was seen as unprofitable at current market rates. For unsecured borrowers, increased recourse to non-market funding sources (for example, client deposits) was noted, alongside

²² See *Euro Money Market Survey*, ECB, September 2015.

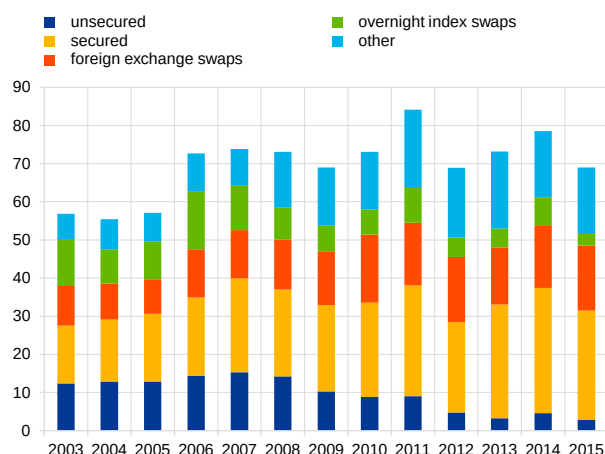
lower credit supply. Activity in the **secured segment** fell by 13% over the same period. While recourse to non-bank funding and low market rates also impacted activity in the secured segment, banks highlighted regulatory considerations and structural changes in their balance sheets as the dominant factors impacting turnover. In particular they noted that capital constraints, the leverage ratio and the liquidity coverage ratio were contributing to a decline in activity.

Chart 2.4

Turnover in euro area money markets has fallen back to 2012 levels...

Market turnover in euro area money markets

(Q2 2003 – Q2 2015; EUR trillions)



Source: ECB and ECB calculations.

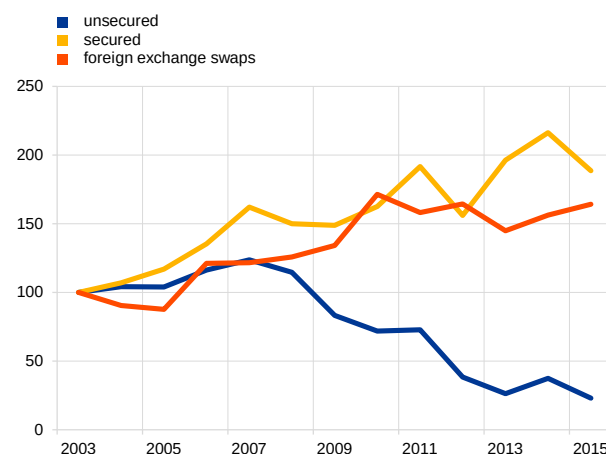
Notes: The panel includes 97 credit institutions. "Other" includes short-term securities, other interest rate swaps, forward rate agreements and currency swaps. Data refer to the second quarter of the respective years.

Chart 2.5

... but trends in activity have varied across segments, with the decline in turnover most pronounced for the unsecured segment

Evolution of turnover in individual money market segments

(Q2 2003 – Q2 2015; index: Q2 2003 = 100)



Source: ECB and ECB calculations.

Notes: The panel includes 97 credit institutions. Data refer to the second quarter of the respective years.

Cross-border flows remain low in money markets as fragmentation persists. Credit risk considerations and local bias are hampering cross-border activity, in particular for lower-rated banks. Banks headquartered in the countries most affected by the euro area sovereign debt crisis face higher funding costs and more limited access to markets, particularly in unsecured segments. Local bias remains a feature as regards counterparty selection in the unsecured segment and collateral decisions in the secured segment. The Euro Money Market Survey shows a decline this year, for banks from large euro area countries, in both the percentage of unsecured activity conducted with non-domestic euro area counterparties and the percentage of secured activity involving non-domestic collateral.²³ A higher concentration of activity within domestic markets, while not ideal, may contribute to the lower volatility as this source of funding tends to be more stable during bouts of market tension than cross-border funding.

The unprecedented low levels of euro area money market rates and their growing divergence with US rates have triggered two key changes in market functioning.

²³ Data on collateral for the secured segment are only available in 2015 for Germany and France.

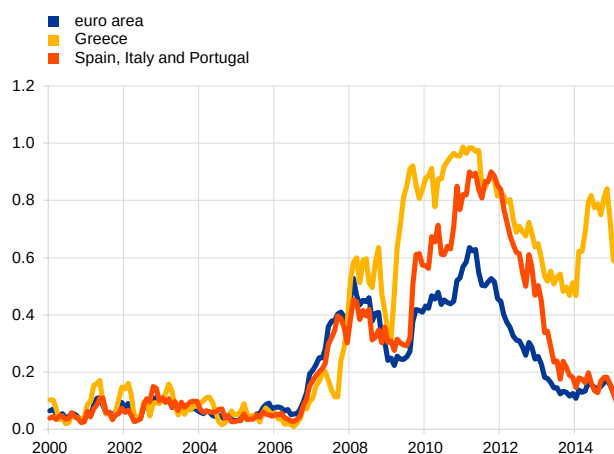
First, issuance activity has fallen owing to an increase in maturity extensions and reduced supply given unprofitably low lending rates. Second, the growing divergence between euro area and US rates has resulted in efforts by issuers and investors to exploit differences in credit spreads that are not offset by the cross-currency basis. In doing so, euro area banks issue in US dollars, as the higher spread attracts investors, and swap back into euro. These developments have financial stability implications given the potential impact on market liquidity and the increased exposure of euro area entities to foreign exchange risk. The recent Euro Money Market Survey shows an increase in the percentage of banks reporting a decline in market liquidity within the secured segment.²⁴

Chart 2.6

Measures of sovereign stress show limited contagion from events in Greece to other euro area markets...

Composite indicator of systemic stress in sovereign bond markets

(Sep. 2000 – Nov. 2015; normalised scale)



Sources: Bloomberg and ECB calculations.

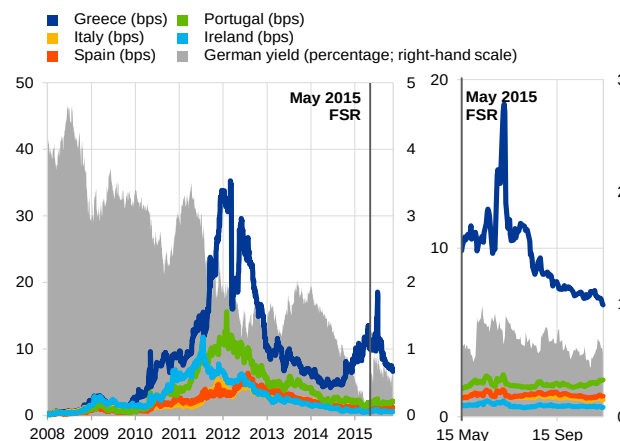
Note: For further details on the CISS methodology, see Hollo, D., Kremer, M. and Lo Duca, M., "CISS – a composite indicator of systemic stress in the financial system", Working Paper Series, No 1426, ECB, March 2012.

Chart 2.7

... as did the evolution of spreads between lower-rated and higher-rated euro area government bonds

Spread between yields on the ten-year German government bond and selected lower-rated euro area government bonds

(Jan. 2008 – Nov. 2015; basis points; percentages)



Sources: Bloomberg and ECB calculations.

Measures of sovereign stress indicate limited contagion from events in Greece and China to **euro area government bond markets** (see **Chart 2.6**). The spike in uncertainty that accompanied developments during the summer had a relatively muted impact. This is evidenced by, among other developments, the spread between the yield on the ten-year German government bond and the corresponding yields for lower-rated euro area countries, which widened only marginally over this period and quickly returned to previous levels (see **Chart 2.7**). At the peak, ten-year sovereign spreads went up by at most 35 basis points for most euro area countries. Implied bond market volatility, among other measures of risk, rose only moderately and temporarily during the episodes of market tension.

²⁴ 37% of banks reported that market liquidity had deteriorated, compared with 22% in the second quarter of 2014.

Chart 2.8

Elevated correlations between US and euro area government bonds reflect global factors rather than monetary policy

Spillovers from US monetary policy to the euro area

(Jan. 2010 – Nov. 2015; regression coefficient of sensitivity of the euro area ten-year sovereign bond yield to US monetary policy expectations)



Sources: Thomson Reuters Datastream and ECB calculations.

Notes: This chart gauges the spillovers from US monetary policy to the euro area ten-year sovereign bond yield. US monetary policy, or expectations thereof, are proxied by the US one-year forward rate one year ahead. The chart plots the corresponding coefficient for regressions of changes in the euro area ten-year sovereign bond yield on changes in the US one-year forward rate one year ahead, controlling for changes in the euro area one-year forward rate one year ahead, changes in the VIX and changes in principal component macro variables for the euro area and the US. Regressions are based on six-month rolling windows of daily data. Missing coefficients in the chart are due to corrections for outliers in daily yield changes.

Yield curve models mainly attribute movements in the yields on higher-rated euro area government bonds since the beginning of the year to changes in the term premium component, rather than changes in expectations of future rates, which are estimated to have remained broadly stable. Similar to the US, term premia for the euro area have remained stable at levels well below long-run averages. The compressed level of term premia on both sides of the Atlantic has raised some concerns regarding the possibility of a sharp snapback as global monetary policy diverges. However, the gap between short-term and long-term yields has remained broadly constant in the euro area and the US since June in spite of mounting speculation about the possible tightening of monetary policy in the US and ongoing speculation regarding ECB monetary policy.

Correlations between euro area and US government bond markets remain at elevated levels, having increased noticeably during the first half of 2015.

However, regression analysis suggests that monetary policy has become less important in explaining correlations between these markets (see [Chart 2.8](#)).

This suggests that other factors, such as developments in China and oil markets, may be behind the increased co-movement in euro area and US sovereign bond

yields. While past experience suggests that developments in US markets can shape global market developments, in the current environment of diverging monetary policy cycles it is difficult to extrapolate from the past into the future, in particular given the enhanced toolkits of major central banks post-crisis. Undoubtedly, the impact of future US rate increases on euro area markets will be influenced not only by economic performance, but also by monetary policy decisions in the euro area amid non-standard monetary policy measures and strong forward guidance.

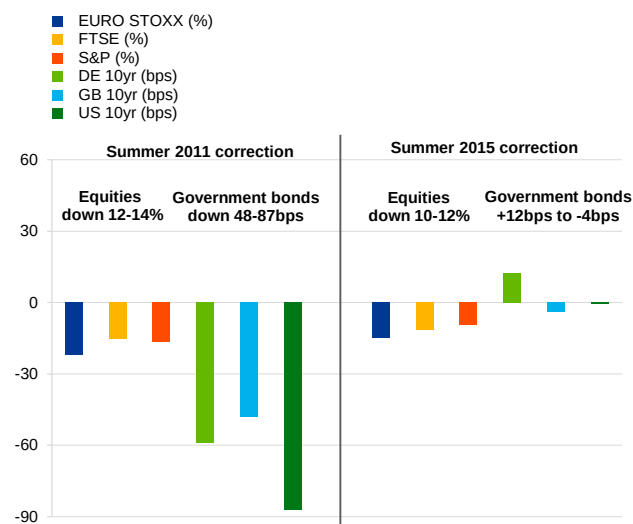
The stability of yields on **higher-rated global sovereign bonds** during the recent equity market sell-off is unusual given their safe-haven status and when compared with previous corrections of a similar magnitude (see [Chart 2.9](#)). The yield on the ten-year German government bond increased, while declines in yields on ten-year US Treasuries and ten-year Japanese government bonds were minor. The muted reaction may reflect, among other things, the following two factors. First, the safe-haven status of these assets may have been affected by major sell-offs over the past year – the US “flash crash” in October 2014 and the more recent Bund sell-off in May 2015 – and by persistent valuation concerns as yields deviate from growth expectations. Second, market reports suggest that official sector activity, including FX reserve sales in China, may have offset the impact of safe-haven flows during the recent correction. Chinese FX reserves fell by a record amount in recent months to their lowest level since July 2013. Approximately two-thirds of Chinese FX reserves are estimated to be held in USD-denominated assets, with the remainder largely

Chart 2.9

Developments in the yields of higher-rated government bonds have been relatively muted compared with those observed during previous equity market corrections

Changes in equity prices and yields on higher-rated government bonds during equity market corrections in 2011 and 2015

(percentages; basis points)



Sources: Bloomberg and ECB calculations.

Note: The equity market correction in 2011 occurred from mid-July to early August when stock markets were affected by concerns regarding a slowdown in US growth, the downgrade by Standard & Poor's of US government debt to below AAA rating for the first time, and the euro area sovereign debt crisis. The correction in 2015 occurred during the period between the yuan devaluation and China's "Black Monday" on 24 August.

consisting of euro, yen and sterling-denominated assets.²⁵ Therefore, a substantial sell-off of Chinese FX reserves could have important implications for higher-rated government bond markets.

Developments in **euro area credit markets** continue to be primarily driven by global factors, which include rising risk aversion and, more recently, a deterioration in the global growth outlook. Corporate bond spreads tended to rise in response to the uncertainty associated with developments in Greece and China, while lower-rated euro area firms appeared reluctant to issue during periods of heightened market uncertainty. The investment-grade sector was also affected by idiosyncratic events in September which contributed to a further widening of credit spreads and two atypical developments during that period. First, the index for non-financial corporate bonds for countries with higher-rated sovereigns underperformed that for issuers from countries with lower-rated sovereigns. Second, non-financial bonds underperformed financial bonds.

Credit spreads widened in an environment of rising risk aversion, which peaked for euro area firms in September as certain large corporations were hit by company-specific shocks. The spread between corporate bonds and the euro area average AAA-rated sovereign curve maintained the steady increase visible

from the summer of last year. A model-based decomposition indicates that the increase in spreads for larger euro area countries over the past year has been primarily driven by increased global uncertainty, while domestic factors largely exerted downward pressure on spreads (see **Chart 2.10**). Model-based evidence also indicates that a deterioration in the growth outlook contributed to an increase in spreads since June 2015. Echoing global trends, the spread between higher and lower-rated euro area corporate bonds also rose further. The magnitude of the spread widening within euro area credit markets has been somewhat smaller than that observed in the US, a reflection perhaps of the high proportion of energy firms (approximately 15%) in the US high-yield sector, which have been adversely impacted by sharp declines in global commodity prices, and the impact of company-specific shocks on the euro area investment-grade sector.

The increase in credit risk premia, after they had hit seven-year nadirs in June 2015, has eased overvaluation concerns somewhat, as corporate spreads are now close to their long-run averages. Moreover, ECB valuation models indicate that the excess bond premium (EBP) for euro area non-financial corporations, computed for corporate bond yields, has been reverting close to their historical mean. The EBP

²⁵ See *Weekly Insight: On Tenterhooks*, Institute of International Finance, September 2015.

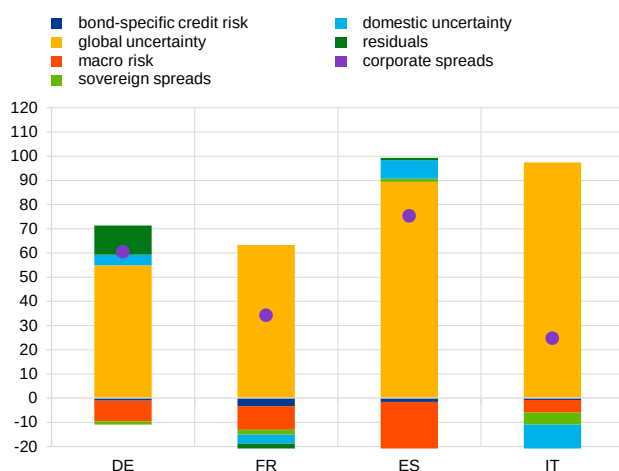
indicator computes the part of the bond yields which cannot be explained by bond characteristics such as the expected default frequency, credit rating, coupon, maturity and outstanding amount of the issuer. As at October 2015 estimates from two models place the EBP at or slightly above zero, implying that corporate yields are in line with credit and liquidity risk (see [Chart 2.11](#)).

Chart 2.10

The increase in euro area corporate bond spreads has been driven to a large extent by global factors...

Decomposition of the change in corporate bond spreads

(Sep. 2014 – Sep. 2015; basis points)



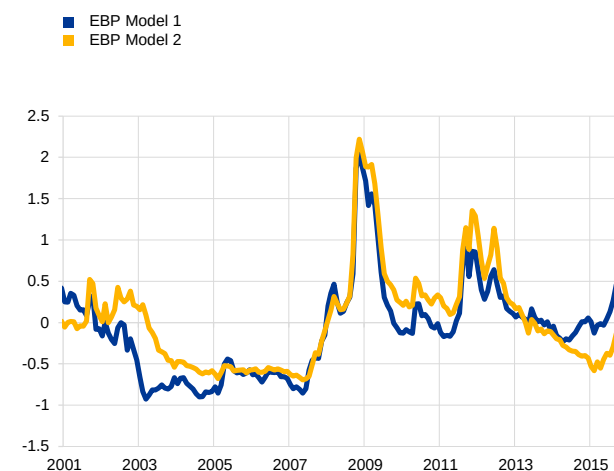
Source: De Santis, R., "Sovereign risk channel, misalignment and fragmentation in the euro area corporate bond market", mimeo, 2015.
Note: "Domestic uncertainty" reflects political and economic uncertainty and includes an index of political uncertainty and the dispersion among professional forecasters of one-year-ahead inflation and GDP growth.

Chart 2.11

... and has brought valuations within the range from fairly priced to slightly underpriced

Euro area non-financial corporations' excess bond premium

(Jan. 2001 – Oct. 2015; percentage points)



Sources: Bloomberg, Merrill Lynch and ECB calculations.
Notes: The excess bond premium (EBP) is the aggregate mean of the deviation of credit spreads from measures of credit risk and liquidity risk at individual bond level, taken from the Merrill Lynch EMU corporate bond indices for non-financial corporations. Model 1 uses asset swap spreads derived from euro-denominated investment-grade and high-yield bonds. Model 2 uses the spread between corporate yields and the overnight index swap derived from euro-denominated investment-grade bonds.

Year-to-date corporate bond issuance is down compared with the same period last year. Primary market activity has weakened in recent months, particularly in the third quarter of 2015. In addition to the usual summer decline in activity, several risk events had a further negative impact on overall issuance (for example, the Greek crisis, events in China and idiosyncratic shocks). The decline in issuance was especially pronounced for the high-yield segment, where gross quarterly issuance was one of the lowest over the past five years. The increase in investors' risk aversion was reflected not only in the amounts issued but also in characteristics of the bonds issued, as the average maturity of new issuance decreased.

In line with global markets, the **euro area stock market** was impacted by the sharp rise in global uncertainty and risk aversion that accompanied events in China. The index fell by 17% in August 2015 and remained at low levels until early October when tentative signs of recovery emerged. Nonetheless, at the end of the review period the index remained 9% below its August peak. The decline has been primarily driven by an increase in the equity risk premium to a level that is high both by historical standards and compared with the levels in the United States (see [Chart 2.12](#)). The elevated level of risk premia in both markets compared with the pre-crisis

period is largely due to higher market volatility (see [Chart 2.13](#)). The gap between euro area and US equity risk premia that emerged during the financial crisis reflects the higher proportion of financial firms in euro area markets and the elevated risk premia of the euro area countries most affected by the sovereign debt crisis (see [Chart 2.14](#)). While equity premia on euro area financial shares have shown a steady decline following the ECB's comprehensive assessment, they remain elevated compared with their US peers.

Chart 2.12

The equity risk premium in the euro area is high and has recently increased again...

Equity risk premia

(Jan. 2005 – Oct. 2015; percentage points)



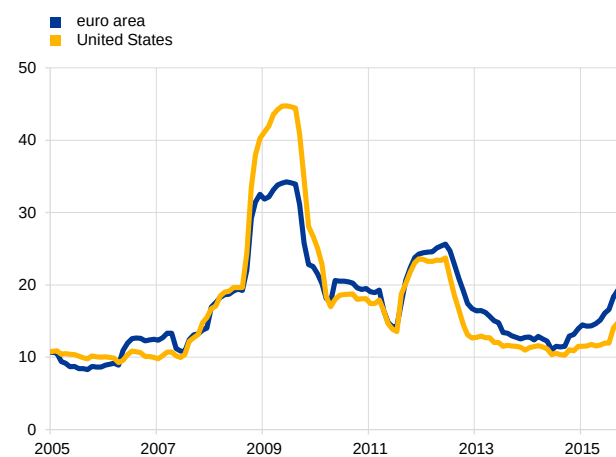
Sources: Thomson Reuters, MSCI I/B/E/S, Consensus Economics and ECB calculations.
Note: The equity risk premium is estimated by means of a two-stage dividend discount model.

Chart 2.13

... amid rising volatility

Realised volatility

(Jan. 2005 – Oct. 2015; percentages)



Sources: Thomson Reuters and ECB calculations.
Note: Realised volatility is computed as the standard deviation of realised daily returns over a one-year rolling period.

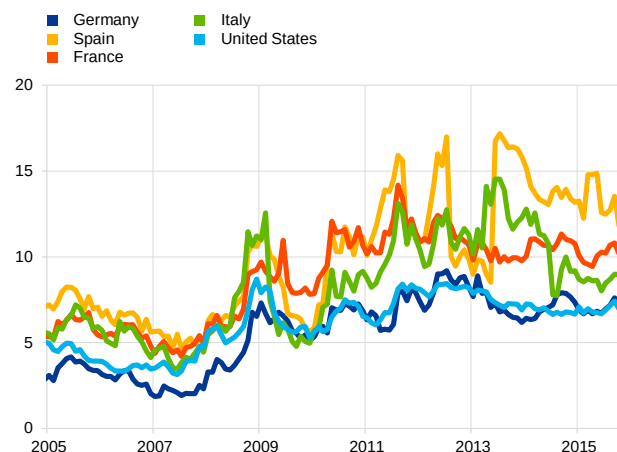
Despite the recent sharp price adjustments, valuation measures for US and euro area equity markets have increased further over the review period. Moreover, valuations for US equities are elevated compared with historical averages, while those for euro area markets are below long-term averages (see [Chart 2.15](#)). For US equities, recent corrections have to be placed in the context of a tripling of the valuations of the main indices over the past six years. Despite the recent correction, the cyclically adjusted price/earnings ratio for the S&P 500 index remains well above its historical average. While estimates of prospective asset overvaluations in any individual market segment differ, it is clear from recent developments that global equity price movements have become increasingly correlated and vulnerable to sharp changes in investor sentiment.

Chart 2.14

Equity risk premia differ across euro area domestic markets

Equity risk premium for selected euro area countries and the United States

(Jan. 2005 – Oct. 2015; percentage points)



Sources: Thomson Reuters, MSCI I/B/E/S, Consensus Economics and ECB calculations.

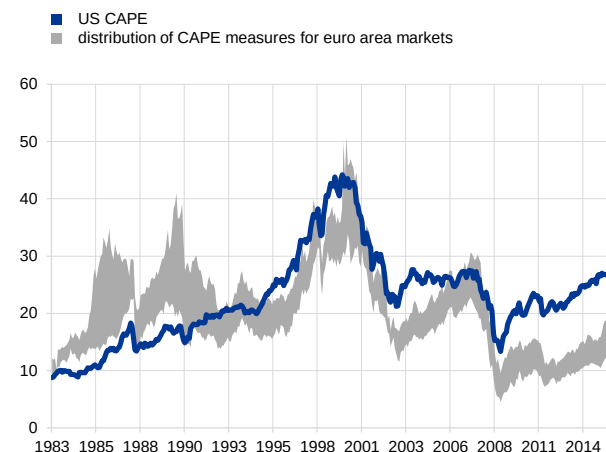
Note: The equity risk premium is estimated by means of a two-stage dividend discount model.

Chart 2.15

Despite significant price corrections, CAPE measures still signal some overvaluation in US equities but not for euro area equities

Cyclically adjusted price/earnings ratio for euro area and US stock markets

(Jan. 1983 – Nov. 2015; grey area represents the 25th-75th percentiles)



Sources: Thomson Reuters Datastream, Robert Shiller's homepage (<http://www.econ.yale.edu/~shiller/data.htm>) and ECB calculations.

Notes: The cyclically adjusted price/earnings (CAPE) ratio for the euro area is imputed from Datastream's stock market indices. The US CAPE is taken from Robert Shiller's homepage.

Box 4

Dark pools and market liquidity

Concerns about potential market liquidity shortfalls have grown in recent years, amid changing roles of participants in financial markets and related trading patterns. As these structural changes have taken hold, one of the factors touted as harbouring the potential to disrupt market liquidity is a change in market microstructure. A particularly opaque element of this structural development has been the growth in little understood trading venues with no regulatory pre-trade transparency requirements – so-called “dark pools”. These types of venue emerged as the initial transparency regime for equities was implemented in the Markets in Financial Instruments Directive (MiFID). New regulation (MiFID II) aims to limit the size of less transparent trading activities and to bring more trades into light pool (or lit) venues where the order book is made public for all participants. Given the current debate on the impact of expanding the transparency regime to fixed income trading under MiFID II, assessing the development of dark pools within equity markets may provide some insights into the potential effect of the new requirements on bond market structure and liquidity.

The trading structure in equity markets noticeably changed after the implementation of MiFID in 2007. Previously, most trading in equities had occurred on a few large exchanges²⁶. MiFID aimed to harmonise transparency, best execution and investor protection across European equity exchanges, and to facilitate competition between exchanges for the trading of equities. As a result, new venues competing for trades emerged, among them “dark” trading venues catering to investors

²⁶ Large exchanges acting virtually as single-country monopolies, such as the London Stock Exchange.

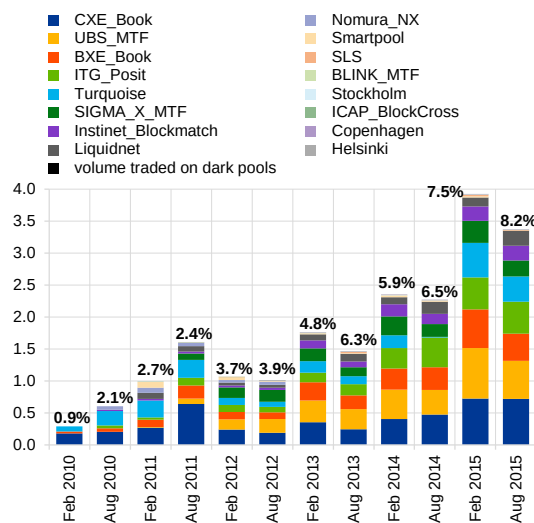
looking for reduced transparency. Using the exemptions for pre-trade transparency requirements, dark pools limit the dissemination of trade data, including information used for price formation. The growth of dark venues, which implies reduced availability of pre-trade information, as well as a higher level of market fragmentation, may be detrimental to market liquidity.

Chart A

Turnover in dark pools has grown rapidly

Reported equity volumes traded in dark pools in Europe

(y-axis: EUR billions; x-axis: traded volumes on the first trading Monday of each month; top of each bar: dark order book as a % of total reported volumes)



Source: BATS Chi-X Europe Market Data.

Notes: Volumes illustrated only for dark order books where data are available via BATS Chi-X Europe; these do not encompass all dark order books or dark pools. Percentages reflect the proportion of all traded volumes in equities at venues reporting to BATS Chi-X Europe.

Dark pools are a type of venue for trading equities with no pre-trade transparency requirements, which serves the needs of traders wishing to place and execute big-ticket orders with minimal adverse price effects. The main types of dark pools are dark order books (DOBs) and broker crossing networks (BCNs). DOBs are registered venues which use pre-trade transparency waivers and external reference prices. In contrast, BCNs are not officially registered venues and use various trade-matching methods. To illustrate the prominence of less transparent trading venues, Chart A shows the growth in volumes traded in a single day on selected DOBs in Europe. Daily trading on DOBs where data are available has grown from less than 1% in 2010 to over 8% of all trading in equities reported by the largest exchanges (including lit and dark order books). There is no equivalent data for volumes traded on BCNs, but studies approximate that 4-6% of volumes traded in equities use these venues.²⁷

Certain investors, especially those looking to make large trades, may prefer using dark pools

for a variety of reasons. One advantage in using them is that orders are generally executed based on the mid-point of an external reference price, and thus investors can avoid market impact costs.²⁸ Additionally, as the price and volume are not disclosed pre-trade, investors can place an order without revealing intentions and without allowing informed traders to take advantage. However, new regulation aiming to limit trading in dark pools should not be detrimental to investors placing larger orders, as they will be protected by the waivers and can use any venue type without pre-trade disclosure.

While uninformed traders may prefer dark pools, informed traders should favour lit markets, because they face lower execution probability in the dark if more of them cluster on one side of the market. As more uninformed traders move to dark pools, the risk of adverse selection for uninformed investors trading on lit venues is higher due to the fact that they are less likely to complete a profitable trade when trading against informed traders. Additionally, this shift may reduce the profits accruing to market-makers from capturing profitable uninformed order flows on lit

²⁷ The TABB Group estimates that BCNs accounted for 6% of pan-European equity market trading in 2012. Deloitte estimates that 4% of equity volumes were traded in BCNs in 2014.

²⁸ The additional transaction cost of executing a trade resulting from the movement in price required to complete it, which depends on market depth.

exchanges. However, market-makers are also active in dark pools, which allows them to also make some profit on these venues.²⁹

Academic literature investigating the effect of dark pools on market liquidity has found mixed results. Those finding negative effects argue that dark pools remove liquidity and information from mainstream platforms where price formation occurs.³⁰ This leads to lower depth, increased trading costs and volatility on lit venues. They claim that consolidating liquidity on a few venues creates economies of scale and positive network externalities.³¹ Thus, reducing dark pools by bringing more trades under a transparency regime may benefit market liquidity.³² On the other hand, the defenders of dark pools argue that current levels of dark trading are too low to harm market quality and provide evidence that these venues benefit especially uninformed and small traders.³³

The growth of dark pools under MiFID illustrates how regulation might influence evolving market microstructure, including a potential fragmentation of liquidity. According to the new provisions, all liquid financial instruments, including bonds, are to be subject to pre- and post-trade transparency on price and volume regardless of the trading venue. The new regulation aims to bring more trading to transparent venues, which, if successful, would also result in more liquidity on those venues. The majority of traders would benefit from consolidating information and promoting transparency, competition and financial stability. That said, some market participants might become more reluctant to engage in the market, as they may perceive transparency to increase the risks and costs of trading. Dark pools for fixed income instruments may emerge, pooling together liquidity and further changing the structure of these markets. Bonds are more heterogeneous than equities and traded less frequently but in larger trade sizes; thus fixed income traders may prefer dark pools to avoid revealing intent and trading with more informed counterparties on lit exchanges. Moreover, larger trade sizes in fixed income markets may make these trades more frequently eligible for transparency waivers. In light of this, more in-depth analysis of the development and potential effects of dark pools, as well as closer monitoring of the evolution of fixed income markets, are essential for designing regulation to adequately capture all facets of rapidly evolving financial markets.

²⁹ Brugler, J., "Into the Light: Dark Pool Trading and Intraday Market Quality on the Primary Exchange", *Working Paper Series*, No 545, Bank of England, 2015.

³⁰ Degryse, H., De Jong, F. and Van Kervel, V., "The Impact of Dark Trading and Visible Fragmentation on Market Quality", *Review of Finance*, 2014.

³¹ Each additional trader increases execution probability and reduces the market impact cost for others. For further discussion, see Pagano, M., "Endogenous market thinness and stock price volatility", *Review of Economic Studies*, Vol. 56(2), 1989, or Fioravanti, S. F. and Gentile, M., "The impact of market fragmentation on European stock exchanges", *Working Paper Series*, No 69, Commissione Nazionale per le Società e la Borsa, 2011.

³² Comerton-Forde, C., and Putnigš, T. J., "Dark trading and price discovery", *Journal of Financial Economics*, 2015.

³³ Brugler, J. (2015), op. cit.