TRV

ESMA Report on Trends, Risks and Vulnerabilities

No. 2, 2016

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Executive summary

Trends and risks

ESMA risk assessment

Risk segments	Risk	Risk categories	Risk	Change	Outlook	Risk sources	Change
Overall ESMA remit	🟠	Liquidity	🟠	→	↗	Macroeconomic environment	↗
Systemic stress	🟡	Market	🔴	→	↗	Low interest rate environment	→
Securities markets	🔴	Contagion	🟠	→	↗	EU sovereign debt markets	→
Investors	🟡	Credit	🔴	→	→	Market functioning	→
Infrastructures and services	🟡	Operational	🟡	→	→	Political and event risks	↗

Note: Assessment of main risks by risk segments for markets under ESMA remit since last assessment, and outlook for forthcoming quarter. Assessment of main risks by risk categories and sources for markets under ESMA remit since last assessment, and outlook for forthcoming quarter. Risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high risk, red=very high risk. Upward arrows indicate an increase in risk intensities, downward arrows a decrease, horizontal arrows no change. Change is measured with respect to the previous quarter; the outlook refers to the forthcoming quarter. ESMA risk assessment based on quantitative indicators and analyst judgement.

Risk summary: In 1H16, risks in the markets under ESMA remit remained at high levels, with market and credit risks very high. Generally, recurrent swings in valuations and high volatilities over the last half-year signalled sustained risk sensitiveness and scope for sudden risk repricing or rise in market imbalances. In particular, markets were affected by equity market disruptions in China, commodity price swings, and EU bank profitability concerns at the beginning of 2016. The outcome of the UK referendum on EU membership on 23 June caused turbulences especially in equity, bond, and currency markets. As political developments post-referendum progress, market turbulences may continue to occur. Business strategies and market structures may adjust to the new political realities in the months and years to come. Accordingly, while overall risk levels prevail and remain high for the time being, the outlook for market, liquidity, and contagion risks has deteriorated, driven by intensified political and event risks, and a weakening macroeconomic environment.

Market environment: The market environment in 1H16 confirmed ESMA's financial stability concerns. The beginning of the year was marked by high volatility concentrated in equity and commodity markets, reflecting valuation concerns, slower EM growth, and turmoil in the energy sector from falling oil prices. These developments were matched by volatile fund returns and a reassessment of credit risk premia leading to portfolio and fund outflows. The environment noticeably improved from March as asset prices recovered, volatility receded and funding conditions improved, owing in part to support from new monetary policy measures in the EU and a reassessment of future interest rate expectations in the US. Credit risk premia also declined, in particular for lower-rated securities, suggesting a possible return of search-for yield behaviour. The outcome of the UK EU referendum had a significant market impact, particularly in foreign exchange and equity markets, and can be expected to cause further disruptions.

Securities markets: Tensions in securities markets were very high at the beginning of the year, reflecting valuation concerns, pressures in emerging markets, and uncertainties over the global economic outlook. The tensions in EU securities markets abated between March and June with reduced volatilities and recovering oil prices. However, the end of 2Q16 was marked by very strong market reactions to the outcome of the UK EU referendum. Equity markets experienced a large sell-off and EU foreign exchange volatilities jumped, while safe-haven assets benefitted from a flight to safety.

Investors: Monthly rates of return in the EU fund industry ranged below zero for all fund types except real estate funds but rebounded to some degree from March 2016, due to price recoveries led by commodity markets. Returns on representative retail investor portfolios fell below zero. Fund flow patterns were dominated by three factors: price developments in asset markets, search for yield, and structural changes in the EU financial system. The uncertainty related to the UK referendum contributed to outflows from EU and UK equity funds ahead of the vote. Significant redemptions from UK funds occurred after the referendum, resulting in some open-ended UK property funds suspending redemptions. The fund sector continued to expand, reaching EUR 11.4tn for the EA in 1Q16. The performance of individual investor

portfolios and funds exposed to UK and EU assets will be impacted by the ongoing market nervousness in the wake of the UK EU referendum, and business strategies and market structures may respond to the new political realities.

Infrastructures and services: Equity trading activity was broadly stable in 1H16 and continued to take place mainly on regulated exchanges. Central clearing further expanded, with the first clearing obligation for interest rate derivatives in G4 currencies taking effect in June and seven third-country CCPs being recognised to operate in the EU. On 29 April, ESMA published the results of the first EU-wide CCP stress test, pointing at a satisfactory level of resilience to counterparty credit risk in light of the scenarios tested. Neither the market disruptions at the beginning of the reporting period nor the drastic jump in market turnover and increased settlement activity following the UK referendum were reported to have caused problems to EU market infrastructures.

Vulnerabilities

Proxy advisors – an overview of the EU market: Information and other transaction costs often limit the capacity of institutional investors to actively monitor firms they invest in and in particular to engage at general meetings. A partial solution is offered by proxy advisors, providing analysis, recommendations and other services in relation to shareholder voting at Annual General Meetings. In the last few years, institutional investors in the EU have made increasing use of their services. ESMA began analysing this topic in 2011, and in 2013 encouraged the proxy advisory industry to establish a code of conduct to address potential issues related to transparency and disclosure. In this article we provide an overview of the proxy advisory market in the EU and summarise the development of a self-regulatory framework by the industry.

Financial innovation scoreboard: ESMA has the mandate to monitor financial innovation in EU securities markets and coordinate regulatory and supervisory treatment where innovations may affect ESMA's objectives. In this second article in a series on ESMA financial innovation analysis we present ESMA's Financial Innovation Scoreboard. To prioritise which financial innovations require deeper analysis and potential responses, e.g. to possible market failures, ESMA requires an overview of the financial innovation landscape. The framework provides a ranking relating product features to ESMA's objectives.

Circuit breakers in the EU – use and effects: Sudden and drastic price swings in financial markets can be a source of instability and are a concern for supervisors, regulators and market participants. Circuit breakers (CB) are key instruments for trading venues to interrupt excessive price movements. We provide an overview of the volatility safeguard mechanisms used by EU trading venues to manage periods of excess volatility. They differ in the type of volatility interruption (price collars, CBs, or both), in the reference price and threshold specification, and in their disclosure to market participants. We find that CB trigger events are concentrated in a small number of trading venues. Furthermore, we find evidence that CBs may help increase market quality for both halted instruments and cross-listed or associated ones.

EU corporate bond market liquidity: The role of corporate bond markets in financing the economy in the EU has gained greater prominence in recent years. At the same time, periods of high volatility associated with short-term illiquidity in different market segments have heightened concerns over the deterioration of liquidity. This article investigates secondary market liquidity developments in EU corporate bond markets. We develop quantity-based and price-based metrics of market liquidity for EU corporate bonds and provide an initial attempt to construct a composite liquidity index. We do not find systematic, significant positive or negative trends in liquidity levels during the period analysed (March 2014 to March 2016). However, when wider market conditions deteriorate, we observe episodes of decreasing market liquidity.

Synthetic leverage in the asset management industry: The use of leverage has been common practice in financial markets for many years. Usually measured as debt over equity, high leverage ratios in individual financial institutions have in the past led to episodes of balance sheet and systemic stress. This prompted greater oversight by global regulators, and in some instances, the introduction of quantitative limits. However, the nature of leverage has evolved and off-balance sheet leverage, built through the use of derivative instruments, has gained traction in recent years. The growth of the EU asset management industry, the size of global derivatives markets, and anecdotal evidence suggest that reliance by investment funds on what has become known as "synthetic leverage" is becoming an increasingly relevant issue, potentially requiring greater regulatory scrutiny. This article looks into the use, measures, regulatory treatments and financial stability risks of synthetic leverage, through the specific prism of investment funds.

Trends

Market environment

The market environment in 1H16 confirmed ESMA's financial stability concerns. The beginning of the year was marked by high volatility concentrated in equity and commodity markets, reflecting valuation issues, slower EM growth and turmoil in the energy sector from falling oil prices. These developments were matched by volatile fund returns and a reassessment of credit risk premia leading to portfolio and fund outflows. The environment improved noticeably from March as asset prices recovered, volatility receded and funding conditions improved, owing in part to support from new monetary policy measures in the EU and a reassessment of future interest rate expectations in the US. Credit risk premia also declined, in particular for lower-rated securities, suggesting a possible return of search-for yield behaviour. The outcome of the UK EU referendum had a significant market impact, particularly in foreign exchange and equity markets, and can be expected to cause further disruptions as illustrated in the suspension of redemptions by several UK property funds.

The **performance** of EU financial markets continued to deteriorate at the beginning of the year as valuation concerns in equity markets and excess oil supply weighed on asset prices. This was accompanied by strong **volatility** (T.2), which peaked at 35% for commodities in February, compared with a five-year average of 18%. Volatile conditions in securities markets were also reflected in the volatility of fund returns (A.107), in particular commodity and equity mutual funds.

Conditions improved until June as concerns around growth in emerging markets subsided and commodity markets recovered, despite episodes of short-term volatility related to the health of some European banking institutions. However, the outcome of the UK referendum sparked a new bout of sell-off in equity markets, with historical volatility spiking above 30%, its highest level since 2011.

The recovery of risk appetite in financial markets prior to the referendum had been bolstered by several monetary policy announcements, including a further cut in the rate on the ECB deposit facility and expansion of the central bank's asset purchase programme. These announcements contributed to an improvement in **funding conditions** and a decline in **credit risk premia** from March (A.49 and A.62), supporting bond prices (including high-yield), which had already proved more resilient than other asset classes in the early part of the year.

The level of **liquidity** in bond markets remained in focus, with further discussion on a possible liquidity "bifurcation" between different segments of the EU bond market and preliminary analysis pointing to potential episodes of decreasing market liquidity in investment-grade corporate bond markets over the last two years (Box T.14 and V-article on corporate bond liquidity, pp. 61-68).

The end of the period was characterised by very high volatility in **foreign exchange** markets due to the outcome of the UK referendum on EU membership. The GBP depreciated sharply against other currencies while equity prices experienced strong declines, with some EA equity indices falling 12% in just one day. In contrast, USD, German government bonds and gold experienced large gains as investors rushed for safe haven assets.

The volatile environment was also reflected in EA **portfolio flows**. Non-EA investors withdrew from EA securities, in line with the 2H15 trend (T.5). EA residents continued to purchase large amounts of long-term foreign debt securities, partly in response to interest rate differentials with other regions, and reduced their exposures to foreign equities (T.7). The resulting net EA outflows reflected lower market **confidence** to a certain extent, particularly on the part of financial intermediaries (A.6).

The evidence on **capital market financing** was mixed. Investment by EA residents in securities markets totalled EUR 1.1tn in 2015, twice the 2014 amount, and rose further in 1Q16 (T.7). This trend was driven primarily by monetary and financial institutions, which invested around EUR 230bn in 2015, and EUR 136bn in 1Q16 alone, following two years of disinvestment in the context of bank deleveraging. In contrast, there was a marked slowdown in the level of institutional financing, which amounted to EUR 418bn in 2015, down 36% from 2014 (T.8). The decline was driven by insurance and pension funds, which reduced their investments by 25% to EUR 255bn, and bond funds' divestments of EUR 110bn. On the issuance side, equities continued to constitute the bulk of EA securities issued. The volume of net financial sector debt issued fell for a fourth consecutive year but NFC debt issuance increased 30%, to EUR 54bn (A.9).

T.1
Market performance
Equity prices fluctuate, commodities recover

Note: Return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro, all maturities). 02/06/2014=100
Sources: Thomson Reuters Datastream, ESMA.

T.2
Market volatilities
Equity volatility rises after UK referendum

Note: Annualised 40D volatility of return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro all maturities), in %.
Sources: Thomson Reuters Datastream, ESMA.

T.3
Exchange rate volatility
Sharp increase in GBP implied volatilities

Note: Implied volatilities for 3M options on exchange rates. 5Y-MA EUR is the five-year moving average of the implied volatility for 3M options on EUR-USD exchange rate.
Sources: Bloomberg, ESMA.

T.4
Credit terms in SFTs and OTC derivatives
Deterioration in collateral market credit terms

Note: Weighted average of responses to the question: "Over the past three months, how have terms offered as reflected across the entire spectrum of securities financing and OTC derivatives transaction types changed?" 1=tightened considerably, 2=tightened somewhat, 3=remained basically unchanged, 4=eased somewhat and 5=eased considerably.
Sources: ECB, ESMA.

T.5
Portfolio investment inflows
Non-EA investors shun EA equities

Note: Net inflows=BoP and international investment position. Portfolio investment liabilities of EA 19 (fixed composition) residents. Net transactions over the period, EUR bn.
Sources: ECB, ESMA.

T.6
Portfolio investment outflows
Foreign debt attracted EA investments

Note: Net outflows=BoP and international investment position. Portfolio investment assets of EA 19 (fixed composition) residents. Net transactions over the period, EUR bn.
Sources: ECB, ESMA.

T.7
Securities investments
Reduced MFI deleveraging

Note: Quarterly Sector Accounts. Investment flows by resident sector in equity (excluding investment fund shares) and debt securities, EUR bn. 1Y-MA=one-year moving average of all investment flows.
Sources: ECB, ESMA.

T.8
Institutional financing
Decline in financing by institutional investors

Note: EA institutional investment flows by type of investor, EUR bn. Other=financial vehicle corporations, mixed funds, other funds. 1Y-MA=one-year moving average of all investment flows.
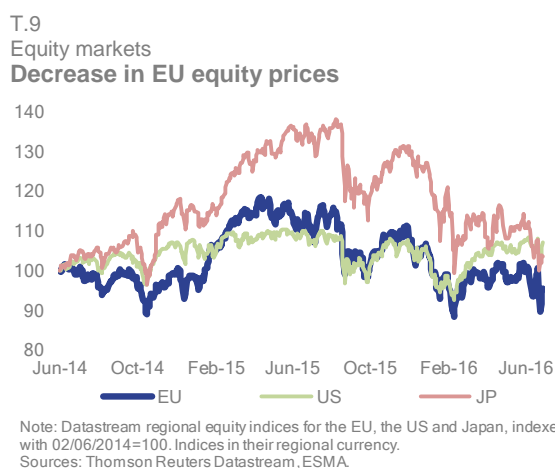Sources: ECB, ESMA.

Securities markets

Tensions in securities markets were very high at the beginning of the year, reflecting valuation concerns, pressures in emerging markets, and uncertainties over the global economic outlook. The turbulences in EU securities markets abated between March and June with reduced volatilities and recovering oil prices. However, the end of 2Q16 was marked by very strong market reactions to the outcome of the UK EU referendum, which wrong-footed investors. Equity markets experienced a large sell-off and EU foreign exchange volatilities jumped, while safe-haven assets benefitted from flight to safety. Search for yield remained an important driver of securities markets trends in 1H16 as the low interest rate environment persisted. Benign conditions prevailed in EU sovereign bond markets amid discussions of a possible liquidity bifurcation between different EU fixed-income markets. Overall, financial stability concerns remained high and are expected to persist in the aftermath of the UK EU referendum.

Equities: Weak performance

EU equity markets were marked by significant turbulence at the beginning of the year, driven by uncertainties over growth in emerging market economies, especially China, concerns about the condition of some EU banks, and increased doubts over policy effectiveness. **Equity prices** declined strongly in the opening weeks of 2016, falling 17% between 1 January and 11 February. However, the subsequent reduction in volatility contributed to a recovery in equity valuations, which nonetheless remained weak compared to 2015.

The UK EU referendum triggered a sharp sell-off in EU equity markets, led by bank shares. The fall was steepest in the EA, where several national equity indices lost more than 12% on 24 June in a sign of generalised risk aversion (A.18). As a result, EU equity prices declined 10% overall in 1H16 (T.9).

T.9
Equity markets
Decrease in EU equity prices

Note: Datastream regional equity indices for the EU, the US and Japan, indexed with 02/06/2014=100. Indices in their regional currency.
Sources: Thomson Reuters Datastream, ESMA.

JP equity prices were characterised by an even stronger decrease, tumbling by 18% in 1H16, while US equity prices at the end of the reporting period were 2% higher than at the end of 2015.

Short-term implied **volatility** in equity prices was high at the beginning of 1H16, with the one-month VSTOXX averaging 29% in January. It rose even higher around the UK referendum date to hit a peak of 40%, compared with a long-term average of 23% (A.21).

Liquidity conditions in EU equity markets deteriorated slightly again in 1H16 with the 40-day average bid-ask spreads on large EU caps at 6.7 basis points in June 2016, compared to 6.3 at the end of 2015 (T.10). However, bid-ask spreads in EU equity markets remained below their long-term average, consistent with overall ample liquidity, as suggested by ESMA's illiquidity indicator (A.22).

T.10
Equity markets
Bid-ask spreads increased slightly

Note: Liquidity measures as median of the bid-ask price percentage difference of the current EU constituents of Stoxx Europe Large 200. in %.
Sources: Thomson Reuters Datastream, ESMA.
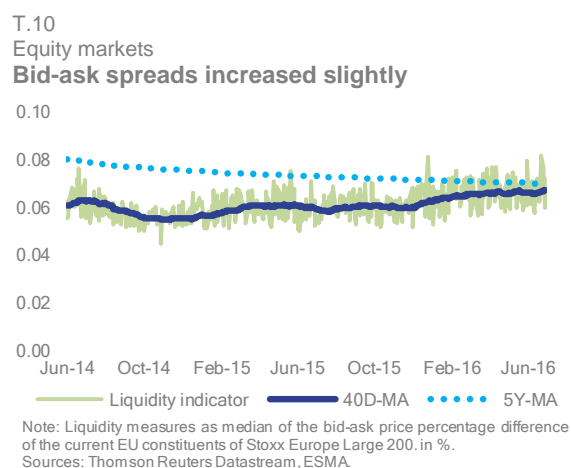
EU **equity issuance** was subdued in the first half of 2016 compared to 1H15 and 1H14, possibly owing to the high volatility in equity markets. The value of IPOs and Follow-On Offerings slumped to EUR 67bn, almost half the 1H15 volume (A.15). The decline was particularly pronounced in the financial sector, with EUR 15bn issued in 1H16 against EUR 44bn in 1H15, in line with the under-performance of financial share prices (A.16).

Securities lending activity on EU equities remained broadly stable in 1H16 versus the same period last year, with a daily average of EUR 198bn on loan (A.67). However, this was due mainly to a lower seasonal peak in loans related to dividend payments, and equity lending activity generally continued to trend up. Short-selling borrowing demand for EU equities, proxied by their utilisation rate, also increased in 1H16 to around 8%, more than 1 percentage point higher than in 1H15 (A.69).

The daily number of listed shares in EU benchmark equity indices on which **short positions** were reported to NCAs increased from an average of 324 in 4Q15 to an average of 340 in 1Q16. The short market value, as a percentage of market value in the EU, also rose by 10% to reach 1.1% of total market value. The increase in short market value in 1Q16 is possibly related to the weak performance and increased volatility that characterised equity markets at the beginning of the year (A.77).

The notional outstanding of equity-linked OTC **derivatives** decreased to USD 7.1tn at the end of 2015 (USD 40bn less than in June 2015), which represented a small fraction (1.5%) of total derivatives (A.89).

Debt instruments: Benign conditions

Sovereign risk premia remained low in a context of sustained low interest rates and supportive monetary policy. Yields on ten-year **sovereign bonds** decreased across the EU with the exception of one country due to heightened banking sector uncertainty (A.30 and A.31). Aside from a temporary widening of EA spreads on 24 June, the UK EU referendum outcome contributed to flight to safety, benefitting sovereign bonds and reinforcing the broad-based investor move away from equities.

Overall, yields remained low compared to their long-term average, consistent with the perception of limited sovereign risk suggested by low sovereign CDS spreads (A.35), and despite the growing proportion of lower-rated sovereign debt securities outstanding (A.27).

Activity in the related securities lending markets declined by around 5% in 1H16 compared with last year. The utilisation rate of EU government bonds, a proxy for short-selling demand, declined from around 31% in December 2015 to 27% in June 2016 (A.69).

T.11
Financial stability
UK EU referendum: Securities market impact

The outcome of the UK EU referendum on 23 June 2016 had strong market impacts. The months preceding the referendum had been characterised by substantial uncertainty about the outcome of the vote, and for much of that period a measurable impact on markets was limited to foreign exchange markets. In particular, the difference in the cost of buying downside versus upside protection in foreign exchange markets for GBP against EUR, known as risk reversal, gave an indication as to the currency risk priced in by market participants.

It was only in the last working days prior to the referendum that market expectations became more visible, with equity prices, sovereign spreads and spot currency rates starting to reflect anticipations of a vote in favour of remaining in the EU.

Against that background, initial market reactions to the actual outcome of the referendum were very strong. In the two weeks that followed the vote, the GBP lost 10% against the EUR and 13% against the USD (T.12). The EUR was also affected, falling 3% against the USD.

On equity markets, EU prices dropped 5% over the same period, although the negative impact was concentrated in specific EA countries, with equity indices falling 12% in Italy and Spain (A.18) on 24 June alone, and 16% in Ireland. Price volatility measured also surged that day amidst very high trading volumes and market turnover (A.21).

The sharp decline in EU stock market indices was led by significant downward pressure on bank equity, with some UK bank shares losing up to 30%, resulting in trading suspensions. Measures of UK banking sector risk perception, such as the 3M Libor OIS (A.82) and CDS spreads, also widened significantly.

The reaction on GBP bond markets was equally strong, with 10Y sovereign yields declining 50 basis points in two weeks, despite a downgrade of the UK sovereign credit rating by two CRAs. Similar declines in sovereign yields were noticeable in other EU countries, with ten-year EA sovereign spreads to Germany tightening 25 basis points in two weeks, reflecting a broad-based flight to safety in financial markets.

As the political work on following up on the referendum outcome progresses, securities markets in the EU and beyond may continue to be affected by decisions taken in this regard. In the medium to long term, open questions around the modalities of implementing the UK decision are likely to translate into further changes in business models and market structures.

T.12
Spot exchange rates
GBP depreciated against USD and EUR
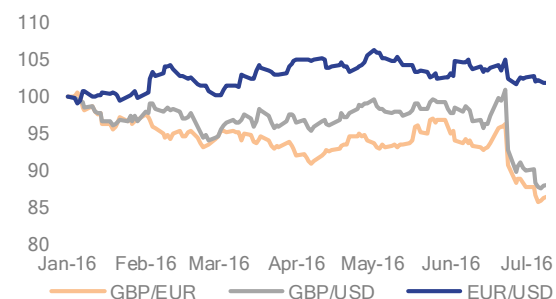
Note: GBP/EUR, GBP/USD and EUR/USD spot exchange rates, indexed with 01/01/2016=100.
Sources: Thomson Reuters Datastream, ESMA.

EU **sovereign bond issuance** declined in 1H16 with a total amount of EUR 364bn issued compared with EUR 673bn in 1H15 (A.25). The

volume of centrally-cleared repos using EUR-denominated sovereign debt as collateral also declined (by 6%) over the same period, to a daily average of EUR 157bn in 1H16 (A.73). Liquidity conditions in cash sovereign bond markets remained benign, with 40-day bid-ask spreads slightly below their long-term average of 2.5 basis points (A.37).

Corporate bond issuance increased 4% in 1H16 compared to the same period last year, to EUR 538bn, potentially driven by the extension of the ECB Asset Purchase Programme to corporate bonds. The major contributor was a 6% increase in non-financial corporate sector issuance, to EUR 222bn (A.39). Looking into the breakdown by instruments, gross issuance of covered bonds increased 14% from 1H15 to EUR 74bn, and the gross issuance of ABS and MBS grew 10% to EUR 46bn (A.39).

The rating distribution of EU corporate bonds continued to deteriorate. The share of AAA-rated bonds outstanding decreased to around 2% at the end of June 2016 from more than 3% in 1H15, and the share of AA-rated bonds declined from 21% to 18%. Over the same period, the share of bonds rated BB and lower increased from 12% to 13% (T.13).

T.13
Corporate bonds
Lower credit quality
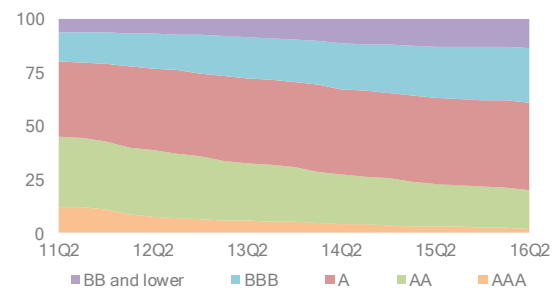
Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
Sources: Dealogic, ESMA.

Corporate bond yields decreased across rating categories in 1H16, with yields on securities rated single-A or higher returning to below 1% and yields of BBB-rated securities to below 2%. The difference between higher- and lower-rated bonds remained broadly stable, with the differential between AAA-rated and BBB-rated bonds around 100 basis points (A.49), slightly below the long-term average of 120 basis points.

Higher issuance and lower yields in corporate bond markets were likely related to the extension of the ECB Asset Purchase Programme to corporate bonds announced on 10 March 2016. ECB corporate bond purchases in June amounted to EUR 6.4bn, taking place mainly in secondary markets.

T.14
Bond markets
Liquidity bifurcation

Discussions of a possible liquidity "bifurcation" between different segments of the EU bond market have emerged in recent months (AMF, 2015; BIS 2016)[1]. Liquidity bifurcation indicates that liquidity is concentrating in the most liquid market segments requiring less dealer balance sheet capacity or more generally relying less on dealer-intermediated trading, while it is deteriorating in the less liquid segments. This phenomenon is relevant in the context of market liquidity resilience analysis: What matters is not only the level of market liquidity in normal times, but also its response to market shocks.

While price-based measures of liquidity in fixed income markets provide little evidence of significant changes, volume trading data signals an adjustment in market-makers' behaviour. For example, an AMF study on the French bond market shows that the number of trades per bond declined among non-financial companies, while the turnover ratio for government bonds increased. Moreover, it shows that volumes were more concentrated in the deepest markets or the lowest-risk securities.

Structural factors, such as dealers' reduced capacity and technological changes, play a driving role in this trend. Dealers have scaled down their market-making willingness and capacity: They have changed their business models, trimming large warehouse positions and lowering their appetite for risk. Moreover, trading large amounts has become more complex and time-consuming. A preference for smaller trade size and standardised instruments is also in line with the increased use of electronic platforms. The latter increases liquidity by improving trading efficiency and facilitating access to a wider pool of market participants; however electronic trading has a comparative advantage mainly for instruments with already homogenous characteristics, reinforcing their liquidity.[2]

In conclusion, the deterioration of liquidity under stressed market conditions is difficult to anticipate. In a recent analysis of the UK bond market, liquidity levels were shown not to have deteriorated lately.[3] However, given the structure of the market, extreme stress conditions can exacerbate liquidity bifurcation, creating a sudden liquidity void in some segments of the fixed income markets. Our analysis on pp. 61-68 in this report provides additional evidence on liquidity conditions in corporate bond markets across the EU.

Regarding **securitised products**, EUR 14bn were placed in 1Q16, i.e. around 25% of issuance, compared to EUR 20bn in 1Q15 (55% of issuance) and EUR 16bn in 4Q15 (22% of issuance). At the end of March 2016, the amount of securitised products outstanding was broadly stable at around EUR 1.3tn (A.51).

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[1]   AMF (2015), "Study of liquidity in French bond markets". BIS (2016) "Fixed income market liquidity", CGFS Paper No. 55.

[2]   BIS (2016), "Electronic trading in fixed income markets", Markets Committee Publications No. 7.

[3]   Aquilina, M. and F. Suntheim (2016), "Liquidity in the UK corporate bond market: evidence from trade data", FCA Occasional Paper No. 14.

Spreads of AAA-rated securitised products remained at low levels compared to their long-term average of 80 basis points, although they did increase from 15 basis points in 2H15 to 23 basis points in 1H16. Spreads in the US also widened, from 102 basis points to 121 basis points (A.59).

The **credit quality** of securitised assets remained stable across rating classes in 2H15. The share of AAA-rated securitised assets remained very high at 84% and 6% for AA (A.55). The overall number of structured finance instrument ratings outstanding declined, as newly-issued ratings did not compensate for those withdrawn (which include maturing assets; A.169). This was due primarily to a net decrease in the number of outstanding CDO ratings (A.53). On the other hand, the default rate for securitised assets remained low, at 0.5% of all rated securitised assets. This marginal increase compared to 1H15 stemmed mainly from a higher CMBS default rate (A.53).

In 1H16 the amount of **covered bonds** outstanding in the EU shrank further, by around EUR 40bn, to EUR 1.17tn. However, gross issuance volumes continued to grow, reaching EUR 88bn in 1H16, up around 15% on 1H15 (A.60). Covered bond spreads declined across rating categories, remaining below their long-term averages despite an increase towards the beginning of 2016 in line with the generally turbulent conditions in securities markets at that time. In June 2016, average covered bond spreads stood at 29 basis points, ranging from 13 basis points for AAA-rated securities to 84 basis points for single-A ratings (down from a peak of 130 basis points in January 2016; A.59).

EUR up versus other currencies

Foreign exchange markets were strongly impacted by the UK EU referendum (Box T.11). The GBP underwent 4% depreciation against the EUR from the beginning of the year to 23 June, with a further drop of 8% in the five days following the vote. Implied volatility options on GBP-EUR and GBP-USD exchange rates peaked above 15%, a five-year high, reflecting uncertainty before the referendum over the outcome, and post-referendum about the potential consequences of the vote.

The EUR appreciated against the USD, gaining around 4% in the first month of 2016, though not enough to recover from its steep decline in 1H15 and despite a 2% repreciation after the UK referendum (A.3). The single currency remained relatively stable against a basket of EM

currencies including CNY, IDR, MXN, RUB and TRY, following its strong increase in 2H15 (10%) in a context of flight to safety in foreign exchange markets. Implied USD-EUR exchange rate volatility remained almost flat around the long-term average of approximately 10% (A.5).

T.15
Foreign exchange rates
EUR appreciated against most other currencies
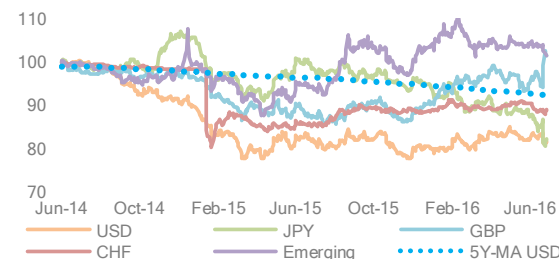
Note: Spot exchange rates to Euro. Emerging is a weighted average (2013 GDP) of spot exchange rates for CNY, BRL, RUB, INR, MXN, IDR and TRY. 02/06/2014=100. Increases in value represent an appreciation of EUR. 5Y-MA USD=five-year moving average of the USD exchange rate.
Sources: ECB, IMF, ESMA.

Commodity prices began to recover after the slump experienced in 2015 and early 2016. Overall, commodity prices stood 11% above their end-December 2015 level, with oil prices up 30%. The main drivers of the oil market recovery were the reduction in high-cost oil supply and revised oil supply forecasts, given recent geopolitical developments. Yet oil prices still remained at relatively low levels, with potentially further destabilising effects on oil-exporting countries (T.16). Precious metal prices increased following the exit vote in the UK referendum, with gold prices up 10% the day after the vote, reflecting a flight to safety.

T.16
Commodities prices
Energy prices recovered from strong decline
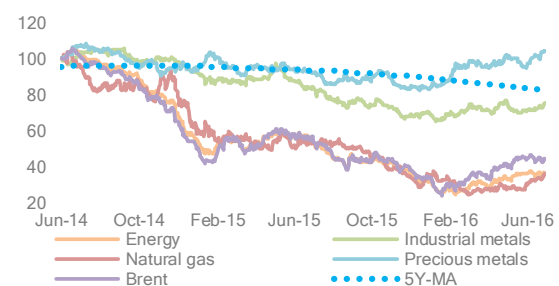
Note: S&P GSCI Commodity indices and Brent price, indexed, 02/06/2014=100. 5Y-MA=five-year moving average computed using S&P GSCI. Indices denominated in USD.
Sources: Thomson Reuters Datastream, ESMA.

In 2H15, notional amounts of outstanding OTC **derivatives** fell to USD 475tn (10% less than in 1H15; A.89). The drop was particularly pronounced in commodity contracts, with volumes down 21%, followed by credit default swaps (-16%), but was more limited for equity-linked contracts (-5%). For interest rate derivatives, which represent the largest part of

the OTC world (81% of total OTC derivative volumes), notional volumes decreased by 12% to USD 384tn in 2H15.

Other markets

In short-term EA **money markets**, both the Euribor and EONIA remained in negative territory, with the EONIA sliding 12 basis points to -34 basis points and the 3M Euribor falling 16 basis points to -29 basis points (A.81). This was mainly in reaction to the ECB's 10 basis-point cut in the deposit facility rate in March. EONIA lending volumes declined to around EUR 1.6tn in 1H16 from around EUR 1.8tn in 2H15 (A.83). The USD-Libor spread increased again, following a Federal Reserve interest rate hike in December 2015, and the GBP-Libor spread jumped by 16 basis points in the days following the UK EU referendum, reflecting heightened counterparty credit risk perception in the UK banking sector (T.17).

T.17
Spreads to OIS
GBP Libor increase following UK referendum vote
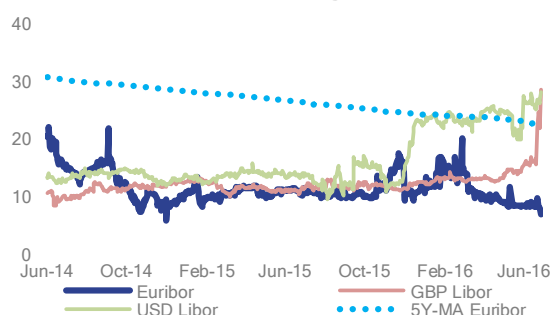
Note: Spreads between 3M interbank rates and 3M Overnight Index Swap (OIS), in basis points. 5Y-MA Euribor=five-year moving average for Euribor spread.
Sources: Thomson Reuters Datastream, ESMA.

With reference to **market-based credit intermediation**, EU MMF liabilities and securities lending continued to increase in 4Q15, jumping 16% and 15% higher respectively than in 4Q14. However, these two types of market-based credit intermediation totalled just EUR 1.5tn, while EU repo market activity, by far the largest part of market-based credit intermediation with a gross notional amount of EUR 5.5tn, has remained relatively stable over the past two years (T.18)

T.18
Market-based credit intermediation
Stable activity
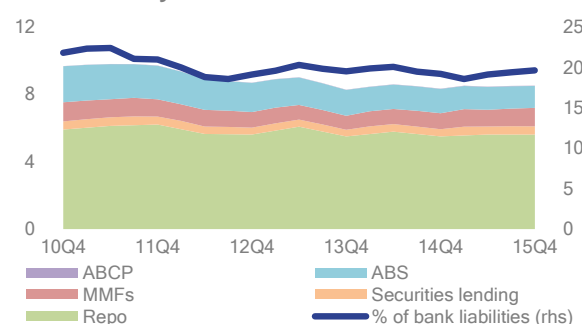
Note: Size of shadow banking system proxied by amounts of ABS and ABCP outstanding, size of the EU repo market and EU securities on loan (collateralised with cash), and liabilities of MMF, in EUR tn. In % of bank liabilities on rhs.
Sources: ECB, AFME, ICMA, Markit Securities Finance, ESMA.

Interconnectedness between EA investment funds and MFIs through loans and debt securities holdings remained broadly stable in 2H15 at around 14% of funds' assets (A.100).

The volume of **structured retail products** sold to retail investors continued to decline, with EUR 24bn sold in 1Q16, down from EUR 27bn in 1Q15. The number of products sold to retail investors also decreased by 24% over the same period, to 410,000 (A.104). Search for yield possibly influenced retail investor purchases, as reflected by the growing share of retail structured products sold without any capital protection (around 70% of total sales).

Investors

Monthly rates of return in the EU fund industry, averaged across one year, ranged below zero for all fund types except real estate funds but rebounded to some degree from March 2016 due to price recoveries led by commodity markets. Returns on representative retail investor portfolios fell below zero. Fund flow patterns were dominated by three factors: price developments in asset markets, search for yield, and structural changes in the EU financial system. The uncertainty related to the UK referendum contributed to outflows from EU and UK equity funds ahead of the vote. Significant redemptions from UK funds occurred after the referendum, resulting in some open-end UK property funds suspending redemptions. In the context of limited growth in the banking and insurance sectors, the fund sector continued to expand, reaching AuM values of 11.4tn for the EA in April 2016. The performance of individual investor portfolios and funds exposed to UK and EU assets will be impacted by ongoing market nervousness in the wake of the UK EU referendum, and business strategies and market structures may respond to the new political realities.
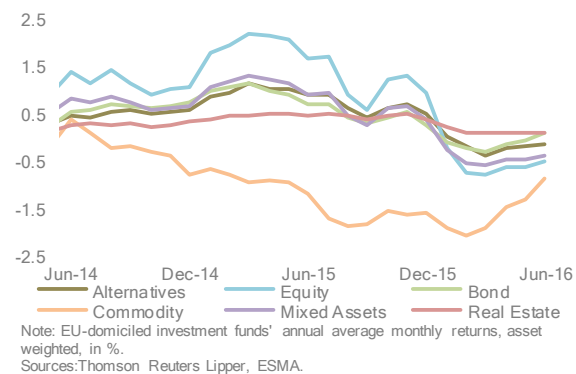
Investment funds: Reduced returns and volatile fund flows

In line with general profitability concerns in the financial industry, investment **fund returns** deteriorated in the opening months of 2016. All fund categories, except for real estate, registered negative performance. Commodity funds clearly underperformed the industry, despite their late rebound to a -0.9% yearly average of monthly returns in June. The most significant decline, however, was experienced by equity funds, with their average rate of return falling by 1.4 percentage points to -0.5% (T.19). Mixed, real estate and alternative funds stood in May at -0.4%, 0.1% and -0.2% respectively. Bond fund returns recovered slightly in June at 0.1%, having entered negative territory in 1Q16 for the first time since the end of the financial crisis. **Return volatilities** peaked in late February for all fund categories, close to the multi-year highs seen in September 2015, and then again at the end of June, particularly for equity and mixed funds (A.108).

T.19
Fund returns
Negative returns for most funds

Note: EU-domiciled investment funds' annual average monthly returns, asset weighted, in %.
Sources: Thomson Reuters Lipper, ESMA.

Fund flows were volatile in the EU investment fund industry, which faced significant outflows in early 1Q16 before recovering to a net cumulative inflow of EUR 39bn over the reporting period (T.20). Flow patterns were dominated by two factors: price developments in asset markets and search for yield. Investors withdrew EUR 32bn from equity funds, except those focused on global markets, and moved either into real estate (EUR 5bn inflow), the more risky fixed income funds (EUR 18bn inflow for bond funds), or re-entered MMFs (EUR 23bn inflow; A.113 to A.117).

T.20
Fund flows
Volatile flows sensitive to relative profitability
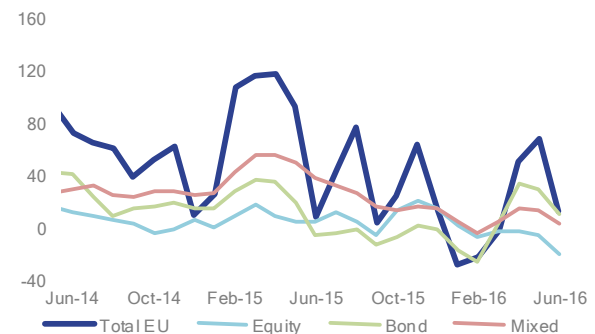
Note: EU-domiciled funds' 2M cumulative net flows, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

Funds investing in the UK experienced similar trends until the referendum, with reduced returns and volatile fund flows. Significant redemptions occurred after the UK referendum, causing a number of open-ended UK real estate funds to halt redemptions (T.22). However, in most fund categories investors, particularly retail clients, had already pulled money out of UK funds ahead of the vote. Moreover, they seemed equally concerned about the outlook for the EU as for the UK. Flows into UK-focused equity funds dropped in 1H16, but less markedly than funds invested in other European countries. UK-focused bond funds continued to register outflows at a stable rate, while bond funds focusing on other

European countries displayed a less stable pattern, with strong outflows until 1Q16 followed by a recovery before the referendum (T.21).

T.21
Fund flows by geographical focus
Similar patterns for BF and EF invested in UK

Note: 2M cumulative flows by regional investment focus, EUR bn. Europe is EU and other Western European countries, excluding UK.
Sources: Thomson Reuters Lipper, ESMA.
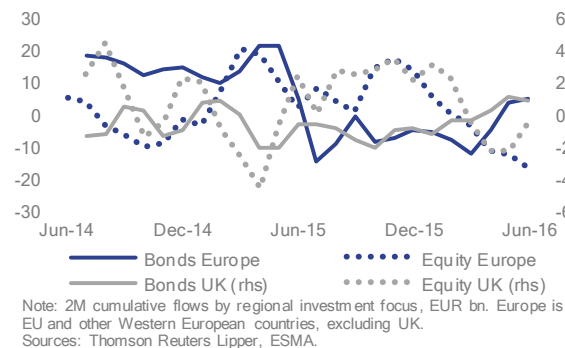
Search for yield resurfaced, with a rotation out of less risky bond funds, including outflows of EUR 3bn from both corporate and sovereign bond funds into EM and mixed strategy bond funds, which experienced inflows of EUR 3bn and EUR 13.5bn respectively (A.117). Rising maturities and increases in the liquidity position of EU bond funds seemed to offset greater risk resulting from this rotation, with higher liquidity positions potentially indicating a stronger position in the sector against liquidity-related risks.

T.22
UK real estate funds
Open-ended funds suspend redemption

In 1H16 UK real estate funds experienced their strongest outflows since 2008 (AuM declined by 25% compared to end-2015, falling to GBP 25.6bn, T.23) with an acceleration in withdrawals by EU investors as the UK referendum approached. In the weeks following the vote on 23 June 2016 their performance index also slid 4.4% (T.23). These developments reflected concerns surrounding the value of the UK property market, especially in London, and the potential loss of attractiveness.

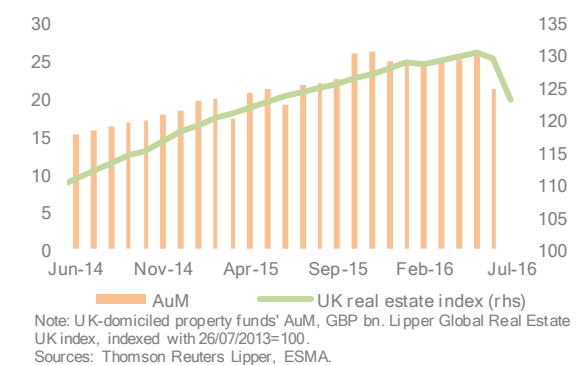In response, some funds suspended redemptions in July or applied a discount of up to 17% of the net asset value to redemption requests. This situation confirmed the concerns previously highlighted by ESMA[4] about a potential liquidity mismatch for funds that offer short-term liquidity while invested in less liquid assets.

UK real estate funds are mostly open-ended, sold to both institutional and retail investors, and offering monthly or sometimes daily pricing. They typically invest in UK commercial property, selected from across retail, office, industrial and other sectors, and property-related shares. Due to the illiquid nature of their investment, UK property funds usually keep some liquid assets on hand in order to meet the typical redemptions they face in normal circumstances. On average in 2Q16 they were holding 4.6% of their assets as cash, with half the funds holding less than 2.5%. Some of these liquid assets may also be stakes in property companies. Selling these stakes to meet redemption requests could generate a contagion effect by driving down the equity prices of the property companies and ultimately the value of the funds' NAV.

At this stage, however, risks of contagion remain contained. Since real estate funds do not borrow and own only around 5% of British commercial property, the situation differs from the property fund suspension at the early stage of the 2007-2008 financial crisis. Nonetheless, strong investor demand for redemption did highlight the vulnerability of funds offering daily redemptions while investing in illiquid assets.

T.23
UK real estate funds
AuM and performance declined

Note: UK-domiciled property funds' AuM, GBP bn. Lipper Global Real Estate UK index, indexed with 26/07/2013=100.
Sources: Thomson Reuters Lipper, ESMA.

Corporate bond funds were able to meet modest redemptions of below 2% of their AuM. However, their cash holdings temporarily dropped below the long-term average, before recovering towards the end of 1H16 (T.24). Cash holdings contribute to corporate bond funds' redemption capacity, particularly if faced with a combination of high outflows and liquidity dry-up in the corporate

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[4]   See ESMA (2016), "Report on Trends, Risks and Vulnerabilities, No.1, 2016".

bond market. In the context of current liquidity concerns around some segments of the EU corporate bond markets (Box T.14) sufficient cash holdings help bolster the industry's resilience.

T.24
EU bond funds' cash position
Temporary decline in cash reserves available
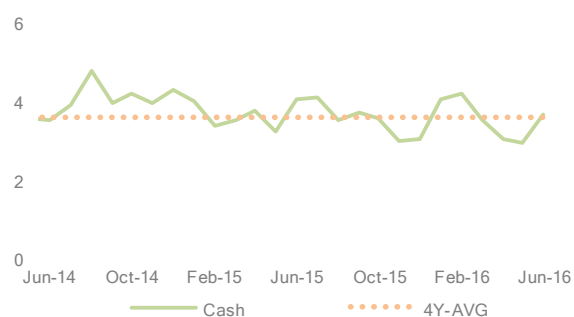
Note: Cash held by EU corporate bond funds, in % of portfolio holdings. Short positions can have a negative value.
Sources: Thomson Reuters Lipper, ESMA.

The sector's assets under management (AuM) stood at EUR 10.4tn in the EA in April 2016, up slightly on December 2015. Equity funds' 3% decline (AuM of EUR 2.7tn) was compensated by bonds and mixed funds (EUR 3.3tn and EUR 2.9tn respectively), while real estate funds grew by 3% to EUR 537bn (A.109, A.117). The sector's NAV contracted by 1% to EUR 9.3tn, implying slightly increased leverage. This was due to heightened leverage by equity and hedge funds, whose NAV fell more sharply (-4%) than their AuM (A.111, A.129). Alternative funds' share of the sector's NAV remained virtually unchanged at slightly above one-third (A.109).

With regard to potential **conduct issues**, recent evidence in the area of closet-indexing (Box T.28) may have potential long-term effects on the fund industry, such as faster transition towards passively managed funds.

Alternative funds: Low returns

Returns remained subdued for alternative funds, although their median improved from -0.8% to 0.2% in the first five months of 2016 (A.125). In the context of weak equity and stronger commodity markets, long/short equity funds performed weakly (-0.4%), while distressed debt funds outperformed with a return of 3.6% over the reporting period. Since the start of 2016, the EU industry has attracted an additional EUR 9bn in shares, while US alternative funds have faced an outflow of EUR 25bn (A.127). Flows seemed to mirror differences in relative profitability, as commodity traders and funds following fixed income strategies in particular experienced increases in their respective shares within the

entire industry's assets, while funds depending on broader market developments, such as funds of funds and event driven funds, saw their market shares decline (T.25).

T.25
Hedge fund performance by strategy
Subdued performance
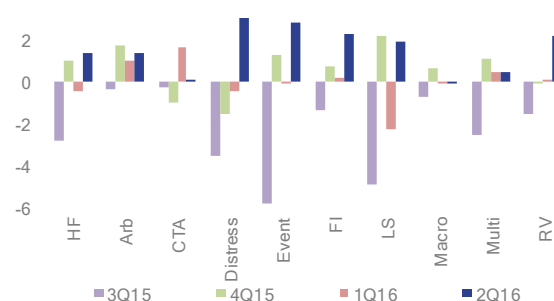
Note: Growth of hedge fund performance indices by strategy: Hedge fund index, arbitrage, Commodity Trading Advisor, distressed debt, event driven, fixed income, long/short equity, macro, multi-strategy, relative value; %.
Sources: Eurekahedge, ESMA.

EA hedge funds' AuM have remained roughly stable in the year to date, standing at EUR 307bn in April (A.129), with alternative funds following fixed income and multiple strategies gaining further weight within the industry. A EUR 8.6bn decrease in EA hedge funds' NAV (EUR 219bn) raised their financial leverage ratio to 1.40, above the five-year average of 1.27 (A.129). Intrasectoral co-dependency of hedge fund returns remained low, with effects contributing to a prevalent moderation of sector trends (A.130), implying moderate contagion within the industry.

Liquidity conditions faced by alternative funds appeared relatively benign, with a broadly stable repo market (A.73) and the wide range of assets eligible for access to central bank liquidity potentially balancing slight increases in the costs of secured funding and potential pressures from the reduced market liquidity of some assets held.

T.26
Alternative strategies
Leverage in the fund industry

The leverage of a financial institution can stem either from debt (financial leverage) or from exposure to derivatives or other off-balance sheet activities (synthetic leverage). Both debt positions and off-balance sheet exposures are limited for virtually all EU funds. UCITS face legal constraints on debt and off-balance sheet positions in general (10% of AuM and 100% of NAV respectively), while alternative funds need to adhere to legally required self-imposed and pre-announced leverage ratios (for more details see V-article on synthetic leverage in the asset management industry, pp.68-74). In addition, various activity-based restrictions exist.

In 2Q16 the average financial leverage ratio of EA funds, including alternative funds, stood at 1.12 (A.111), slightly exceeding the limit for UCITS, with hedge, real estate and bond funds reporting higher ratios of 1.39, 1.21 and 1.14 respectively. Current regulations for financial leverage appear to be binding for many funds, raising the question of whether additional leverage, either financial or synthetic, would imply risks to the financial system. The V-article on synthetic leverage in the asset management industry (pp. 69-75) presents evidence that leveraged equity funds held on average 44% of their AuM as cash, indicating the presence of buffers against the risk of margin calls or other derivative-related risks. More leveraged funds also tend to have higher exposures to market risk and more volatile returns. Hence, proxies for risk and its mitigation correlate positively with the degree of leverage, suggesting that risks associated with leverage, if present, are in some form managed by funds.

Leverage-related financial stability risks from exposure concentration, pro-cyclicality of collateral, contagion through exposure and collateral networks, and liquidity impacts on underlying asset classes are potentially reduced by individual funds' risk mitigation. Nonetheless, leverage in investment funds continues to warrant further regulatory and supervisory attention.

MMFs: Returns below zero, flows sensitive to expected yields

In an increasingly low interest rate environment average monthly RoR continued to decline for MMFs, reaching -0.2% in June 2016. The dispersion of fund performance increased at the end of the reporting period (A.121), potentially also temporarily affected by currency movements, i.e. negative effects of the depreciating USD on the value of MMFs invested in US assets. Consistent with this interpretation, EU MMFs continued to attract investors, realising inflows of EUR 23bn, while US MMFs experienced outflows of EUR 16bn. Similarly, MMFs focusing their investment on EU assets were able to collect an additional EUR 21bn of shares, despite strong outflows at the end of the reporting period (T.27 and A.123). Amid market expectations of a temporary delay in the rise of regional interest rate differentials, marginal flows proved yield-sensitive. In total, the AuM and NAV of EA MMFs declined roughly in line by 4% each to EUR 1.1tn and 1.0tn respectively, implying a stable financial leverage ratio (A.123).

The sector's liquidity conditions remained broadly unchanged, with the share of prime funds' liquid assets available at one-day and one-week notice stable at 29% and 41% of AuM respectively (A.101). The weighted-average maturity and life of prime funds' assets increased to around 45 and 64 days as of April 2016 (A.1012).

T.27
Money market fund flows
Flows sensitive to yield expectations
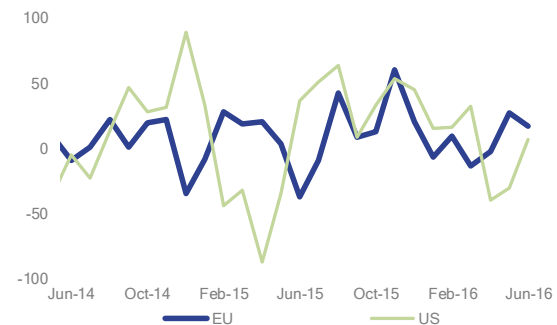
Note: MMF 2M cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

ETF inflows despite negative returns

Like other fund types, EU exchange-traded funds (ETFs) have experienced negative returns year-to-date (A.131). In May their monthly returns averaged across a year stood at -0.2%, with most of the sector's return distribution in negative territory. Return volatility increased until early February (A.131) but subsequently reverted to low levels, while ETF benchmark-tracking errors rose by 12% (A.135). EU ETFs' NAV stood at EUR 441bn in June, having risen by 2% since December 2015 (A.133), with positive flows offsetting negative valuation effects (A.135). In terms of NAV growth, increases for commodity, bond and other ETFs were balanced by reductions on the part of alternative, money market, equity and mixed ETFs (A.133). A 5% growth in the number of EU ETFs to 1,896 likely signalled rising competition in the sector (A.133).

T.28
EU equity funds
Closet indexing

At the beginning of February 2016, ESMA published a statement on closet indexing[5]. Closet indexing is a practice whereby asset managers claim, according to their fund rules and investor information documentation, to manage their funds in an active manner while the funds are, in fact, staying very close to a benchmark. At the same time, it is alleged that these funds charge management fees in line with those of funds that are considered to be actively managed[6].

The issues around closet indexing form part of a broader discussion around the effectiveness of investor disclosure and the legitimate expectations of investors in respect of the service provided by some asset managers.

ESMA gathered a sample of around 1,200 UCITS equity funds domiciled (based on data from Morningstar) in the EU and featuring a significant size and a management fee in the typical range of actively managed funds.

The quantitative analysis provided initial indicators of potential closet indexing funds. It was, therefore, complemented by qualitative research into the documentation of the identified funds aimed at checking whether the potential closet indexers identified by the quantitative analysis were describing themselves as active managers in their prospectuses and KIIDs. In their disclosures the vast majority of the identified funds described their management approach as active. Notwithstanding the results below, ESMA is mindful of the limitations of the quantitative analysis. Definitive evidence will require a more detailed follow-up by NCAs.

The analysis uses different combinations of active share, tracking error and R^2 (r-squared). The active share shows the percentage of the portfolio of a UCITS that does not coincide with the underlying equity benchmark. The tracking error shows the volatility of the difference between the fund return and the return of its benchmark. In conjunction, low active share and low tracking error indicate that the fund portfolio is close to that of the respective index, which could be indicative of passive fund management. R^2 represents the percentage of fund performance that can be explained by a change of performance in a benchmark index. The higher the R^2, the closer the performance of the fund is correlated to that of the benchmark. Depending on the identification criteria applied, our analysis suggests that between 5% and 15% of the equity funds in our sample may be pursuing closet-indexing-style strategies.

Identification criteria	Potential closet indexing funds (equity)	Potential actively managed funds (equity)
Active share <60% + tracking error <4%	15%	85%
Active share <50% + tracking error <3%	7%	93%
Active share <50% + tracking error <3% + R^2 >0.95	5%	95%

Confirming our findings, a study from Morningstar Manager Research in March 2016 analysed 456 non-index tracking and large-cap European funds over the period from June 2012 to March 2015. According to this report, around 20% of the funds in the sample had a three-year average active share below 60% and a tracking error of less than 3% and were indicated as potential closet indexing funds.

Retail investors: Muted response to weakness in equities

The steep fall in equity prices in January 2016 – with the equity component of the representative portfolio down 7% over the month – drove retail investors' **returns** well below the five-year moving average. The present environment of historically low yields limits the extent to which positive bond returns can offset negative equity returns. While equity markets subsequently recovered somewhat after January, year-on-year average monthly returns remained negative up to June due largely to base effects (T.29).

T.29
Portfolio returns
Drop in equity prices impacts returns
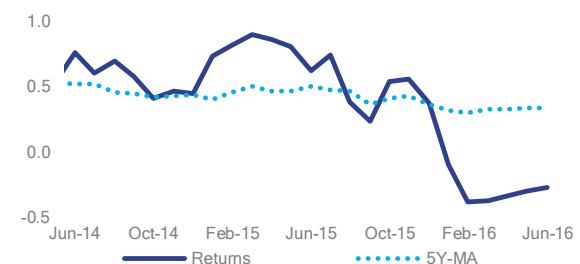
Note: Annual average monthly returns for a representative portfolio for households, in %. Asset weights, computed using ECB Financial Accounts by Institutional Sectors, are 37% for collective investment schemes (of which 12% mutual funds and 25% insurance and pension funds), 31% for deposits, 22% for equity, 7% debt securities and 3% for other assets.
Sources: Thomson Reuters Datastream, Thomson Reuters Lipper, ECB, ESMA.

Despite the turbulence in equity markets in 1Q16 due to renewed concerns about global growth, **investor sentiment** showed some resilience. Current sentiment showed little decline over the six months to June 2016, remaining mildly positive and markedly better than for most of the previous five years (T.30). Expectations of future EA performance continued to weaken slightly, though much of the adjustment to lower growth expectations had already taken place earlier in 2015.

T.30
Investor sentiment
Confidence only slightly dented by equities
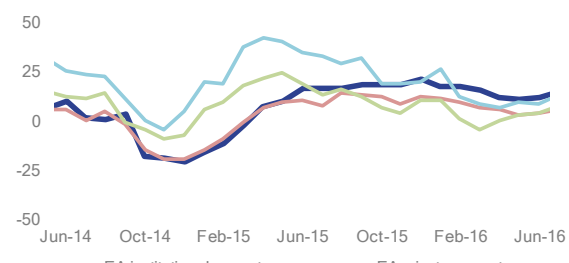
Note: Sentix Sentiment Indicators for Euro Area private and institutional investors for a 10Y horizon. The zero benchmark marks a risk-neutral position. Monthly frequency.
Sources: Thomson Reuters Datastream, ESMA.

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[5]   https://www.esma.europa.eu/press-news/esma-news/esma-updates-supervisory-work-closet-indexing

[6]   ESMA recognises that management fees may depend on a number of factors.

Retail investors' confidence may have been buoyed by continuing robust growth in **disposable income**, which remained above an annualised rate of 3% throughout 2015, though falling from a high of over 4.5% in the first half of the year (T.31).

T.31
Disposable income
Return to stronger income growth

Note: Annualised growth rates of average gross disposable income in 14 EU countries (AT, BE, CZ, DE, ES, FI, FR, GB, IE, IT, NL, PT, SE, SI), in %.
Sources: Eurostat, ESMA.
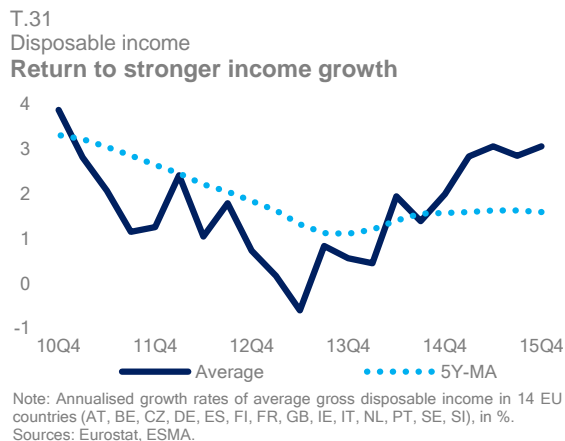
There was less movement in retail investors' **asset allocation** in 2H15 than in recent years, as measured by dispersion in growth rates between asset classes (T.32). Holdings of bonds and equities saw the highest growth rates in 4Q15 of around 10% and 8% respectively, documenting a move to market-based financial products. Growth in bonds was largely explained by increased purchases. A rebound in equity prices following August 2015 was a major factor in the 4Q15 growth in equity holdings. However, inflows also played a part, indicating that demand remained firm despite market turbulence.

T.32
Households' financial assets
Asset allocation fairly stable

Note: Average annualised growth rates of financial asset classes held by EU households, in %.
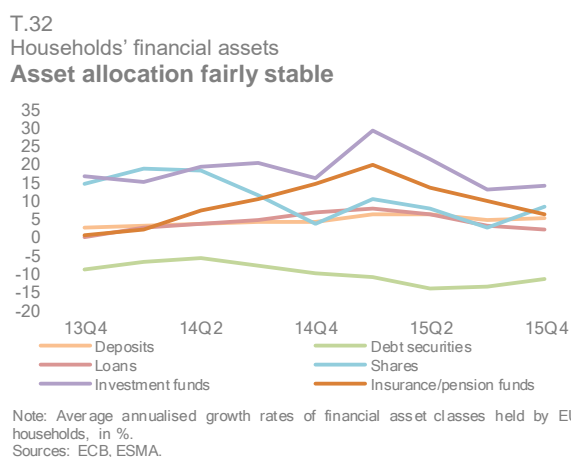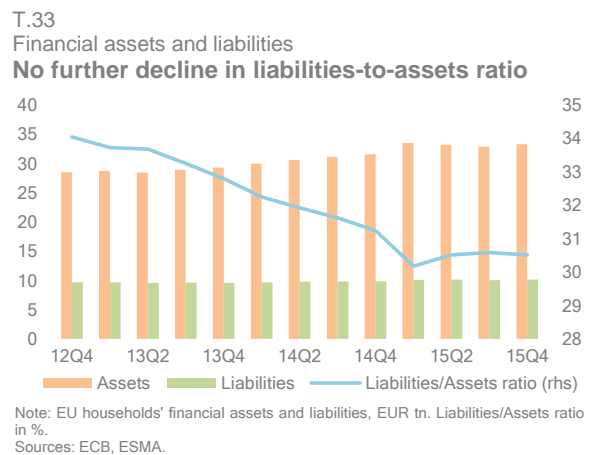Sources: ECB, ESMA.

EU households held EUR 33tn of financial assets and had EUR 10tn of financial liabilities at the end of 2015. The asset-to-liability ratio remained largely unchanged throughout the year, in contrast to the steady deleveraging of the household sector that had taken place from late 2012 to 1Q15 (T.33). The halt in deleveraging

was driven by household assets, whose value ceased to rise in 2015. Household loans, on the other hand, held fairly constant as credit conditions remained tight.

T.33
Financial assets and liabilities
No further decline in liabilities-to-assets ratio

Note: EU households' financial assets and liabilities, EUR tn. Liabilities/Assets ratio in %.
Sources: ECB, ESMA.

Turning to retail investors' **complaints**, a continuing trend is that consumers increasingly voice concerns regarding fees and charges, which for the first time are the most common cause for complaint. The reverse pattern is true with regard to the quality of information provided, which was responsible for around half of complaints back in 2H13. The share of complaints citing information quality has decreased for the fifth successive half-year and now stands at 16.8% (T.34).

T.34
Complaints data by cause
Shift in focus from information quality to fees

Note: Complaints data by cause of complaint in % over the total. Data collected from NCAs, firms and Ombudsmen of up to 26 EU countries (AT, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LI, LU, LV, MT, NO, PL, PT, RO, SE, SI, SK, UK).
Sources: ESMA Complaints data collection by EU NCAs.
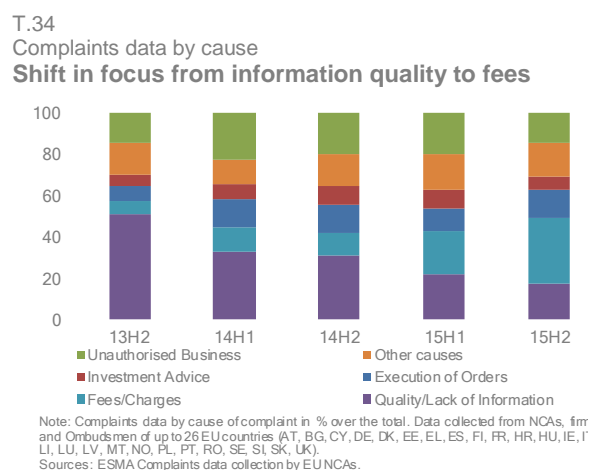
Breaking down the complaints data by financial instrument, contracts for difference were responsible for around a third of complaints. This was a higher proportion than in previous surveys and represented more complaints than any other category (T.35). The second category of financial instrument by number of complaints – options, futures and swaps – saw a slight decrease on the previous half-year, while the third category – shares, stock and equity – was little changed.

T.35
Complaints data by financial instrument
Contracts for difference draw attention
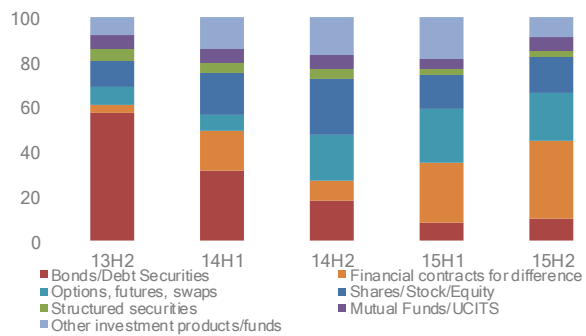
Bonds/Debt Securities
Financial contracts for difference
Options, futures, swaps
Shares/Stock/Equity
Structured securities
Mutual Funds/UCITS
Other investment products/funds

Note: Complaints data by financial instrument in % over the total. Data collected from NCAs, firms and Ombudsmen of up to 26 EU countries (AT, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LI, LU, LV, MT, NO, PL, PT, RO, SE, SI, SK, UK).
Sources: ESMA Complaints data collection by EU NCAs.

Infrastructures and services

Equity trading activity was broadly stable in 1H16 and continued to take place mainly on regulated exchanges. Central clearing further expanded with the first clearing obligation for IRD in G4 currencies taking effect in June, and seven third-country CCPs being recognised to operate in the EU. On 29 April, ESMA published the results of the first EU-wide CCP stress test, pointing at a satisfactory level of resilience to counterparty credit risk in the light of the scenarios tested. Neither the market disruptions at the beginning of the reporting period nor the drastic jump in market turnover and increased settlement activity following the UK EU referendum were reported to have caused problems to EU financial market infrastructures.

Trading venues: Turnover stable

Trading activity was broadly stable in 1H16, recording a slight slowdown in its upward trend. However, equity trading rose above its long-term average in June owing to a 30% increase in electronic order book transactions from the previous month and reflecting increased trading activity following the UK EU referendum (T.36).

T.36
Equity turnover by transaction type
Slight slowdown in the upward trend

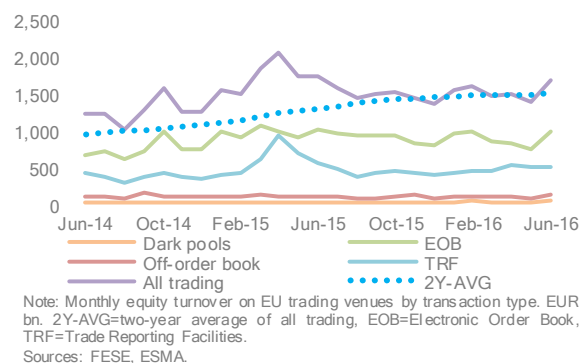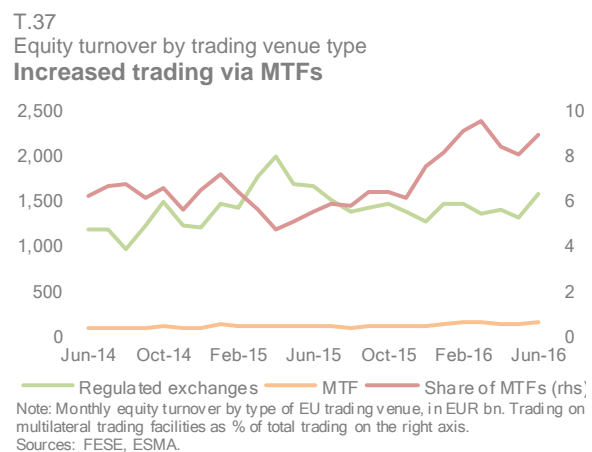Note: Monthly equity turnover on EU trading venues by transaction type. EUR bn. 2Y-AVG=two-year average of all trading, EOB=Electronic Order Book, TRF=Trade Reporting Facilities.
Sources: FESE, ESMA.

The share of equity transactions conducted via electronic order books was 58% year-to-date, a 3% increase compared to the same period last year. The share of trades transacted via trade reporting facilities stood at 32%, recording a 4% decrease, and 7% of transactions were off order books. Based on commercial data, dark pools make up a relatively small share of the total, standing at 2.7%, but steadily increasing from 1.5% in 2011 (A.151). However, an industry report estimated the share of dark pools in equity transactions at 8% in December 2015.[7]

Equity trading continued to take place mainly on regulated exchanges (around 91% in June 2016). Trading on multilateral trading facilities increased from a low point of 5% in April 2015 to almost 9% on average in 1H16 (T.37).

T.37
Equity turnover by trading venue type
Increased trading via MTFs

Note: Monthly equity turnover by type of EU trading venue, in EUR bn. Trading on multilateral trading facilities as % of total trading on the right axis.
Sources: FESE, ESMA.

Trading turnover on exchanges remained dominated by equity trading, which amounted to 68% of the total turnover in 1H16. Around 30% of the transactions were bonds, while ETFs and UCITS amounted to, respectively, 1.4% and 0.2% (A.156). However, there was a 60% increase in ETF turnover in 1H16 from the beginning of 2014, while bond trading declined by 15% over the same period, from 818bn in 1H14 to 691bn in 1H16 (A.155).

Trading volumes surged for equities, bonds and derivatives in the direct aftermath of the UK referendum with, for example, a notional equity value of EUR 20.7bn traded on Chi-X Europe on 24 June, compared with an average EUR 8bn on the five preceding days.

According to ESMA's register on suspensions and removals, at the end of 2Q16 73 financial instruments traded on EEA trading venues were suspended from trading, mostly due to market management arrangements (20 suspensions), and 68 financial instruments were removed from trading (A.149 and A.150). In 2Q16 the average duration of on-going suspensions was 1.8 years and has been steadily increasing over the past two years. The average duration of suspensions

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[7] http://www.bloomberg.com/news/articles/2016-01-14/european-dark-pools-expand-in-face-of-rules-limiting-their-use

that were not live at the end of 1Q16 has decreased since 3Q14, from an average of 71.5 days to 7.4 days in 2Q16.

Heightened market volatility following the UK referendum results triggered a large number of circuit breakers on EU trading venues. Circuit breakers are mechanisms designed to manage periods of high volatility by halting trading whenever the price of a security falls out of a predetermined price range; trading resumes after the affected securities are put into auctions. Based on commercial data on a sample of 5,000 financial instruments traded on EU venues, we observe that on Friday, 24 June 2016 a total of 1,233 circuit breakers were triggered on 321 financial instruments (250 stocks, 55 ETFs and 16 corporate bonds; T.38). This was substantially higher than the daily average of 54 circuit breakers triggered during the four days preceding the UK referendum results. On the four days that followed the UK EU referendum, the number of circuit breaker occurrences declined sharply, gradually moving back to their earlier 2016 levels.

T.38
Circuit breakers
UK referendum triggered multiple circuit breakers
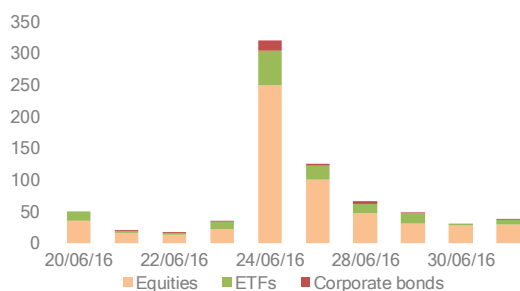
Note: Number of financial instruments affected by circuit breaker trigger events on the days before and after 24 June 2016.
Sources: Morningstar Real Time, ESMA.

CCPs: Central clearing expands

Seven new CCPs established in third countries, including South Africa, Canada, Mexico, Switzerland and South Korea, have been recognised to offer services and activities in the EU. This brings the number of third-country CCPs recognised in the EU to 18 institutions established in 9 countries. On 21 June, the first phase of the clearing obligation for IRS denominated in G4 currencies (GBP, EUR, JPY and USD) took effect. Clearing members for the designated asset class are now subject to the clearing obligation, while other types of counterparties will have a phase-in period.

T.39
IRS CCP clearing
IRS CCP clearing trending up
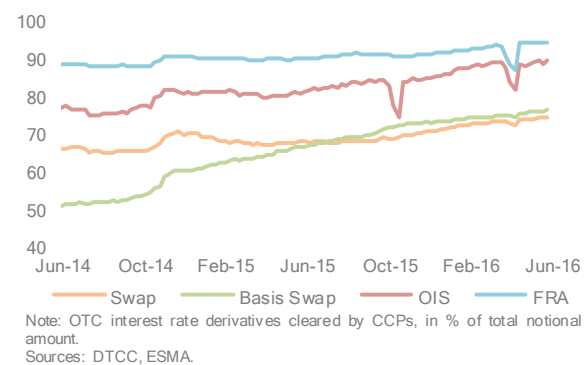
Note: OTC interest rate derivatives cleared by CCPs, in % of total notional amount.
Sources: DTCC, ESMA.

The increase in the share of interest rate derivatives that are centrally-cleared globally continues to trend up for most asset classes, although the share was more volatile for smaller parts of the market such as FRA and OIS. The share of centrally-cleared basis swaps rose from around 50% in 1H14 to more than 70% in 1H16, while vanilla swap contracts now stand at around 75% (against 66% at the beginning of 2H14) (T.39). For credit derivatives, based on daily trading volumes for some of the main European CDS indices, the share of trades that are centrally cleared stood close to 80%, up from around 40% at the beginning of 2014 (T.40).

T.40
Daily trading activity for CDS indices
CDS central clearing expands to 80%
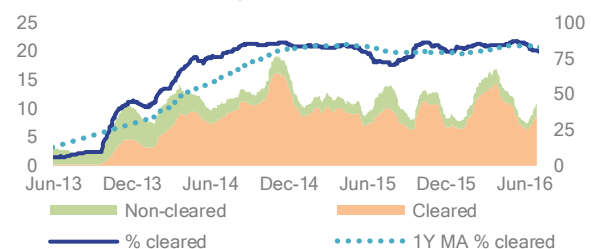
Note: Daily trading volumes for the main EUR CDS indices including Itraxx Europe, Itraxx Europe Crossover, Itraxx Europe Sr Financials. 40D MA, EUR bn. ISDA SwapsInfo data are based on publicly reported data from DTCC Data Repository LLC and Bloomberg Swap Data Repository.
Sources: ISDASwaps, ESMA.

T.41
Central counterparties
ESMA EU-wide CCP stress test exercise

On 29 April ESMA published the results of its first EU-wide stress test exercise on CCPs. The exercise, conducted in cooperation with NCAs and the European Systemic Risk Board (ESRB), tested the resilience of 17 European CCPs to counterparty risk by exposing them to adverse market scenarios. ESMA's stress test subjected CCPs to three different clearing members' (CMs) default scenarios, which included the default:

– of the two CMs with the largest exposures per CCP, taking into account the common membership across CCPs;

– the default of the two groups of CMs EU-wide with the largest aggregate exposures; and

– the default of the two groups of CMs EU-wide with the largest aggregate exposures weighted by their probability of default.

The exercise combined the CM default scenarios with extreme market price shocks. These consisted of a range of historical and hypothetical scenarios made up of defined minimum price shocks and a set of hypothetical modelled stress scenarios. The exercise was complemented by an analysis of the inter-dependency of CCPs through common CMs, the concentration of CCPs' exposures and the potential spill-over effects to non-defaulting CMs triggered by the loss absorption mechanism of CCPs. CCPs were also tested against a set of reverse stress scenarios by further increasing the number of defaulting CMs in order to look for extreme but plausible scenarios that could have a significant impact on the resilience of EU CCPs.

Overall the system of EU CCPs is resilient to counterparty risk under the scenarios used to model extreme and plausible market developments. In particular, pre-funded CCPs' resources were deemed sufficient to cope with default by the top two EU-wide groups, combined with historical and hypothetical market stress shocks. Under more severe stress scenarios, CCPs faced small amounts of total (i.e. across all CCPs) residual uncovered losses varying from EUR 0.1bn up to EUR 4bn.

Finally, ESMA identified potential shortcomings and included some recommendations to NCAs on conducting the necessary supervisory follow up. These recommendations focus on the assessment by CCPs of clearing members' creditworthiness allowing for their exposures to other CCPs and on revision of the price shocks used by CCPs in their stress test methodologies where gaps were identified in the course of the exercise.

CSDs: Reduced settlement volatility

In 1H16 ESMA published its draft RTS on settlement discipline as part of the implementation of the Central Securities Depository Regulation (CSDR). The RTS contains measures for preventing as well as monitoring and addressing settlement fails when they occur.

T.42
Settlement activity
Stable activity in all segments

Note: Total value of settled transactions in the EU as reported by NCAs; daily values in EUR bn. Free-of-payment transactions not considered. Partial reporting after 31 May 2016.
Sources: National Competent Authorities, ESMA.
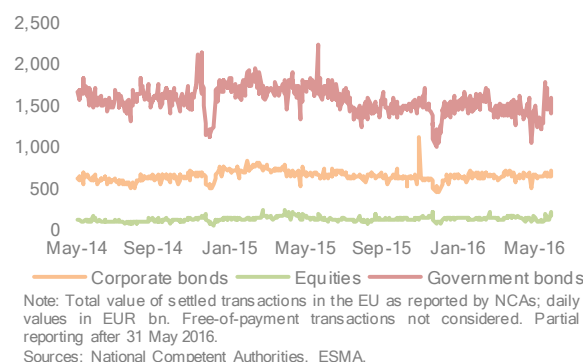
Settlement activity was relatively stable in 1H16 except at the beginning of the year, when activity slowed due to a seasonal decrease in market activity around year-end holidays (T.42).

T.43
Settlement fails
More volatile for corporate bonds

Note: Share of failed settlement instructions in EU; % of value, 5D-MA. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.
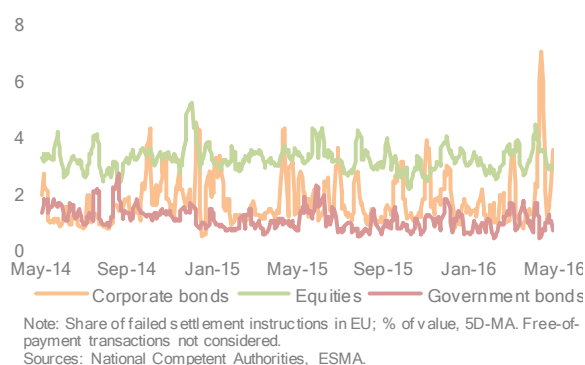
The percentage of settlement fails was, as usual, more volatile for corporate bonds than other asset classes, while the fail percentage level remained higher for equities than government bonds, despite some short-term fluctuations due mainly to low volumes in various countries (T.43).

In the direct aftermath of the UK EU referendum, initial evidence from selected countries shows increased settlement activity for sovereign bonds, with the rate of settlement fails high in some low-settlement-activity jurisdictions and in one more vulnerable country where settlement fail rates are usually already high.

CRAs: Decline in the number of SFI and covered bond ratings

Credit ratings performed similarly across asset classes over the period from 1H11 to 2H15, as evidenced by the cumulative accuracy profile (CAP) curves. The shapes of the curves indicate that there were relatively few defaults on highly-rated instruments in all asset classes (T.44).

T.44
Credit ratings
Few defaults for higher-rated instruments

Note: Cumulative accuracy profile (CAP) curves for the 3 largest credit rating agencies. 1H11-2H15. The CAP curve plots the cumulative proportion of issuers by rating grade (starting with the lowest grade on the left) against the cumulative proportion of defaulters by rating grade.
Sources: CEREP, ESMA.
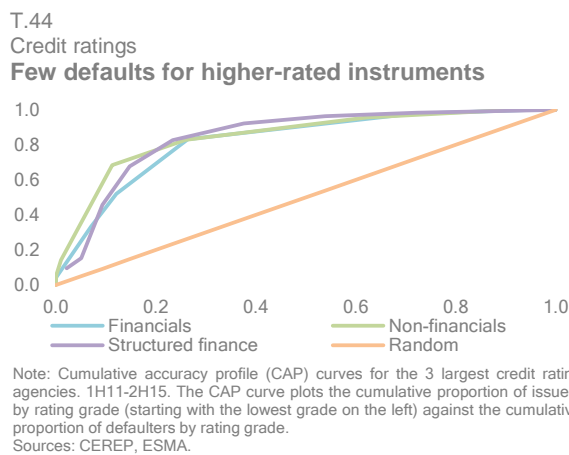
Compared to the 2H10 to 1H15 average, the corresponding five-year accuracy ratio increased for non-financials from 65% to 70% and for financials from 54% to 65%, while decreasing from 70% to 69% for structured finance instrument ratings. The improvement in rating performance is due partly to cyclical factors as the 5-year CAP period gradually moves out of the crisis years.

Newly-issued ratings of structured finance instruments in 2H15 increased by 45% compared to the previous period. However, this sharp increase was not enough to compensate for the large number of withdrawals, including maturing assets. As a result, the net number of outstanding structured finance instrument ratings declined (T.45). The same trend could be observed for covered bonds, although this was mainly driven by the increased number of withdrawals in 2H15, while the number of new ratings issued was relatively stable from the previous period.

T.45
Credit ratings
Net decline in SFI ratings

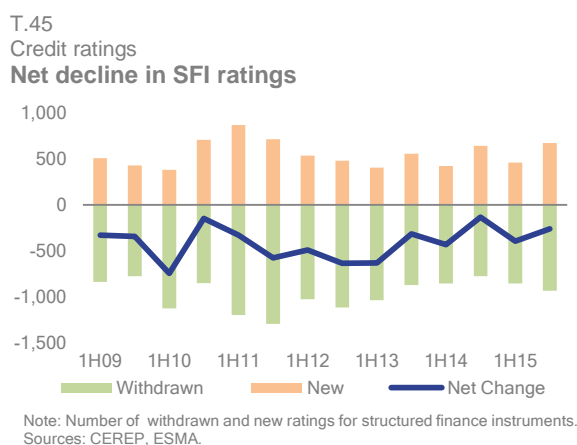Note: Number of withdrawn and new ratings for structured finance instruments.
Sources: CEREP, ESMA.

T.46
Distributed Ledger Technology
DLT may transform post-trading business models

On 2 June 2016, ESMA published a Discussion Paper on the Distributed Ledger Technology (DLT) applied to securities markets.[8] Distributed ledgers are records, or ledgers, of electronic transactions, very similar to accounting ledgers. Their uniqueness lies in the fact that they are maintained by a shared or distributed network of participants (so-called nodes) and not by a centralised entity. Another important feature is the extensive use of computer-based encryption techniques to store assets and validate transactions. The most widely-known application of DLT is the public ledger of transactions for virtual currencies, such as Bitcoin. Financial market participants are now exploring the application of DLT to traditional financial services.

DLT may change the way in which financial transactions occur by: reducing the time needed to clear and settle trades; facilitating the recording of securities ownership and the safekeeping of assets; facilitating the collection, consolidation and sharing of data for reporting, risk management and supervisory purposes; and enhancing pre-trade information with the matching of buyers and sellers. The DLT is frequently presented as a potentially secure technology that theoretically operates on a continuous basis, cutting costs for post-trading activities.

Nevertheless, in order to be applied to securities markets, DLT needs to overcome certain hurdles. Some of the benefits the technology introduces, notably low latency and low costs, may be less relevant if the technology is deployed on a larger scale. DLT networks would also have to be fully interoperable among themselves and with previously existing market infrastructures, and should enable settlement in central bank money. Given the immutability of DLT systems, questions arise as to the handling of possible mistakes from a technological and governance perspective. The technology must also enable netting, margin finance and short selling. Governance and policy issues on how network participants are selected or how confidential information is retained, as well as regulatory issues on enforceability and supervision, also arise.

The introduction of DLT for securities markets may harbour new risks. For example, even though the shared nature of the ledgers lowers the probability of cyber-attacks, the impact of a potential successful cyber-attack could be much more severe and more difficult to detect, as it would most probably imply control over all the participants in the DLT network. A single glitch or a failure in the system could have wider consequences. In addition, the new market structure following the introduction of DLT in securities markets could intensify the interconnectedness between market participants and create new pockets of risks in financial markets by fostering the development of anonymous markets under the radar of regulatory authorities.

Financial benchmarks: Enhanced governance

On 28 April 2016 the European Parliament adopted the Financial Benchmarks Regulation, which aims to improve the functioning and governance of benchmarks and to ensure that the benchmarks created and used in the EU are robust, reliable, representative, fit for purpose and not subject to manipulation (Box T.50). In
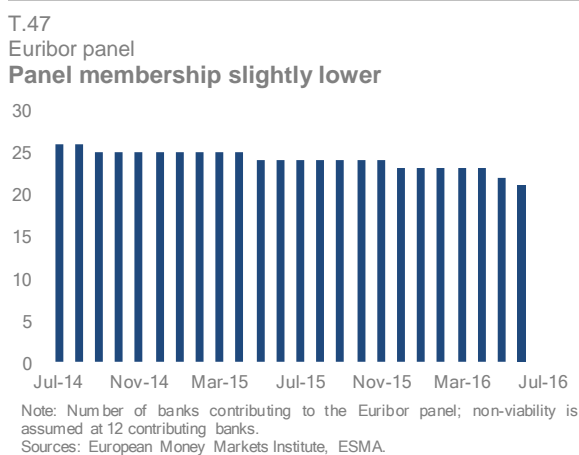
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[8]   ESMA Discussion Paper (2016), "The Distributed Ledger Technology Applied to Securities Markets".

https://www.esma.europa.eu/sites/default/files/library/2016-773_dp_dlt_0.pdf
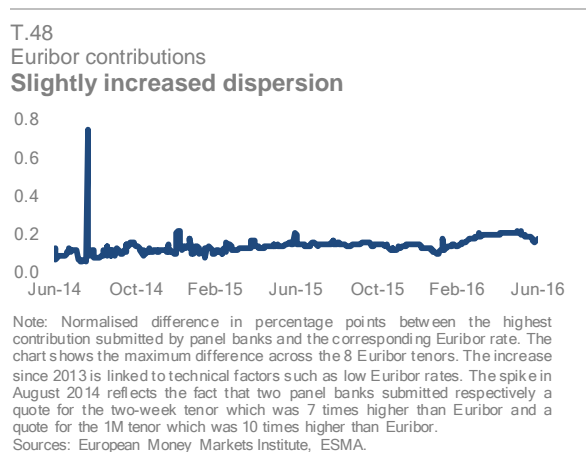
February 2016 IOSCO published the "Second review of the implementation of IOSCO's Principles for Financial Benchmarks by Administrators of Euribor, Libor and Tibor".[9] According to this review, the administrators of Libor and Euribor have progressed with their reforms by conducting data collection exercises, round tables and public consultations in order to develop approaches to anchor the benchmarks in market transactions.

In particular, the European Money Market Institute (EMMI), the international association providing Euribor and Eonia, has enhanced the Euribor control framework by adopting a policy that sets up intraday refixing conditions for Euribor rates in the event of an error being found. Implementation of this policy is expected for July 2016. In addition, in June 2016 the EMMI reviewed the Euribor Code of Conduct to align it with upcoming regulatory requirements for administrators.
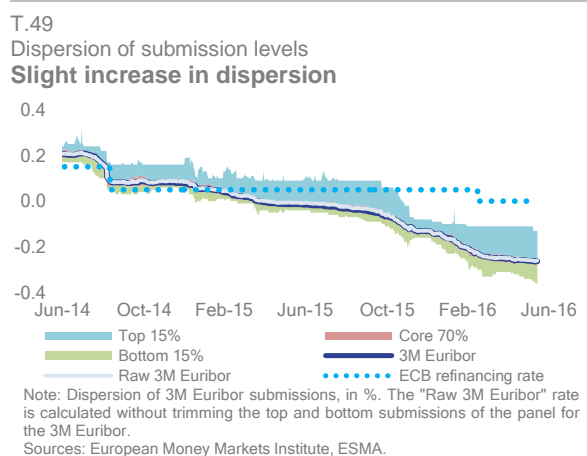
In May 2016 the panel of banks contributing to the Euribor registered the withdrawal of one bank, which brought the number of contributors from 23 to 22 (T.47). An additional bank announced that it would stop contributing in July.

T.47
Euribor panel
Panel membership slightly lower

Note: Number of banks contributing to the Euribor panel; non-viability is assumed at 12 contributing banks.
Sources: European Money Markets Institute, ESMA.

The **maximum difference** between the submitted quotes and Euribor across all maturities increased slightly in 1H16, with the maximum difference observed on the three-month and six-month tenors (T.48). However, the smallness of the increase coupled with the continued absence of spikes confirms the increased reliability and quality of Euribor quotes submitted.

T.48
Euribor contributions
Slightly increased dispersion

Note: Normalised difference in percentage points between the highest contribution submitted by panel banks and the corresponding Euribor rate. The chart shows the maximum difference across the 8 Euribor tenors. The increase since 2013 is linked to technical factors such as low Euribor rates. The spike in August 2014 reflects the fact that two panel banks submitted respectively a quote for the two-week tenor which was 7 times higher than Euribor and a quote for the 1M tenor which was 10 times higher than Euribor.
Sources: European Money Markets Institute, ESMA.

The actual Euribor is calculated by eliminating the highest and lowest 15% of quotes in order to prevent any individual contributors from influencing the rate. The remaining quotes are then averaged. The gap between the actual Euribor and the non-trimmed average for the three-month tenor widened over the reporting period due to higher dispersion in the top 15% of submissions (T.49).

T.49
Dispersion of submission levels
Slight increase in dispersion

Note: Dispersion of 3M Euribor submissions, in %. The "Raw 3M Euribor" rate is calculated without trimming the top and bottom submissions of the panel for the 3M Euribor.
Sources: European Money Markets Institute, ESMA.

In 1H16 the three-month Euribor decreased continuously, with 16% of banks lowering the previous-day submission, only 5% raising their quotes and 78% keeping them unchanged. Finally, in 2016 the three-month Euribor remained below the ECB interest rate for the main refinancing operations.

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9   OICV-IOSCO (2016), "Second Review of the Implementation of IOSCO's Principles for Financial Benchmarks by Administrators of EURIBOR, LIBOR and TIBOR".

https://www.iosco.org/library/pubdocs/pdf/IOSCOPD526.pdf

T.50
EU financial benchmarks
EU Benchmarks Regulation in progress

In September 2013, in the wake of the manipulation of various benchmarks, the European Commission proposed a draft Regulation on indices used as benchmarks in financial instruments and financial contracts (Benchmarks Regulation).

On 24 November 2015, the European Parliament and the Council reached a preliminary political agreement on a compromise text for the Benchmarks Regulation, an agreement that was confirmed on 9 December 2015 by the Permanent Representatives Committee of the Council of the European Union. The European Parliament voted on and approved the text of the Benchmarks Regulation in its plenary session on 28 April 2016. On 17 May 2016 the Council of the EU adopted the Benchmarks Regulation, which was published in the Official Journal of the EU on 29 June 2016 and entered into force on 30 June 2016. ESMA is mandated by the European Commission to develop Regulatory Technical Standards by April 2017.

On 11 February 2016 ESMA received a request from the European Commission for technical advice on possible delegated acts. The technical advice was to be delivered within four months after entry into force of the Regulation.

On 15 February 2016 ESMA published a Discussion Paper (DP) on the Benchmarks Regulation. The DP included ESMA's policy orientations and initial proposals on both the technical advice to the Commission and the draft technical standards under the Benchmarks Regulation.

On 27 May 2016 ESMA published a consultation paper on the draft technical advice.

Risks

ESMA Risk Dashboard

R.1
Main risks

Risk segments	Risk	Risk categories	Risk	Change	Outlook	Risk sources	Change
Overall ESMA remit	🟠	Liquidity	🟠	➡	↗	Macroeconomic environment	↗
Systemic stress	🟡	Market	🔴	➡	↗	Low interest rate environment	➡
Securities markets	🔴	Contagion	🟠	➡	↗	EU sovereign debt markets	➡
Investors	🟡	Credit	🔴	➡	➡	Market functioning	➡
Infrastructures and services	🟡	Operational	🟡	➡	➡	Political and event risks	↗

Note: Assessment of main risks by risk segments for markets under ESMA remit since last assessment, and outlook for forthcoming quarter. Assessment of main risks by risk categories and sources for markets under ESMA remit since last assessment, and outlook for forthcoming quarter. Risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high risk, red=very high risk. Upward arrows indicate an increase in risk intensities, downward arrows a decrease, horizontal arrows no change. Change is measured with respect to the previous quarter; the outlook refers to the forthcoming quarter. ESMA risk assessment based on quantitative indicators and analyst judgement.

After stabilising during 2Q16, markets reacted strongly to the outcome of the UK EU referendum, reflecting high economic and political uncertainty. While overall risk levels prevail for the time being, characterised by very high market and credit risks, the outlook for the markets in ESMA's remit has deteriorated, as reflected in our Risk Dashboard update of 13 July 2016. Market, liquidity, and contagion risks may rise going forward, as political and event risks have intensified, and the macroeconomic environment may deteriorate. Persistence of the low interest rate environment has sustained concerns related to excessive risk taking, especially in an environment characterised by correlated asset price movements and sudden changes in market confidence. Uncertain growth prospects and the fiscal situation in the Member States remain important drivers of market sentiment.

Risk summary

While overall risk levels prevailed and remained high in 2Q16, the outlook for the markets in ESMA's remit has deteriorated following the outcome of the UK referendum on EU membership, as reflected in our Risk Dashboard update of 13 July 2016[10]. In the wake of the referendum, severe market movements occurred, especially in equity, bond, and currency markets. Market, liquidity, and contagion risks may rise going forward, as political and event risks have intensified, and the macroeconomic environment may deteriorate. As political developments post-referendum unfold, market turbulences may continue to occur. Business strategies and market structures may adjust to the new political realities in the months and years to come. Generally, recurrent swings in valuations and high volatilities continued to signal sustained risk sensitiveness and scope for sudden risk repricing or rising market imbalances.

Systemic stress had declined in the first part of 2Q16, driven by improvements in both equity and bond markets, with valuations reinforced by supportive EA monetary policy. This explained most of the reduction in the composite indicator of systemic stress (R.2). Despite this, key risk sources remained, including the weak and uneven economic development in the EU, slow implementation of national structural reforms, and uncertainty related to the political developments around the outcome of the UK EU referendum.

R.2
ESMA composite systemic stress indicator
Systemic risk retreated in first part of 2Q16
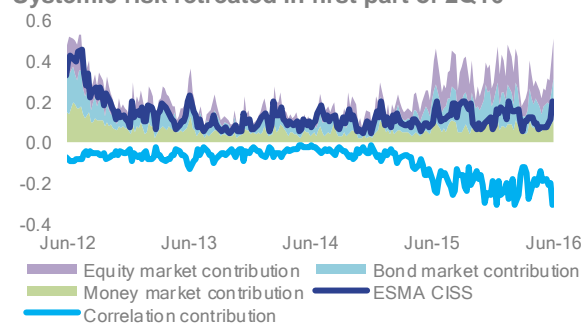
Note: ESMA version of the ECB-CISS indicator measuring systemic stress in securities markets. It focuses on three financial market segments: equity, bond and money markets, aggregated through standard portfolio theory. It is based on securities market indicators such as volatilities and risk spreads.
Sources: ECB, ESMA.

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[10]   https://www.esma.europa.eu/sites/default/files/library/2016-1096_risk_dashboard_   up-date_13_july_2016.pdf

Risk sources

Macroeconomic environment: Even though signs of improved economic growth, fuelled by consumption and a pick-up in investments, were observed for the EU in 2Q16, economic activity overall remained weak and the outlook uncertain. This was related to both EU-internal and external financial and economic developments.[11] Still-uneven growth and structural reform implementation across EU countries, low inflation, and internal EU developments were the major source of concern. Following the UK EU referendum, lower asset prices, high volatility and delayed issuance deals will likely weigh on the medium-term economic outlook, while the long-term outlook will depend on political developments and the outcome of the negotiations with the UK.

Low-interest rate environment: Risks stemming from the low-interest rate environment persisted as monetary policy in the Euro Area remained accommodative. The ECB in April provided details on the outright purchases of investment-grade EUR-denominated bonds issued by non-bank corporations established in the Euro Area, starting in June 2016. Both sovereign and corporate bond spreads decreased in 2Q16 (R.12), while HY issuance picked up considerably. Sustained search-for-yield strategies thus remained a source of concern, as in an environment of high risk sensitiveness and rapid changes in market confidence vulnerabilities related to risk re-assessment and repricing can be substantial and can materialise even in the absence of a rise in interest rates. This was mirrored in the sudden decline in investor appetite for riskier assets observed following the UK referendum, with outflows from funds focused on riskier assets and increased demand for sovereign bonds. Moreover, additional strains may follow in the medium term with potential increases in risk premia and substantial reversals in capital flows across EU markets.

EU sovereign debt markets: Overall, the demand for EU sovereign bonds remained high and risk premia subdued amid low interest rates and supportive monetary policy. This was reinforced by the tendency of a flight to safety, especially after the UK EU referendum.

Market functioning: No significant disruptions in EU market functioning were observed in 2Q16. Results for the ESMA EU-wide CCP stress tests were published. The system of EU CCPs proved resilient to counterparty risk under the scenarios used to model extreme and plausible market developments.[12] No relevant events affecting the operations of EU trading venues were observed, even after the UK referendum when large trading volumes were recorded. Noteworthy in terms of the importance of exercising effective surveillance is the successful conclusion of a high-profile insider dealing case in the UK. Regarding market efficiency, it is worth mentioning plans within the bank payment systems network to increase information sharing in order to more effectively act against cyber-attacks.

Political and event risk: The UK EU referendum vote created substantial uncertainty regarding the future economic outlook and EU institutional arrangements, with key aspects to be negotiated over the coming months, and possibly years. Focus on the news flow and announcements may result in intensified political and event risk, contributing to uncertainty and greater asset price volatility in EU markets. Further risks in this group include political and geo-strategic challenges at the EU perimeter and at international level.

Risk categories

Market risk – very high: Market risk remained very high. Indeed, the risk outlook increased as a consequence of the UK referendum outcome. Valuations improved at the beginning of 2Q16, and implied volatilities receded, with 1M VSTOXX averaging around 25% in 2Q16, 5 percentage points lower than 1Q16 (R.7). Improving market conditions were also observed for other asset classes. On average, spreads for BBB and AAA-rated corporate bonds in 2Q16 declined by 26% and more than 45% respectively compared to 1Q16 (R.12). Most of the improvements reversed following the UK EU referendum vote. Equity price volatility increased up to 35% on 24 June, while market turnover multiplied. The 1M VSTOXX hit a 40% peak, above February 2016 (R.7). The GBP lost 10% to the EUR, 13% to the USD, and 17% to the JPY, reflecting an increase in short-term implied volatility contracts in foreign exchange markets ahead of the referendum

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[11] European Commission (2016), "European Economic Forecasts, Spring 2016", Institutional Paper 025.

[12] ESMA (2016), "EU-wide CCP Stress Test Report 2015".

https://www.esma.europa.eu/press-news/esma-news/esma-publishes-results-eu-central-counterparties-stress-test

(R.6). The EUR has also been impacted, losing 3% to the USD, and 8% to the JPY.[13]

Liquidity risk – high: Liquidity risk maintained a high level, yet with an increased outlook. Liquidity pressures eased in 2Q16, but increased again in June in relation to higher stock market volatility triggered by the UK referendum results (R.4). In fixed income markets liquidity conditions ameliorated (R.9, R.13), with reduced volatilities and improved market confidence linked to continued monetary policy support and better economic conditions in the EU. However, uncertainty surrounding market liquidity and the potential for sudden liquidity evaporation remained. Even if market conditions were relatively calmer in 2Q16, risks of a sudden change in market confidence and liquidity deterioration lingered. The UK's decision to leave the EU heightened financial stability risks, especially in an environment of high interconnectedness across financial market sectors leading to the simultaneous unwinding of positions and exacerbating market stress. Following the UK vote, increased outflows have precipitated the suspension of redemptions in a number of open-ended funds holding UK commercial property. This has highlighted the potential vulnerability of funds that offer daily redemptions while investing in illiquid assets.

Signs of increased stress were also observed in the sovereign debt market with an increase in the dispersion of repo specialness (R.11) at the end of 2Q16.

Contagion risk – high: Contagion risk remained high, but with an increased outlook as a result of the potential implications and perceived impact of the UK referendum on other EU countries. Sovereign bond correlations decreased in 2Q16 and dispersion increased (R.16). These developments were probably due to more prudent valuations for peripheral countries amid growing uncertainty over structural developments and debt sustainability. Concerns remained regarding the increasing interconnectedness of the asset management sector with the banking and insurance sectors and the potential for spillovers into different financial market segments. In fact, increased correlation in market valuations across different market segments has been observed: periods of stress seemed to affect different asset classes simultaneously

(R.27). Against this background, increased uncertainty may intensify market stress and endanger financial stability.

Credit risk – very high: Credit risk remained at a very high level, with a stable outlook. 2Q16 saw a rise in corporate bond issuance for both IG and HY segments. The growth in HY issuance was around 150% in 2Q16 compared to 1Q16 (R.20). This was also mirrored in fund flow movements: Inflows for bond funds, especially those focused on the EU and the US, increased significantly in 2Q16 (R.25). The above developments probably reflected a combination of the new ECB monetary policy measures, including the outright purchases of investment-grade, euro-denominated bonds issued by non-bank corporations, and sustained search-for-yield strategies. Underlying risks remained, with further deterioration in credit quality (R.14) and corporate bond spreads higher than a year ago, albeit decreasing (R.12). In the UK, this was also reflected in its sovereign credit rating downgrade after the referendum. In the second half of the quarter, outflows from EU funds invested in equities were observed. Uncertainty about economic growth and the consequences stemming from the UK decision likely contributed to this development.

Operational risk – elevated: Results from the ESMA EU-wide CCP stress test, published on 29 April 2016, showed that:

— prefunded CCPs' resources were sufficient for CCPs to withstand default by the top two EU-wide clearing member groups under historical and hypothetical market stress shocks;
— under more severe scenarios, CCPs faced small amounts of total (i.e. across all CCPs) residual uncovered losses varying from EUR 0.1bn up to EUR 4bn.[14]

On the day after the UK referendum EU trading venues and other market infrastructures were resilient, despite multiplied trading volumes and high volatility. A substantial number of circuit breakers were triggered on EU trading venues under these market conditions. However, no trading disruptions were observed, nor any operational issues on EU trading venues and other market infrastructures.

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13   See Box T.11, p.10.

14   That is the case in particular for scenarios assuming default of the top two CMs per CCP where a CM defaulting in one CCP would also be considered to be in

default in all CCPs, leading to more than 25 CM defaulting EU-wide.

Securities markets

R.3

Risk summary

Risk level   🔴

Risk change from 1Q16   ➡️

Outlook for 3Q16   ↗️

Risk drivers

– Asset revaluation and risk reassessment.

– Low-interest-rate environment and excessive risk taking.

– Low inflation and uneven EU growth.

– Political and event risks.

Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for current quarter. Systemic risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high risk, red=very high risk. Upward arrows indicate a risk increase, downward arrows a risk decrease. ESMA risk assessment based on quantitative indicators and analyst judgement.

R.4
Equity illiquidity
**Liquidity oscillating, declining end-2Q16**
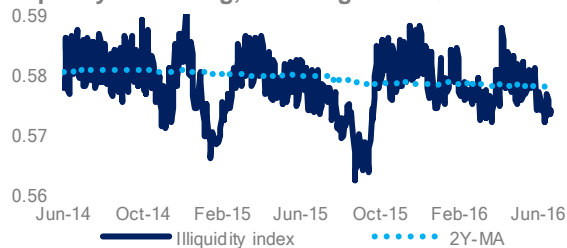
Note: Composite indicator of liquidity in the equity market for the current Eurostoxx 200 constituents, computed by applying the principal component methodology to six input liquidity measures (Amihud illiquidity coefficient, bid-ask spread, Hui-Heubel ratio, turnover value, inverse turnover ratio, MEC). The indicator range is between 0 (higher liquidity) and 1 (lower liquidity).
Sources: Thomson Reuters Datastream, ESMA.

R.5
Equity valuation
**Below long-term average in EU but increasing**
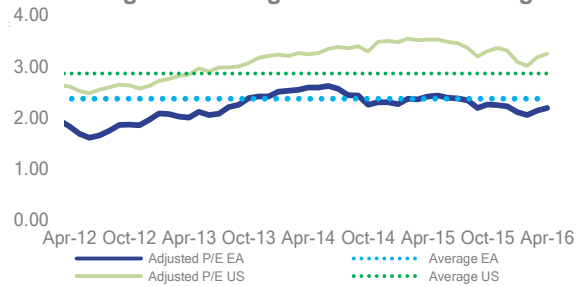
Note: Monthly earnings adjusted for trends and cyclical factors via Kalman filter methodology based on OECD leading indicators; units of standard deviation; averages computed from 8Y. Data available until the end of April 2016.
Sources: Thomson Reuters Datastream, ESMA.

R.6
Exchange rate volatilities
Sharp increase in GBP implied volatilities
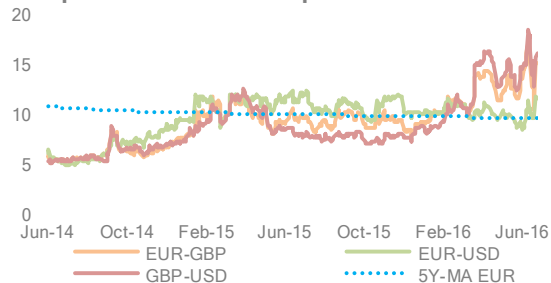
Note: Implied volatilities for 3M options on exchange rates. 5Y-MA EUR is the five-year moving average of the implied volatility for 3M options on EUR-USD exchange rate.
Sources: Bloomberg, ESMA.

R.7
Financial instruments volatilities
Short-term volatility increases for equities
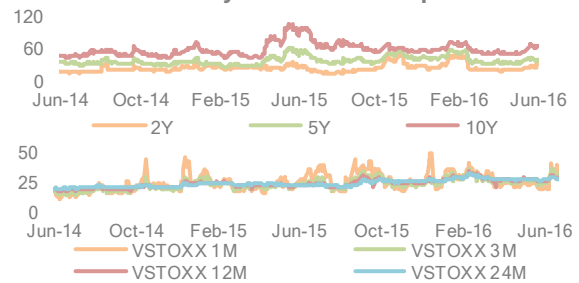
Note: Top panel: implied volatilities on 1M forward ICAP Euro vs. 6M Euroibor swaptions based on the Normal volatility model, in bp; low panel: Eurostoxx50 implied volatilities, measured as price indices, in %.
Sources: Thomson Reuters Datastream, ESMA.

R.8
Sovereign risk premia
At low levels, yet increasing for some countries
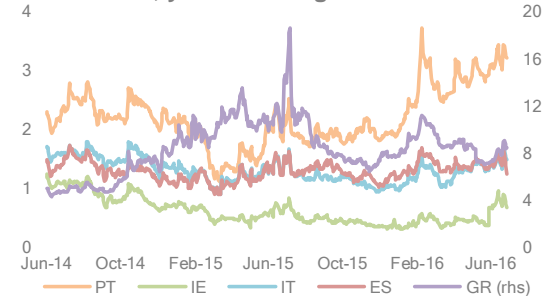
Note: Selected 10Y EA sovereign bond risk premia (vs. DE Bunds), in %.
Sources: Thomson Reuters Datastream, ESMA.

R.9
Sovereign liquidity
Slight improvement in 2Q16
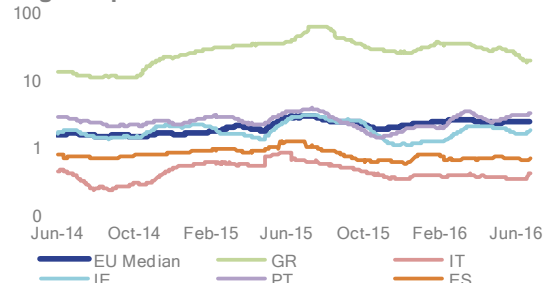
Note: Liquidity measured as difference of ask and bid yields for 10Y sovereign bonds, in basis points. EU Median computed using data for 24 countries. Logarithmic scale.
Sources: Bloomberg, ESMA.

R.10
CDS volumes
Broadly stable

Note: Value of outstanding net notional sovereign CDS for selected countries; USD bn.
Sources: DTCC, ESMA.

R.11
Repo markets specialness
Signs of tension in sovereign repo markets

Note: Median, 75th and 90th percentile of weekly specialness, measured as the difference between general collateral and special collateral repo rates on government bonds in selected countries, in basis points.
Sources: RepoFunds Rate (BrokerTec, MTS, ICAP), ESMA.

R.12
Corporate bond spreads
Decline in 2Q16

Note: EA non-financial corporate bond spreads by rating between iBoxx non-financial corporate yields and ICAP Euro Euribor swap rates for different maturities, basis points.
Sources: Thomson Reuters Datastream, ESMA.

ICAP Euro Euribor swap rates

R.13
Corporate bond bid-ask spreads
Increasing trend

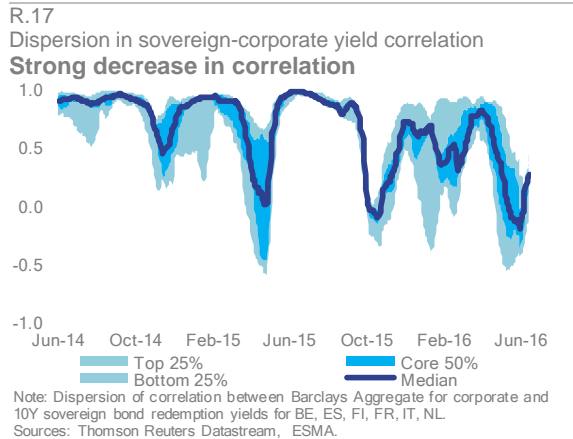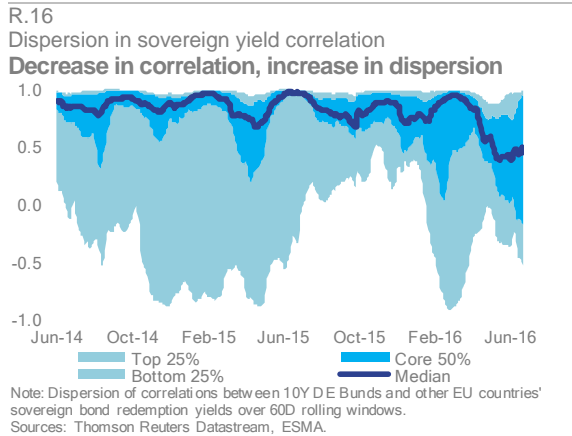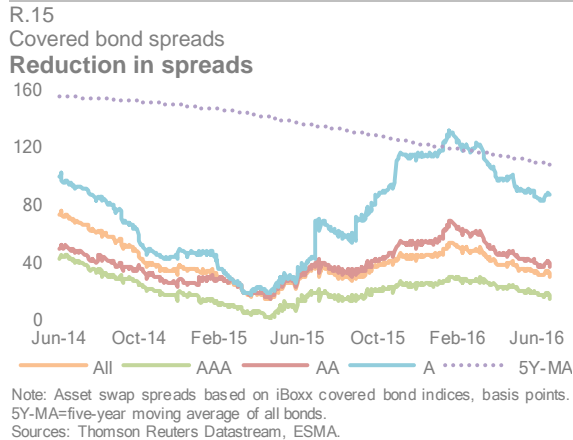Note: EUR Markit Iboxx corporate bond index bid-ask spread in bp, computed as the weighted sum of the bid-ask spread of its components in the current composition. 1Y MA = one-year moving average.
Sources: Markit, ESMA.

R.14
Outstanding long term debt
Lower credit quality

Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
Sources: Dealogic, ESMA.

R.15
Covered bond spreads
Reduction in spreads

Note: Asset swap spreads based on iBoxx covered bond indices, basis points. 5Y-MA=five-year moving average of all bonds.
Sources: Thomson Reuters Datastream, ESMA.

R.16
Dispersion in sovereign yield correlation
Decrease in correlation, increase in dispersion

Note: Dispersion of correlations between 10Y DE Bunds and other EU countries' sovereign bond redemption yields over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

R.17
Dispersion in sovereign-corporate yield correlation
Strong decrease in correlation

Note: Dispersion of correlation between Barclays Aggregate for corporate and 10Y sovereign bond redemption yields for BE, ES, FI, FR, IT, NL.
Sources: Thomson Reuters Datastream, ESMA.

R.18
Debt issuance growth
Increased HY debt issuance

Note: Growth rates of issuance volume, in %, normalised by standard deviation for the following bond classes: asset backed securities (ABS); high-yield (HY); investment grade (IG); covered bonds (CB); mortgage backed securities (MBS); money market (MM); sovereign (SOV). Percentiles computed from 12Q rolling window. All data include securities with a maturity higher than 18M. Bars denote the range of values between the 10th and 90th percentiles.
Sources: Dealogic, ESMA.

R.19
Net sovereign debt issuance
Sovereign issuance subdued

Note: Quarterly net issuance of EU sovereign debt by country, EUR bn. Net issuance calculated as the difference between new issuance over the quarter and outstanding debt maturing over the quarter. Highest and lowest quarterly net issuance in the past year are reported. EU total on right-hand scale.
Sources: Dealogic, ESMA.

R.20
HY issuance
Issuance increasing in EU and US
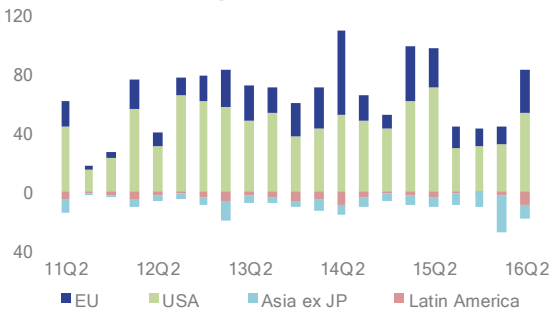
Note: Quarterly data on high-yield corporate bond issuance by region of issuance; EUR bn.
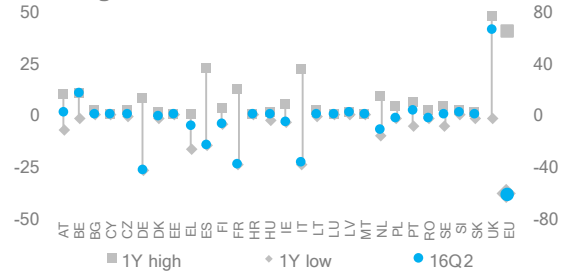Sources: Dealogic, ESMA.

R.21
Hybrid capital issuance and outstanding
Low issuance
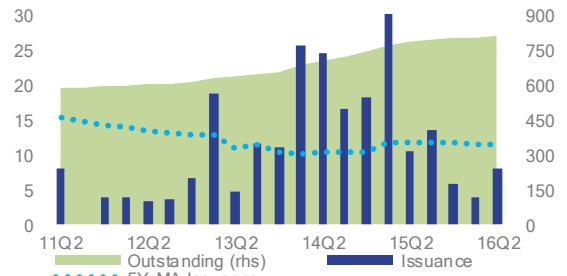
Note: Outstanding amount computed as the cumulated sum of previously issued debt minus the cumulated matured debt prior to reference date. EUR bn. According to Dealogic classification, hybrid capital refers to subordinated debt Tier 1 capital mostly having perpetual maturity.
Sources: Dealogic, ESMA.

R.22
Debt maturity
Broadly stable
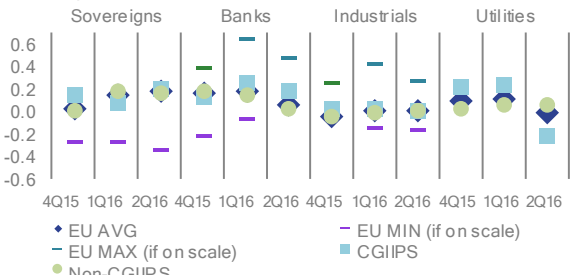
Note: Quarterly change in maturity of outstanding debt by sector and country groups in the EU, years. CGIIPS include CY, GR, IT, IE, PT and ES. Min and Max may not be displayed where they are out of the scale provided in the graph.
Sources: Dealogic, ESMA.

R.23
Debt redemption profile
Redemptions decreasing for banks
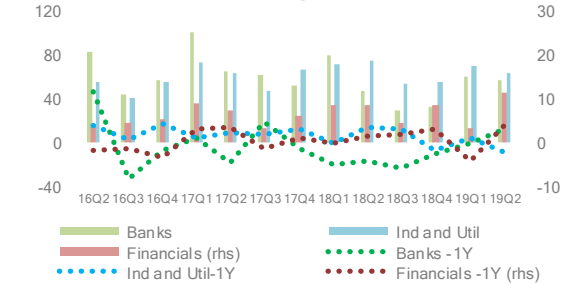
Note: Quarterly redemptions over a 3Y-horizon by European private corporates (banks, non-bank financials, and industrials and utilities), current and change over last year (dotted lines), EUR bn. Excluding bank redemptions to central banks.
Sources: Dealogic, ESMA.

Investors

R.24

Risk summary

Risk level   🟡

Risk change from 1Q16   ➡️

Outlook for 3Q16   ↗️

Risk drivers

– Sustained search for yield.

– Correlation in asset prices and increase in redemptions.

– Deterioration in quality of securities in portfolios.

– Uncertainty on economic outlook and political developments in EU.

Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for current quarter. Systemic risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high risk, red=very high risk. Upward arrows indicate a risk increase, downward arrows a risk decrease. ESMA risk assessment based on quantitative indicators and analyst judgement.

R.25
Cumulative investment fund flows
Rise in EU and US bond fund flows

Note: Cumulative net flows into bond and equity funds (BF and EF) over time since 2004 by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA

R.26
EU bond fund net flows
Outflows from riskier strategies
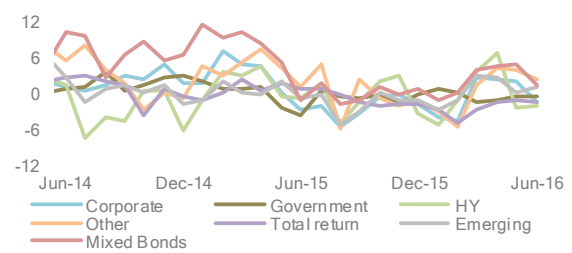
Note: Net flows for bond funds, EUR bn. Funds investing in corporate and government bonds that qualify for another category are only reported once (e.g. funds investing in emerging government bonds will be reported as Emerging; funds investing in HY corporate bonds will be reported as HY).
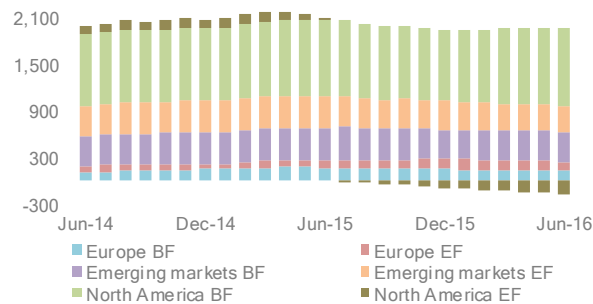Sources: Thomson Reuters Lipper, ESMA.

R.27
RoR volatilities by fund type
Volatilities increasing at the end of 2Q16
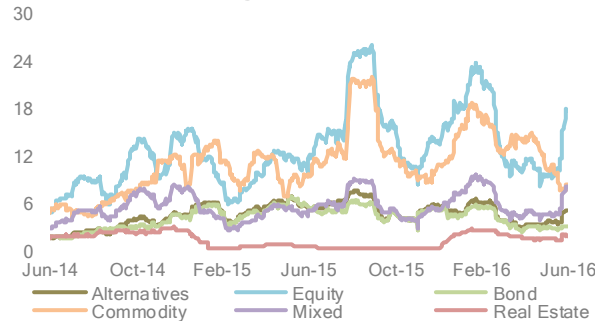
Note: Annualised 40D historical return volatility (%) of EU domiciled mutual funds.
Sources: Thomson Reuters Lipper, ESMA.

R.28
Liquidity risk profile of EU bond funds
Stable liquidity and mixed maturity changes
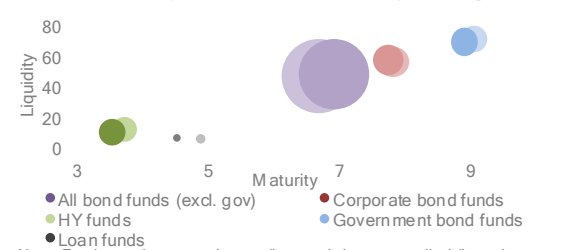
Note: Fund type is reported according to their average liquidity ratio, as a percentage (Y-axis), the effective average maturity of their assets (X-axis) and their size. Each series is reported for 2 years, i.e. 2015 (mid tones) and 2016 (hue). "All bond funds" also include mixed bond funds, convertible bond funds, total return bond funds and other bond funds.
Sources: Thomson Reuters Lipper, ESMA.

R.29
Retail funds synthetic risk and reward indicator
Risks increasing for commodity and equity
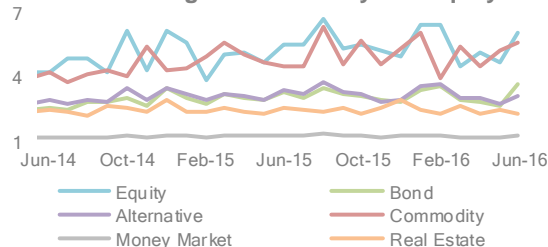
Note:The calculated Synthetic Risk and Reward Indicator is based on ESMA SRRI guidelines. It is computed via a simple 5 year annualised volatility measure which is then translated into categories 1-7 (with 7 representing higher levels of volatility).
Sources:Thomson Reuters Lipper, ESMA.

R.30
Leverage by investment fund type
Leverage declined for real-estate funds
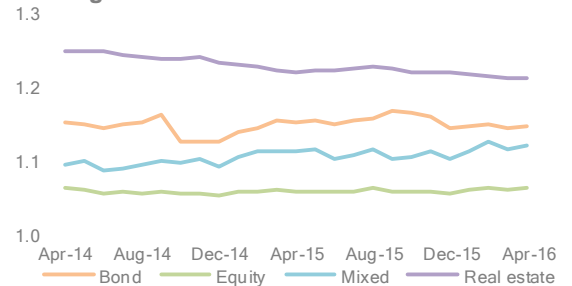
Note: EA Investment funds' leverage by fund type computed as the AuM/NAV ratio. Data until April 2016.
Sources: ECB, ESMA.

R.31
Financial market interconnectedness
Slight increase across funds

Note: Loan and debt securities vis-à-vis MFI counterparts, as a share of total assets. EA investment funds and MMFs, in %. Total funds includes: bond funds, equity funds, mixed funds, real estate funds, hedge funds, MMFs and other non-MMFs investment funds.
Sources: ECB, ESMA.

R.32
Hedge fund interconnectedness
Interconnectedness increased for stabiliser HFs

Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coeffcient individual fund return's impact on average return of sector significant at 99% level and respective average estimators. Coefficients stem from VAR models regressing individual fund returns on lags and general financial market indices. Measures aggregated across individual regressions. Data until September 2015.
Sources: Barclayhedge, Eurekahedge, TASS, HFR, ESMA.

Infrastructures and services

Risk summary

Risk level ● (yellow)

Risk change from 1Q16 ➡

Outlook for 3Q16 ➡

Risk drivers

– Operational risks, incl. insufficient technology management, cyber-attacks.

– Conduct risk, incl. intentional or accidental behaviour by individuals, market abuse.

– Systemic relevance of individual operations, incl. market share, complexity of operations, interconnectedness with other infrastructures or financial activities, system substitutability.

Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for current quarter. Systemic risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high risk, red=very high risk. Upward arrows indicate a risk increase, downward arrows a risk decrease. ESMA risk assessment based on quantitative indicators and analyst judgement.

R.34
Market concentration
Dispersion among equity indices increased
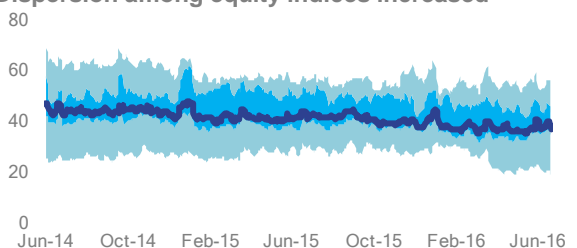
Note: Concentration of notional value of equity trading by national indices computed as a 22D-MA of the Herfindahl-Hirschmann Index, in %. Indices included are FTSE100, CAC40, DAX, FTSE MIB, IBEX35, AEX, OMXS30, BEL20, OMXC20, OMXH25, PSI20, ATX.
Sources: BATS, ESMA.

R.35
Settlement fails
Fails more volatile for corporate bonds
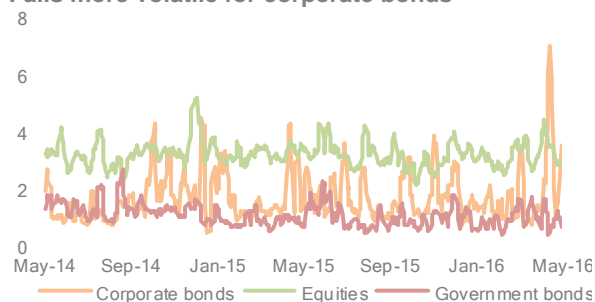
Note: Share of failed settlement instructions in EU; % of value, 5D-MA. Free-of-payment transactions not considered. Data available until May 2016.
Sources: National Competent Authorities, ESMA.

R.36
IRS clearing
Volatile for some asset classes
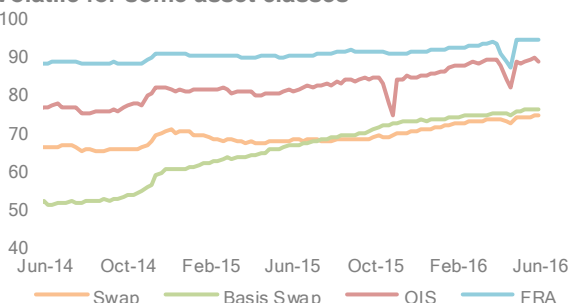
Note: OTC interest rate derivatives cleared by CCPs, in % of total notional amount.
Sources: DTCC, ESMA.

R.37
Euribor – Dispersion in contributions
Slight decline end-2Q16
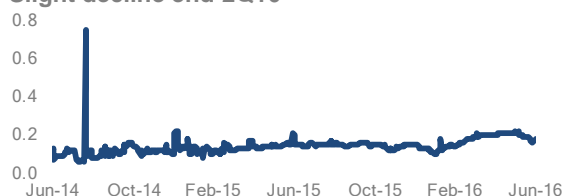

Note: Normalised difference in percentage points between the highest contribution submitted by panel banks and the corresponding Euribor rate. The chart shows the maximum difference across the 8 Euribor tenors. The increase since 2013 is linked to technical factors such as low Euribor rates. The spike in August 2014 reflects the fact that two panel banks submitted respectively a quote for the two-week tenor which was 7 times higher than Euribor and a quote for the 1M tenor which was 10 times higher than Euribor.
Sources: European Money Markets Institute, ESMA.

R.38
Euribor – Dispersion of submission levels
Increased dispersion in submissions
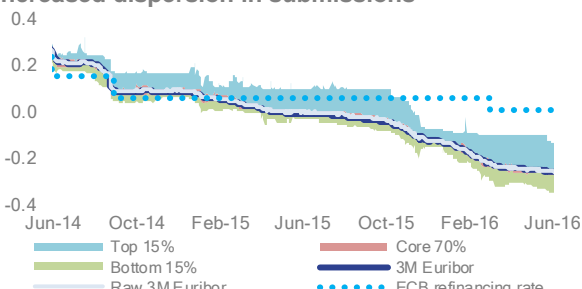
Note: Dispersion of 3M Euribor submissions, in %. The "Raw 3M Euribor" rate is calculated without trimming the top and bottom submissions of the panel for the 3M Euribor.
Sources: European Money Markets Institute, ESMA.

R.39
Rating changes
Negative for non-financials and sovereigns
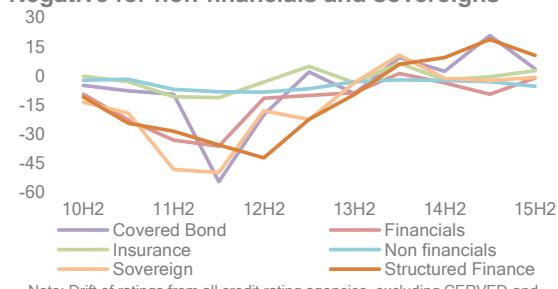
Note: Drift of ratings from all credit rating agencies, excluding CERVED and ICAP, by asset class computed as percentage number of upgrades minus percentage number of downgrades.
Sources: CEREP, ESMA.

Vulnerabilities

Investor protection

Proxy advisors – an overview of the EU market

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Information and other transaction costs may limit the capacity of institutional investors to actively monitor firms they invest in and in particular to engage at general meetings. A partial solution is offered by proxy advisors, providing analysis, recommendations and other services in relation to shareholder voting at Annual General Meetings. In the last few years, institutional investors in the EU have made increasing use of such services. ESMA began analysing this topic in 2011 and in 2013 encouraged the EU proxy advisory industry to establish a code of conduct to address potential issues related to transparency and disclosure. In this article we summarise the development of a self-regulatory framework by the industry and provide an overview of the proxy advisory market in the EU.

Introduction

Corporate governance theory predicts that shareholders can mitigate traditional agency problems with the management by exercising control over corporate decisions.[2] Several empirical papers find that while the presence of institutional investors in European financial markets is increasing, they tend to remain passive as they lack the appropriate incentives to cast informed ballots.[3] Having highly diversified portfolios, they may not be able to bear the cost of performing research on each agenda item that is decided at the Annual General Meetings (AGMs) of the companies they invest in.[4]

In this context, proxy advisors help institutional investors reduce research costs by supporting their voting decisions at AGMs, including with specific recommendations. As a result, investors are increasingly using proxy advisors' services as a basis for their engagement strategies, prompting a debate on whether and to what extent this has systematically affected their voting behaviour.

Academic studies, all based on the US experience, seem to confirm the existence of a correlation between proxy advisors' analyses and shareholder votes (Choi et al., 2009, Cai et al., 2009; Larcker et al., 2013)[5]. A more comprehensive study by Ertimur et al. (2013) also assesses how correlation between proxy advisors' analyses and shareholder votes varies depending on the ownership structure, the rationale behind the recommendation and some corporate characteristics in the case of say-on-pay votes.[6] So far, no complete analysis of EU data is available, but anecdotal or preliminary evidence from some EU jurisdictions similarly seems to confirm the existence of a correlation between proxy advisors' analyses and shareholder votes in the EU.[7]

This article provides an overview of the EU proxy advisory market and summarises the process

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[2] Bebchuk, L. A. (2005).

[3] See for example Renneboog and Szilagyi (2013).

[4] A thorough analysis of the different business models through which institutional investors operate is performed by Celik and Isaksson (2014).

[5] One body of evidence assesses whether proxy advisors' recommendations have an impact on the outcome of compensation-related proxy proposals. For example, Cai et al. (2009) examine the causes of favourable votes cast in uncontested director elections, and indicate that negative recommendations can influence the outcome of a vote by 19%. Choi et al. (2009) analyse voting recommendations issued by four proxy

advisors in the context of uncontested director elections, and find a moderate impact of one proxy advisor's recommendations on voting outcomes. Another stream of the literature argues that proxy advisory firms have influence over companies' decisions in compensation design. For example, Larcker et al (2013) find that corporations change their executive compensation programmes to garner a favourable say-on-pay recommendation from proxy advisory firms.

[6] "Say on pay" refers to the situation in which a firm's shareholders have the right to vote on executive remuneration.

[7] Some analyses focus on local markets within the EU, e.g. Belcredi et al. (2015).

leading to the development of a self-regulatory framework by the industry.

Regulatory environment

Policy evolution

The greater relevance of proxy advisors has also increased attention from policy makers and regulators across the globe. In the US, providing proxy voting advice constitutes a "solicitation", and as such it is subject to the information and filing requirements of the federal proxy rules.[8] At the same time, the Exchange Act Rule 14a-2(b) provides exemptions from the information and filing requirements of the federal proxy rules for proxy firms that meet specific conditions. The Securities and Exchange Commission (SEC) has issued guidance indicating the steps that proxy advisors should follow to take advantage of the exemptions, including when they may need to disclose potential conflicts of interest.[9] More recently, a bill introduced by two US Congress members in the House of Representatives on 24 May 2016 would, if confirmed, create an oversight framework for proxy advisors.[10]

The regulation of proxy advisors is also being debated in the EU, where the revised Shareholder Rights Directive (SRD)[11] – currently under negotiation – will introduce new transparency requirements vis-à-vis the public, including reference to compliance with a code of conduct on a comply-or-explain basis.

ESMA work

ESMA has analysed the proxy advisory market since the summer of 2011, when it carried out a targeted fact-finding exercise among representatives of a number of stakeholders from the industry: proxy advisors, institutional investors and corporate issuers. ESMA has also held several bilateral discussions with market participants and reviewed the academic literature and other policy studies in the area.

Based on this work, ESMA published a Discussion Paper in March 2012[12], asking for stakeholder input on whether market failures related to the activities of proxy advisors existed. The Discussion Paper also presented four broad policy options which ESMA was considering: 1) no EU-level action at that stage, 2) encouraging Member States and/or the industry to develop standards, 3) quasi-binding EU-level regulatory instruments or 4) binding EU-level legislative instruments.

In its 2013 Final Report[13], ESMA concluded that there was no clear evidence of market failure in relation to how proxy advisors interact with investors and issuers and – on this basis – did not consider the introduction of binding measures justified.

However, ESMA indicated that a coordinated effort on the part of the proxy advisory industry would foster greater understanding and assurance among stakeholders in several areas, thereby encouraging it to develop a Code of Conduct. ESMA complemented this with a number of specific expectations on how to bring about the necessary improvements, both in some key areas such as conflicts of interests and transparency and on the governance criteria for developing, maintaining and updating the Code.

As a result, six industry members[14] formed a group (the "Best Practice Principles Group" or BPPG) with the aim of drafting a set of best practice principles. The industry's Best Practice Principles (BPP) were published in their final version in March 2014 and complemented by a Chair Report explaining the decisions made during the drafting process, together with a feedback statement analysing in detail the results of the industry's consultation process.

The BPP were then signed by a number of proxy advisors, including the two largest global firms and a few smaller companies operating mainly at the EU level. In the words of the BPPG chair, the

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8   SEC (2014), Staff Legal Bulletin No. 20.
    https://www.sec.gov/interps/legal/cfslb20.htm

9   The SEC guidance also focuses on investment advisors that owe their clients a duty of care and loyalty with respect to proxy voting as well as other services undertaken on the client's behalf, including ascertaining whether the proxy advisory firm has the capacity and competency to adequately analyse proxy issues.

10 Proxy Advisory Firm Reform Act of 2016. http://financialservices.house.gov/uploadedfiles/bills-114-pafra-pih.pdf

11 Revision of Directive 2007/36/EC as regards the encouragement of long-term shareholder engagement and Directive 2013/34/EU as regards certain elements of the corporate governance statement.

http://ec.europa.eu/internal_market/company/shareholders/indexa_en.htm

12 ESMA (2012) Discussion Paper, "An overview of the proxy advisory industry. Considerations on possible policy options".
    https://www.esma.europa.eu/sites/default/files/library/2015/11/2012-212.pdf

13 ESMA (2013) Final Report, "Feedback statement on the consultation regarding the role of the proxy advisory industry".
    https://www.esma.europa.eu/sites/default/files/library/2015/11/2013-84.pdf

14 The members of the drafting group behind the BPP were Glass, Lewis & Co, ISS, IVOX, Manifest PIRC and Proxinvest.

principles are designed to "help clients and stakeholders understand the nature and character of shareholder voting research and analysis services, the standards of conduct that underpin those services and how signatories to the Principles interact with other market participants".

To assess the degree to which creation of the BPP had so far contributed to addressing these expectations, in the course of 2015 ESMA undertook a review of the functioning of the BPP. ESMA looked at both the width and depth of the BPP's impact, i.e. the number and size of signatories and the extent of changes evidenced in practice. ESMA also examined the extent to which the governance arrangements surrounding the BPP met the expectations presented in its Final Report. To do so, ESMA sought information from different sources, including bilateral meetings with proxy advisors, a public call for evidence and a roundtable with a broad range of stakeholders.

The conclusions of the ESMA review were the following:

- The BPP themselves are overall in line with the expectations set out in ESMA's report.

- Despite being of varying length and detail, compliance statements[15] all contain the greater part of the minimum information which ESMA expected.

- While ESMA recognised that it was still too early to draw any definitive conclusion, on the basis of the available information it concluded that the BPP had to date made a certain impact on the market, especially in terms of enhanced clarity for different stakeholders on how proxy advisors operate.

- As regards the governance approach of the BPPG, while the process surrounding the drafting of the BPP was deemed in line with ESMA's governance expectations, the governance regarding the on-going

functioning of the BPP after their publication was viewed less positively.

ESMA highlighted that the BPPG would benefit from a clearer and more robust governance structure and that a number of arrangements could contribute to these goals, e.g. a broader composition of the BPPG. ESMA identified this as the main challenge ahead, a fundamental step in ensuring that the BPP are fully effective and that stakeholders have confidence in the role of the BPP in addressing the areas identified in ESMA's Final Report.[16]

V.1
Proxy advisors – definition

There is no universal definition of the proxy advisory market as the definitions provided by ESMA in its 2013 report and those used in the BPP and the SRD are not fully aligned. There are three core aspects of the ESMA definition, namely: i) proxy advisors are firms that provide services, ii) proxy advisors' services are constituted by advice or recommendations on the exercise of voting rights at AGMs, and iii) proxy advisors' voting advice or recommendations are offered to shareholders, which are in most cases institutional investors.

The BPP definition is compatible with some main elements of the ESMA definition. However, its scope is broader as proxy advisors under the BPP definition can also be entities: i) other than firms and/or ii) which do not offer explicit voting advice or recommendations but provide general recommendations/research, possibly as ancillary or free-of-charge services. The SRD definition has not yet been finalised but is likely to be narrower than that established by the BPP.

However, as ESMA highlighted in its 2015 follow-up report, while defining the relevant market is obviously important, the consequences of a wider scope should not be overemphasised. Indeed, the BPP are based on the comply-or-explain principle allowing for a flexible implementation based on signatories' characteristics, provided that full transparency on different choices is ensured.

Overview of the EU proxy advisory services market

The following describes the industry structure based on data provided by respondents to the ESMA 2015 call for evidence.[17] Respondents were the six signatories of the BPP and two other firms indicating that they fall within the BPP scope.[18]

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[15] These are drafted by signatories with the aim of explaining the way they intend to apply the BPP, based on the comply-or-explain principle.

[16] ESMA (2015), "Follow-up on the development of the Best Practice Principles for Providers of Shareholder Voting Research and Analysis".

[17] ESMA (2015) Call for Evidence, "Impact of the Best Practice Principles for Providers of Shareholder Voting Research and Analysis". https://www.esma.europa.eu/sites/default/files/library/2015/11/2015-920.pdf

[18] In addition to the six firms participating in the BPPG, there are others which could possibly fall within the definition of a proxy advisor provided by the BPP. Some of these firms

– Institutional Voting Information Services (IVIS) and Eumedion – explicitly acknowledge in their responses to ESMA's 2015 call for evidence that they fall within the definition provided in the BPP but indicate that for different reasons they have chosen not to become a signatory. ESMA is further aware of several firms or industry associations which possibly fall under the BPP definition but are not signatories at this stage. Responses to the call for evidence mentioned the existence of more than 10 such firms, mostly local. For example, one respondent indicated that some members of the Expert Corporate Governance Service (ECGS) fall within the scope of the BPP.

Geographic presence

On the basis of the responses to ESMA's call for evidence we can describe the size of proxy advisors by presenting information on staff numbers. These indicate wide variation across the market. They further point to ISS and Glass, Lewis & Co. as the two largest actors (V.2).[19]

V.2
Proxy advisors' staff numbers
Heterogeneous picture

Proxy advisor	Staff number	Of which temporary employees	BPP signatories
Eumedion	4	NA	No
Glass, Lewis & Co.	+360	NA	Yes
ISS	987	220	Yes
IVIS	11	5	No
IVOX	10	2	Yes
Manifest	55	NA	Yes
PIRC	40	NA	Yes
Proxinvest	14	6	Yes

Note: Non-signatories' staff numbers were provided through the call for evidence. Global numbers for Glass, Lewis & Co. and ISS.
Source: ESMA.

Charts V.3 to V.5 summarise information received from four of the firms that provided data to ESMA.[20] While this is only partial evidence which may not be fully representative of the overall market, it can help gain a better understanding of the quantitative characteristics of the proxy advisory market in Europe.

Overall, proxy advisors are present in almost all EU countries with non-negligible coverage of listed companies. The two biggest players in the market are active across almost all EU countries, covering between 29% and 48% of listed companies in these countries. A third player is active in 14 countries with around 10% of listed companies covered[21], while one player is active in one country only, with coverage of more than 80% of listed companies. This data suggests the existence of global and local business models, as well as an intermediate model focusing on key companies in selected markets (V.3).

V.3
Companies covered by proxy advisors
Different business models
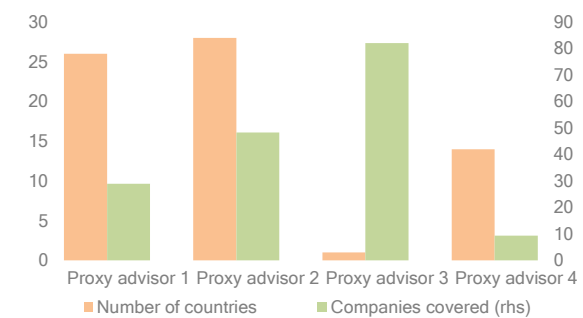
Note: Number of EU countries where proxy advisors are active and average number of companies covered (rhs), in % of total listed companies.
Sources: ESMA.

Services provided

In addition to providing recommendations and analysis to shareholders in relation to AGM voting, proxy advisors offer a range of subsidiary services, e.g., governance-related research, and voting logistics.[22] From the data collected it seems that in the EU most of the proxy advisors' turnover is generated by voting recommendations and analysis, i.e. the core proxy advisory business. However, turnover from other services cannot be considered negligible (V.4).

V.4
Proxy advisory services
Turnover is driven by the core business
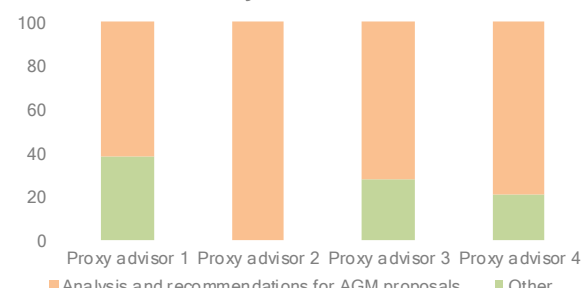
Note: Turnover from analysis and recommendations in relation to AGM proposals and other services, in % of total proxy advisors' turnover (excluding consulting services). Other includes e.g. governance-related research and voting logistics.
Sources: ESMA.

Regarding the way proxy advisors' services are delivered, it is important to assess the extent to which these are tailored to shareholder investment strategies and to listed companies' specificities. It is also worth investigating whether they take into account listed companies' specificities and viewpoints.

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[19] Throughout the consultation process ESMA has obtained various extra data from some of the respondents. Most of these have, however, asked that their responses be kept confidential.

[20] Proxy advisors' numbers used in charts V.3 to V.5 are randomly allocated. Therefore, these charts are not directly comparable.

[21] It should be noted that while it covers just a minor part of the listed companies in absolute numbers, these are generally the biggest and therefore constitute an important share of the market capitalisation.

[22] While some proxy advisors also offer consulting services to issuers, ESMA has not received relevant data on this important aspect.

We attempt to measure the first aspect by looking at the number of custom policies. Custom policies refer to the cases in which proxy advisors provide analysis and recommendations on specific agenda items based on criteria that – at least to a certain extent – are set out by shareholders. Data shows that one player in the market provides policies which are at least partly customised with reference to more than 80% of the companies covered, while for another two players the percentages decrease to 50% and 10% respectively of the companies covered. Finally, one player indicated that it does not provide custom policy services. These results seem to indicate the existence of different business strategies when it comes to the degree to which services are tailored to clients.

As for the second element, we measure proxy advisors' tendency to verify that their analysis is based on a correct understanding of listed companies' characteristics by looking at the frequency of their dialogue with issuers. This is the extent to which information used for the purpose of drafting voting recommendations is complemented by clarifications received directly from the relevant issuers, either by email, conference call or other means. Data shows that dialogue with issuers covers a proportion of the market ranging from over 10% to around 45% of the companies covered (V.5).[23]

V.5
Proxy advisory services
Custom policy and dialogue with issuers

Note: Custom policy and dialogue with issuers, in % of listed companies covered by proxy advisors.
Sources: ESMA.
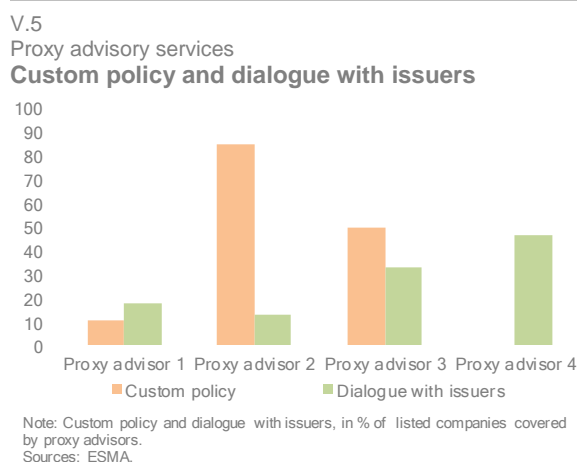
Trends

Several trends in the proxy advisory market are publicly discussed on the basis of anecdotal evidence, prompted in particular by proxy seasons. One specific trend often addressed is increasing market concentration. Recent acquisitions of smaller EU companies by the two

biggest players have reinforced this discussion.[24] However, little empirical analysis has been carried out so far to permit careful investigation of this industry's evolution, partly due to scarce data availability. Further work in this area would be beneficial.

Conclusion

Information and other transaction costs may limit the ability of institutional investors to actively monitor firms they invest in and to engage at general meetings. A partial solution is offered by proxy advisors providing analysis, recommendations, and other services in relation to shareholder voting at Annual General Meetings.

ESMA has analysed this issue since 2011 and in a February 2013 Final Report encouraged the proxy industry to establish a code of conduct to address issues regarding transparency and disclosure (BPP).

In this article we have summarised the process leading to the development of a self-regulatory framework by the industry. To assess the degree to which the creation of the BPP had so far contributed to addressing these expectations, in 2015 ESMA undertook a review of the functioning of the BPP and concluded that the BPPG would benefit from a clearer and more robust governance structure.

Based on some (albeit partial) data received in the consultation process, we have also provided an overview of the proxy advisory market in the EU. This is a first step to gain a better understanding of the quantitative characteristics of the European proxy advisory market.

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[23] Only three proxy advisors provided data on this topic.

[24] On 11 June 2015, the acquisition of IVOX by Glass, Lewis & Co. was announced. On 15 September 2015, ISS announced the acquisition of Ethix SRI Advisors.

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Investor protection

Financial innovation risk assessment scoreboard

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ESMA has the mandate to monitor financial innovation in EU securities markets and coordinate regulatory and supervisory treatment where innovations may affect ESMA's objectives. In this second article in a series on how ESMA analyses financial innovation, we examine more closely ESMA's financial innovation scoreboard. In an effort to prioritise which financial innovations require deeper analysis and potential responses, e.g. to possible market failures, ESMA requires an overview of the financial innovation landscape. To determine which innovations demand further analysis the framework must provide some form of ranking relating product features to ESMA's objectives. ESMA has therefore developed the financial innovation scoreboard, a methodology that enables ESMA to prioritise and analyse financial innovations in securities markets.

Introduction

In the previous article on financial innovation[2] we discussed how ESMA had put in place a framework for monitoring financial innovation. We touched on the topic of how, given the volume of innovation coming to market, we need to prioritise our work and promised to return to that topic in greater depth with a particular focus on how our financial innovation scoreboard helps us with the prioritisation. In this article we describe the methodology of our financial innovation scoreboard.

Exchanges with other regulatory authorities suggest that we are the first to employ a quantitative scoreboard to rank financial innovations that come to market. Such a framework was originally met with some scepticism by those who said that innovation was not given to such a quantitative process. The argument went that a financial innovation scoreboard which tries to quantify risk factors that are inherently unquantifiable would only provide the user with a false sense of security. Moreover, it would never be sufficiently comprehensive to capture all innovations. Recognising the justified concerns and potential frailties of such a purely quantitative process, we reinforced the quantitative metrics with a qualitative overlay which we believe overcomes the weaknesses of a purely quantitative process. The resulting scoreboard

framework provides a robust basis for discussion when prioritising work as well as identifying potential threats to ESMA's core objectives. However, the scoring of innovations based on the criteria proposed is clearly not an exact or objective science and hence can only ever be just that: a robust basis for discussion.

Specificities of scoring financial innovation

The analysis of innovation in the financial sector is particularly challenging when compared to other sectors such as commerce or manufacturing for a number of reasons.

First, in contrast to other economic sectors, the financial system is highly interconnected. As a result, a financial innovation may create externalities[3] that are difficult to assess when examining the financial innovation without considering its context. Those externalities may be positive or negative and they may change over time. For example, while mortgage securitisation increased availability of financing to less creditworthy individuals and initially contributed to a growing economy, it subsequently contributed to the financial crisis and led to significantly lower credit availability in the economy as a whole. This suggests that the value of innovation is contextually and temporally dependent[4].

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[1]   This article was co-authored by Sophie Ahlswede and Patrick Armstrong.

[2]   ESMA (2016), "Report on Trends, Risks and Vulnerabilities, No.1, 2016".

[3]   Lerner and Tufano (2011), "The Consequences of Financial Innovation – A Counterfactual Research Agenda", NBER Working Paper (w16780), p.5.

[4]   Lerner and Tufano (2011).

Second, innovations can depend upon one another, meaning that one innovation can contribute to creating another innovation.[5] For example, technological advances in information technology made possible the creation of digital currencies and the distributed ledger technology[6].

Third, another difference is the long-term nature of many financial services products compared to, say, most manufactured products or services. It may take decades for a flaw to become apparent in an innovative investment product, not least because the product is only asked to pay out – to "work" – at the end of its contractual life. While physical products such as autos and other durable goods can represent relatively long-term purchases, these purchases are usually put to use immediately, making it easier to identify major design defects. In turn, the time it takes for outcomes to become apparent means that the innovative product may have been sold in large numbers before the error is found.

Fourth, financial products and services have the potential to allow for asymmetries of information between the seller and the buyer. The designer of a new mortgage product is almost certain to understand the fundamental risks associated with the product better than most borrowers.

Finally, leverage is a distinct feature of many financial products (as well as a feature of the financial industry as a whole). It acts to magnify the effect of outcomes, negative as well as positive ones. However, some investors' well-documented behavioural biases[7] make them underestimate the likelihood or impact of negative outcomes and their ability to deal with them. To summarise, the evaluation of financial innovations is dependent on previous innovations, context, time and constant changes. An assessment of financial innovation in a static framework can therefore only ever be a starting point for a deeper analysis. The framework proposed in this paper for assessing financial innovation provides this starting point by prioritising innovations based on their structural features and providing an overview of the current innovation landscape.

Methodology and steps towards a financial innovation scoreboard

The following subsections outline how a securities markets supervisor may prioritise and analyse new financial products and processes. Prioritisation is carried out in 5 steps, with each building on the previous one.

Step 1: Identify

Step 1 is to identify all current innovations by using relevant sources. We described this first step in the previous article. The result of the first step is a simple list of financial innovations. The following steps are to categorise, filter, analyse and decide on action.

Step 2: Categorise

The list resulting from step 1 may contain innovations that originate from a variety of financial sectors, and we need to determine whether the innovation in question falls into the remit of a securities markets supervisor (otherwise we refer it to the EBA or EIOPA). Sometimes, labels or terms describing an innovation can be misleading, which is why it is necessary to look at the function of the product in the financial system[8]. An example is virtual currencies or digital currencies which sound like a payment mechanism but can be used to transact financial assets as well. We typically differentiate between product and process innovations. We define product innovations as "the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses." In contrast, we define process innovations as "the implementation of a new or significantly improved production or delivery method." This includes significant changes in techniques, equipment and/or software.

Hence, the objective of step 2 is to categorise innovations by type of innovation and by their function in the financial system (V.6).

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[5] Merton (1992) coined the term "innovation spiral" to describe the process whereby one financial innovation begets the next. Sometimes this spiral has one successful innovation providing the raw material, or building blocks, for another.

[6] ESMA (2015), "Investment using virtual currency or distributed ledger technology".

https://www.esma.europa.eu/press-news/consultations/investment-using-virtual-currency-or-distributed-ledger-technology

[7] Campbell (2006), "Household Finance", Journal of Finance, v61, pp.1553-1604.

[8] Merton (1995), "A Functional Perspective of Financial Intermediation", Financial Management, Vol. 24, No.2, Silver Anniversary Commemoration, pp. 23-41

Function 1: Payments: A financial system provides a payments system for the exchange of goods and services. e.g., credit card checking accounts.

Function 2: Pool funds: A financial system provides a mechanism for the pooling of funds to undertake large-scale indivisible enterprises, e.g. mutual funds.

Function 3: Transfer resources over time: A financial system provides a way to transfer economic resources through time and across geographic regions and industries, e.g. loans, savings accounts.

Function 4: Manage risks: A financial system provides a way to manage uncertainty and control risk, e.g. derivatives, insurance.

Function 5: Provision of price information: A financial system provides price information that helps coordinate decentralised decision-making in various sectors of the economy, e.g. credit default swaps.

Function 6: Measures to address asymmetric information/incentive problems: A financial system provides a way to deal with the asymmetric information and incentive problems when one party to a financial transaction has information that the other party does not, e.g. credit scores.

The result is a list of financial innovations categorised by its type and the function it serves in the financial system. This step can serve to exclude certain products from further analysis (and notify the supervisor in charge) or alternatively propose common work on an innovation that also falls under the remit of other supervisor(s).

Step 3: Filter

The filtering process serves to prioritise financial innovations relative to ESMA's objectives of investor protection, financial stability and orderly markets.

The objective filtering assigns scores, typically binary or on a low/medium/high scale, on criteria that are relevant to the objective in question. The aim is to be parsimonious with the criteria, i.e. consider as many criteria as necessary but not necessarily all criteria that have an impact on the respective objective.

The sum of points per product creates a ranking of products. A high score indicates a need for more detailed analysis. The score in itself does not mean to convey a judgement of a product's appropriateness or suitability for market participants. The purpose of the ranking is to facilitate discussion, prioritise financial

innovations to monitor and conduct more detailed analysis as needed (step 4).

We have outlined in Table V.7 the various categories we employ as well as the specific risk factors and criteria. The criteria have been developed with consideration as to the factors that have undermined protection, stability and orderly markets in the past. We will examine some of the criteria and risk factors below, while providing actual examples of how certain products or processes scored relative to the criteria.

Filter with the objective of investor protection

Degree of complexity of a financial instrument[9]: "Complexity points" for "financial instruments incorporating a structure which makes it difficult for the client to understand the risk involved."[10] As an example, when analysing bitcoins, the instrument was considered both complex and opaque, lacking readily available information, and featuring a comparatively lengthy intermediation chain.

Distribution/Market width/growth[11]: attempts to identify the breadth, depth and anticipated size of a given innovation[12]. Again, using the bitcoin example, the underlying risk factors for growth pointed to one that may grow rapidly and widely (this was before the failure of the largest bitcoin exchange).

Retail/institutional: If the product is specifically designed for and sold directly to retail investors it generates a higher score. Continuing with the bitcoin case, we saw the instrument as one that was largely oriented towards the retail investor, accentuating the investor protection concerns.

Existing regulation: To what degree does the issuer, manufacturer, distributor or underlying product fall under existing regulation/supervision? As for bitcoins, the instrument was specifically designed to fall outside the purview of regulation, again scoring high on this criterion.

Liquidity risk: e.g., depth of secondary market. When assessing the bitcoin, we viewed the secondary market as opaque and vulnerable to shutting down.

Leverage (exposure of investor): The investor can lose funds more rapidly or lose more than

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9   European Parliament and Council 5/15/2014b, Art. 40 (8) a)

10   European Parliament and Council 5/15/2014a, Art. 25.

11   European Parliament and Council 5/15/2014b, Art. 40 (8) b); Further size/volume measures are being taken

into account in the analysis following the filtering and prioritisation.

12   European Parliament and Council 5/15/2014a, Art. 25.

the initial capital invested. On this criterion, the bitcoin did not score highly as we did not see trading in the instrument necessitating the use of leverage.

Counterparty/default risk: Given the anonymity of the bitcoin's origins, we had heightened concerns as to investors purchasing bitcoins, subjecting themselves to default risk.

Filter with the objective of financial stability[13]

It is commonly accepted that financial crises may not be caused by one or more innovations alone, but by a combination of economic circumstances, incentives, changing features in existing products, as well as contagion, which make for materiality[14]. The stability factors must therefore filter and prioritise products/processes that have the potential to create negative externalities. "Negative externalities" mean that a non-performing product causes financial detriment not only to investors or other direct participants but also to other market participants that have not invested in this particular product and have no direct connection. The challenge lies in establishing a correlation between particular product features and a potential market event.

Features that led to systemic vulnerabilities when the size and interconnectedness increased and the nature of the products changed include the following:

− Complexity, features that are difficult to value and lack of transparency of the product and/or its underlying; limited use of counterparty collateralization or low margin requirements that triggered contagion;

− Maturity or liquidity mismatches between product and underlying;

− Leverage in the financial system:

− Regulatory arbitrage.

We capture the above features with the following financial stability factors:

− Degree of complexity: As an example, when analysing contingent convertible instruments, we determined that the risk return profile of these instruments was difficult to assess given the challenge of modelling when the instrument may default.

− Distribution/width/growth: Again, using the contingent convertible example, based on the potential usage of these instruments to meet the Additional Tier 1 capital requirements across the banking sector, we viewed the market growth and breadth high.

− Liquidity: The sudden absence of liquidity was a major feature of the most recent financial crisis. Using the contingent convertible case, we assigned comparatively higher liquidity risk to these instruments as we believed secondary market trading might quickly evaporate in a stressed environment.

− Leverage in the financial system: The product increases leverage in the financial system; on this front, we viewed the issuance as marginal to increased risk. While debt instruments are adding leverage to a bank's balance sheet, they do not increase leverage in the financial system as a whole given that they most likely replace other bank debt previously held by similar investors.

Market size is deliberately not part of the scoring in order to enable a "forward looking approach" and avoid focusing on issues that are already "big" in terms of size.

Filter with the objective of orderly markets

To better understand how to identify risk factors that may threaten orderly markets, we analysed past instances of such failures, such as the Libor rigging scandal. As our final example, we examine how this actual market failure fits into our framework. We found that the past market integrity incidents had the following common features:

− Lack of transparency, equal access to privileged/non-public and price sensitive information and detailed supervision;

− Lack of robust internal controls;

− Lack of or light regulation; conflicts of interest, incentive and opportunity to manipulate;

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[13] ECB definition of financial stability: "Financial stability can be defined as a condition in which the financial system – comprising financial intermediaries, markets and market infrastructures – is capable of withstanding shocks, thereby reducing the likelihood of disruptions in the financial intermediation process which are severe enough to significantly impair the allocation of savings to profitable investment opportunities."

[14] See as an example National Commission on the Causes of the Financial and Economic Crisis in the United States (2011).

- Fragmentation of markets or lack of active secondary market leading to relative illiquidity;

- Technical/operational issues due to a combination of automation and human interference.

When looking at past market integrity issues, few involve a particular product but are more often a result of market participants' behaviour related to a process or market infrastructure issue. Hence, the factors need to identify product features that increase the likelihood of market participants' opportunities and incentives to manipulate: low transparency and a low level of regulation and supervision.

The criteria to be considered regarding the objective of market integrity include:

- Degree of complexity/opaqueness: In the case of Libor rigging, while the process of setting and in turn manipulating the rate was not complex, the process itself was clouded in opacity.

- Distribution/width/growth: Again, employing the Libor example, the impact of the manipulation was widespread, affecting most financial market sectors.

- Existing regulation: In the Libor case, the British Bankers' Association ("BBA"), a self-regulating body, oversaw Libor setting. There was no formal governmental regulation or oversight of the process

- Concentration: The limited number of banks involved in setting Libor, at most 18 for USD Libor, allowed a comparatively small sub-cohort of derivative traders to manipulate the rates.

The ranking resulting from the sum of the three filters is not intended to be treated as a given or to automatically lead to an analysis of the highest-ranking products and to elimination of the lowest ranking ones from any monitoring. Rather, the ranking is intended to provide a robust basis for discussion.

Step 4: Analyse

Once the scoreboard quantitative results are known, relevant ESMA staff conduct a qualitative review of the innovation. The goal of this stage is threefold:

- First, to determine whether the initial reasons for concern remain valid;

- Second, to review more closely the expected growth and scale of the issue;

- Third, to place the innovation relative to others so that any future action is proportionate and consistent while considering the existing regulatory environment.

The qualitative discussion typically aims at gaining an understanding of the drivers of the innovation. We also try to better understand the life cycle of the issue so as to have a more complete understanding of the players involved throughout the manufacture and distribution process.

Step 5: How to act based on the analysis of a financial innovation?

If it is determined that action is needed, we have put in place a framework to guide us on which action to take. In doing so, we ask ourselves a series of questions to best shape our response, which are:

- What is the issue with the financial innovation?

- What needs to change in order to address the problem?

- What is the desired outcome?

Depending on the response to these questions, ESMA may employ one of its regulatory tools, such as an Opinion, Advice, Guidelines, a Warning or, in future, Product Intervention powers. For example, when we scored Contingent Convertible Instruments, the product scored comparatively high on the three objectives − investor protection owing to their complexity and valuation challenges; financial stability due to uncertainty as to how they would perform in a financial crisis; and orderly markets, largely because of the complexity of the risk/return profile.

Conclusion

The objective of the financial innovation scoreboard presented in this article is to enable an overview of the current financial innovations landscape. The overview is intended to provide a robust basis for discussion on which innovations may require deeper analysis and potential responses, e.g. to possible market failures. It is the first framework of analysis of financial innovation designed for the use of securities markets regulators/supervisors and is so far a "living methodology" which requires further testing and fine-tuning.

One of the scoreboard's attributes is that it relates product features of financial innovations to supervisors' objectives. This said, we

recognise that negative outcomes cannot be easily predicted. We have tested our scoreboard by applying it to previous instruments that contributed to impairing investor protection, financial stability and market integrity. In turn, that exercise enabled us to ensure that we adequately captured the risk factors that such instruments introduced. However, we realise that the scoreboard cannot rely simply on an analysis of past innovations to calibrate the risk factors. In addition, we adjust the scoreboard and the risk factors on a regular basis as market events and renewed insight permit. We certainly may not capture all products or processes that undermine our objectives, but we believe the scoreboard process has greatly improved our chances of doing so.

V.7

Overview of filtering criteria by objective

	Investor protection	Financial stability	Market Integrity
Complexity and transparency	– "Optionality" or embedded feature – Information – Term/maturity – Length of intermediation chain – Innovation	– Complexity of risk-return profile	– Complexity of risk-return profile
Distribution, market width and growth	– "Bling factor" – Countries affected – Market width ("mainstream") – Market growth/new market participants	– Distribution, market width and growth	– Distribution, market width and growth
Type of investor	– Retail/institutional		
Regulation and supervision	– Issuer not regulated – Manufacturer not regulated – Distributor not regulated – Product not regulated		– Regulation and supervision
Risks	– Liquidity risk – Leverage (exposure of investor) – Credit risk – Counterparty risk – Operational risk – Relative market risk	– Liquidity risk – Leverage in the financial system – Limited collateralization – Concentration	– Liquidity risk – Concentration – Market abuse and financial crime – Detection is difficult
Costs and incentives	– Lack of or complicated ex ante cost disclosure – Costs of investing	– Incentives are aligned across intermediaries on the supply side	– Incentive and opportunity to manipulate

Orderly markets

Circuit breakers in the EU – use and effects

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Sudden and drastic price swings in financial markets can be a source of instability and are a concern for supervisors, regulators and market participants. Circuit breakers (CB) are key instruments for trading venues to interrupt excessive price movements. We provide an overview of the volatility safeguard mechanisms used by EU trading venues to manage periods of excess volatility. They differ in the type of volatility interruption (price collars, CBs, or both), in the reference price and threshold specification, and in their disclosure to market participants. We find that CB trigger events are concentrated in a small number of trading venues. Furthermore, we find evidence that CBs may help increase market quality for both halted instruments and cross-listed or associated ones.

Introduction

A number of events in recent years have highlighted the importance of ensuring orderly markets in situations of large and sudden market price movements. Examples of these events include the 6 May 2010 flash crash, out-of-control algorithms by Knight Capital in 2012, the Treasuries flash rally in October 2014 or the market movements in US equity and ETF markets on 24 August 2015. Price movements not related to economic fundamentals worsen market quality by hindering the market from allocating capital efficiently in the short and long run (i.e. uncertainty might lead investors or risk-absorbing market makers to retreat from the markets). This is exacerbated by the fact that market microstructure has changed significantly over the past decade, with concentrated marketplaces progressively being replaced by fragmented markets characterised by trading practices based on advanced technologies, such as high-frequency trading, that do not involve human judgement. Large institutional orders are programmed to execute algorithmically and automatically across markets and time, creating potential short-term liquidity dry-ups.[2] In this context, mandated trading interruptions, circuit breakers (CBs), have been implemented as a means of calming the market during extreme price swings.

What are CBs?

CBs are mechanisms that monitor the market continuously and trigger a trading halt as soon as the price of an individual security or an index falls below or above a predetermined level. In practice, the terms "circuit breakers" and "trading halts" are often used interchangeably by practitioners and academics. Conceptually, CBs – together with price collars – are a subcategory of volatility safeguards. Other types of trading interruptions include regulatory suspensions and technical halts.

V.8
Types of trading halts and volatility safeguards
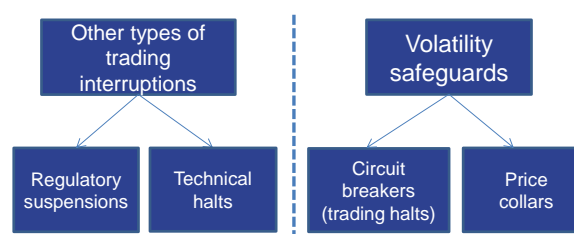
Regulatory suspensions are temporary suspensions in the trading of a particular security enforced by the competent supervisory authority in cases of, for instance, insider trading, market manipulation, inaccuracy and non-availability of public information. Technical halts are initiated by the trading venue when outages occur on its IT infrastructures. Regulatory suspensions and technical halts are not analysed in this article, which focuses only on CBs. CBs are market-based halts applied and operated by trading venues. They can be triggered during either the auction phase or continuous trading.

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[2]   For more details on the relationships between algorithmic trading and circuit breakers see Draus and Van Achter (2015) "Circuit Breakers and Market Runs".

Auction CBs are the result of order imbalances in the auction's call phase, while continuous trading CBs are triggered during continuous trading because the execution price or potential execution price breaches predetermined price ranges. Both have the same aim: to interrupt a period of excessive volatility in order to calm the market and give investors the possibility to reassess their positions and strategies. The result of an auction CB is to extend the auction period, while continuous trading CBs either stop trading for a few minutes to then resume it through an auction phase, or directly switch from continuous trading to an auction call.

CBs can be further differentiated by the reference price used to trigger the halt, which is usually calibrated in accordance with the nature of the financial instrument concerned and its liquidity profile. The reference price can be either static (e.g. the closing price of the previous trading session) or dynamic (e.g. the price of the last transaction).

CBs also differ as to whether they are calibrated at instrument level (single-stock CBs, for each individual security independently from other securities) or at market level (market-wide CBs; when the index breaches predetermined thresholds continuous trading is halted for a wider set of securities), or a combination of both.

Price collars (or price limits) are another tool used by trading venues. Together with CBs they compose the set of safeguards that trading venues can adopt to manage periods of excess market volatility. As opposed to CBs, price collars do not halt continuous trading but rather constrain it; orders that would match a price above or below certain thresholds are rejected and continuous trading is not stopped.

Regulatory framework

In the EU regulatory framework, although MiFID I did not specifically require trading venues to set in place mechanisms to halt or constrain trading, it provided for "fair and orderly trading" in Article 39(d). This concept was clarified in the ESMA Guidelines3 in 2012 specifying that this include in particular trading halts, "arrangements (for example volatility interruptions or automatic rejections of orders which are outside of certain set volume trend price thresholds) to constrain trading or halt trading in individual or multiple

financial instruments when necessary, to maintain an orderly market".

The recent Directive on markets in financial instruments (MiFID II) addresses the topic of trading halts directly by imposing two different requirements. Article 48(4) requires trading venues "to have in place effective systems, procedures and arrangements to reject orders that exceed predetermined volume and price thresholds or are clearly erroneous". Article 48(5) requires trading venues to have the ability to "temporarily halt or constrain trading if there is a significant price movement in a financial instrument on that market or a related market during a short period". Finally, Article 48(13) mandates ESMA to develop guidelines on the appropriate calibration of trading halts, taking into account the liquidity of different asset classes and subclasses, the nature of the market model and the types of users.

In the United States CB mechanisms at single-stock level are set by the Securities and Exchange Commission (SEC), while market-wide CBs are set jointly by the SEC and the Commodity Futures Trading Commission (CFTC). Market-wide CBs are designed for three levels of market declines: 7% (Level 1), 13% (Level 2), and 20% (Level 3). These triggers are set by the markets at point levels that are calculated daily based on the prior-day closing price of the S&P 500 Index. If a Level 1 or Level 2 halt is triggered before 3:25 p.m., trading can only be resumed after a 15-minute trading pause. After 3:25 p.m. trading does not stop unless there is a Level 3 market decline, in which case trading stops for the rest of the trading day (4.00 p.m.).

The SEC has also introduced uniform CBs for individual stocks – the limit up-down mechanism – that halt trading, depending on the stock price and when declines occur. The mechanism is a combination of single-stock CB and order price collar. The price limit bands are set at percentage levels above and below the average price of the stock over the preceding 5-minute trading period. These price limit bands are 5%, 10%, 20%, or the lesser of USD 0.15 or 75%, depending on the price of the stock. The bands are double this size during the opening and closing periods of the trading day. If the national best bid and offer price for individual stock exceeds one of the upper or lower price limits for 15 seconds, trading is halted for 5 minutes.

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3   ESMA (2012), "Guidelines on Systems and Controls in an Automated Trading Environment".

https://www.esma.europa.eu/sites/default/files/library/2015/11/esma_2012_122_en.pdf

The limit up-down mechanism introduced on 31 May 2012 replaced a simpler single-stock CB mechanism which halted trading for five minutes if a stock price moved up or down by 10% in a five-minute window.

V.9
Recent flash crash events

Flash crashes are very rapid, deep and volatile falls in security prices. Over the last decades, flash crashes have attracted increasing attention at regulatory and market level. Flash crashes may be initiated by malfunctioning algorithms and reinforced by algorithmic and high-frequency trading, in which speed and interconnectivity fuel market instability. Particularly during times of market stress, market-making algorithms are less likely to provide liquidity than human traders tasked with maintaining an orderly market, with the result that there is less liquidity when risk aversion spikes and everyone wants to sell. This creates order imbalances and sudden price drops.

Examples of flash crashes are the events of 6 May 2010 on US stock markets, the flash rally in the US Treasuries market on 15 October 2014 and the "mini flash crash" on US ETFs markets on 24 August 2015.

The first so-called "flash crash" occurred on 6 May 2010 at 2.32 p.m. when a large mutual fund initiated an automated execution algorithm to liquidate a position in index-futures of about USD 4.1bn to hedge an existing equity position. In a few seconds, this aggressive sell order not triggered by any price-sensitive news, coupled with the absence of sufficient demand, triggered a liquidity spiral causing equity markets instantly to dry up and indices to fall by 5-6%. However, within 20 minutes these losses were quickly recovered and the market had regained most of the drop.

The flash crash on 15 October 2014 occurred on the US Treasuries market, one of the largest and most liquid financial markets in the world. In the morning, the yield on the 10-year Treasury bond fell by 37 basis points (from 2.23% to 1.86% percent) but rebounded quickly and closed the day only 6 basis points below the previous closing level. This price swing was not driven by any informational events.

The last, so called "mini flash crash" occurred on 24 August 2015 when market turmoil partly related to concerns about an economic slowdown in China caused stocks and ETFs traded on US trading venues to be halted more than 1,200 times. Notwithstanding the presence of CBs, ETFs showed "flash crash"-style drops with prices falling up to 50% from the previous closing prices, as investors sold their ETF shares at a deep discount to the NAV. ETF prices registered wider swings because of their unique structure. Like mutual funds, ETFs own a basket of investments. But they have the advantage of actively trading throughout the day. As stocks in the ETFs basket were halted it became impossible to price the ETFs themselves. This pressured market makers, such as broker-dealers that facilitate trades, to sell off ETFs, fuelling price decline and triggering CBs.

The economics of CBs

Liquidity in a market is determined mainly by two factors: first, the asymmetry of information between market participants supplying and demanding liquidity; second, the inventory risk taken by liquidity suppliers. The asymmetry of information exposes liquidity suppliers to potential losses arising from trading with better

informed investors. Inventory risk arises because liquidity suppliers are exposed to variations in the value of their positions that cannot be unwound immediately. The bid-ask spread is the compensation required by liquidity suppliers to cover the adverse-selection cost and inventory-holding costs.

Market microstructure theories explain that market volatility has a strong negative relationship with market liquidity. In order to investigate this relationship, further examination of the components of market volatility is necessary. Market volatility can be separated into two components: the jump component and the diffusion component. The jump component refers to infrequent, large, isolated changes while the diffusion component arises from smooth and expected small price changes.

Amiram et al.[4] have shown that the jump component has a more dominant effect on liquidity than the diffusion component. The jump component is associated with the inventory-risk dimension of liquidity, in which market makers bear the risk of sudden, large price changes to their inventories. In contrast, the diffusion component, characterized by small (and more frequent) price changes, has a smaller effect on liquidity because market makers can adjust their portfolios in a more flexible and gradual manner.

The jump component also affects market liquidity through the information asymmetry channel, since the jump component is also driven by information events while the diffusion component is generally associated only with increased trading.

To sum up, the jump-component drives the positive relationship between volatility and illiquidity through the channels of asymmetry information and inventory risk.

CB mechanisms can be put in place to limit discontinuous price changes (the jump component) and to enhance liquidity. However, in order to assess the effectiveness of CB mechanisms we need to further differentiate volatility based on the nature of the trader: fundamental volatility and transitory volatility.

When traders discover new information about the fundamental value, they push prices toward their estimated value, creating fundamental volatility. Literature refers to them as "informed" traders. "Uninformed" traders are considered to be those

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[4]   Amiram et al. (2015) "Volatility and Liquidity", Columbia Business School Research Paper, No.15-62.

whose trades are not based on new information. Uninformed traders' trades are driven by market sentiment or private liquidity shocks and result in transitory volatility. When uninformed traders push prices away from their fundamentals, informed traders correct them. Transitory volatility is therefore the tendency of prices to fluctuate around their fundamental values.

CB mechanisms are considered particularly effective when they reduce transitory volatility caused by uninformed traders.[5] Such halts may also give informed traders an opportunity to enter the market and provide liquidity; without a market halt such traders may have been reluctant to post orders given the uncertainty about the price at which these orders will be executed.

CBs are understood to be less effective if they try to address fundamental volatility.[6] In this case, CBs prevent prices adjusting quickly to new information; they are likely to generate substantial volatility when markets reopen.

V.10
CBs' interaction with price movements: Case study

In China, the China Securities Regulatory Commission (CSRC) introduced a market-wide CB system which halted trading on the Shanghai and Shenzhen stock exchanges for 15 minutes whenever the CSI 300 index moved up or down by 5% compared to the previous closing price and for the entire trading session if it moved by 7%. The CB rules entered into force on 1 January 2016. On the first day of trading after implementation (4 January 2016) market-wide CBs were triggered: Trading on the Shanghai and Shenzhen exchanges was halted for 15 minutes when the CSI 300 index fell by 5% from the previous closing price and then for the rest of the day as the index subsequently fell by 7%. On 7 January 2016, CBs were triggered again and stock markets closed only 30 minutes after they had opened. In the evening of that day the CSRC suspended the CB rules, and the CSI 300 recovered 2% on the following day. This case highlighted the complex dynamics and interaction between markets and trading rules in stress situations.

Recent evidence on CB effectiveness

Most of the empirical literature on CBs' efficacy has analysed market quality before, during and after a CB event. Goldstein and Kavajecz (2004)[7] analyse the CBs triggered on NYSE on October 27 1997. They conclude that CBs did not calm the market and caused a reduction in liquidity on the

following day as limit traders were not willing to resubmit previous days' expired orders, thus causing a lack of depth in the limit order book.

Brugler and Linton (2015)[8] evaluated the efficacy of LSE single-stock CBs on the subsequent market quality of the same security and other securities. The authors conclude that a breach of the lower limit of the CB reduces the market quality of the same security (greater degree of price inefficiency and market microstructure noise for a given volume and frequency of trading) but they do not find a significant effect for upper-limit breaches. Assessing the overall market quality, the authors conclude that CBs help to prevent contagion through poor market quality.

The main limitation of these studies is the lack of an appropriate counterfactual. Nor do they take into account whether CBs may have elements of a self-fulfilling prophecy when prices approach the CB trigger. In other words, by studying the post-halt market quality compared to pre-halt market quality, researchers may have concluded that CBs prevent high volatility when it was in fact the presence of CBs themselves that fuelled ex-ante volatility.[9]

Brogaard and Roshak (2016)[10] overcome this issue by analysing the effect of CBs on price paths that approach the limit, by comparing volatility in stocks where CBs are in place and for stocks for which there are no CBs.[11] The researchers take advantage of the SEC having introduced CB mechanisms for different parts of the equity market in a staggered manner.

The study does not find evidence that CBs have elements of a self-fulfilling prophecy when prices approach the CB trigger. They find that the existence of CBs causes informed traders to react strategically before the price of the security approaches the CB trigger. They will hold back some of their trading, as a trading halt would be detrimental for them (since they cannot take advantage of their information for a certain period of time). Overall this reduces the frequency and severity of extreme price movements, which in

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[5]   Harris (1998). "Circuit breakers and program trading limits: What have we learned." Brookings-Wharton Papers on Financial Services, No.63.

[6]   See footnote 4.

[7]   Goldstein and Kavajecz (2004), "Trading strategies during circuit breakers and extreme market movements". Journal of Financial Markets, No.7, pp.301-333.

[8]   Brugler and Linton (2014). "Single stock circuit breakers on the London Stock Exchange: do they improve subsequent market quality?"

[9]   The so called "magnet effect", hypothesised by Subrahmanyam (1994) where, in the presence of a CB, traders react strategically, rushing to trade in anticipation of the market halt, creating a magnetic effect toward the limit.

[10] Brogaard and Roshak (2015). "Prices and price limits."

[11] In their research design, the authors take into account the liquidity of the stocks concerned by introducing control variables for time-invariant differences.

turn leads to increased provision of liquidity by market makers.

Draus and Van Achter (2015)[12] evaluate the conditions under which CBs increase or decrease welfare. While CBs are set up to prevent short-term market runs, they cannot distinguish the underlying motivation for the excessive selling volume and might therefore restrain trading induced by actual liquidity needs. The authors analyse this trade-off and contribute to the literature by determining the characteristics of a socially-optimal CB which yield a maximum welfare improvement. According to the authors, a circuit breaker's social usefulness is considerable when there is a low probability of traders having urgent liquidity needs. Similarly, they argue that high uncertainty about future liquidity needs implies that a restriction on trading can be more socially useful. To apply the socially-optimal CB in practice, the authors suggest that exchanges and regulators could use investor fear indices, market stress indicators or high-frequency market run predictors to capture the common uncertainty on future liquid shocks.

The literature on the coordination of CBs is scant, and most of it dates back to the '90s when the market structure was different, much less fragmented. Subrahmanyam (1994)[13] analyses a situation in which a CB causes trading to be halted in both a "dominant" (more liquid) and a "satellite" market. As agents switch from the dominant market to the satellite, price variability and market liquidity decline on the former and increase on the latter. Morris et al. (1990)[14] conclude that uncoordinated CBs will more likely harm the market than improve its quality due to higher volatility and a rising demand in liquidity on the non-halting markets. A recent study on the subject by Gomber et al. (2012)[15] empirically found that CBs are effective in reducing volatility in the home market and in the satellite market, but at the cost of higher spreads. Moreover, the satellite market's quality and price discovery during the halt is weakened and only recovers as the other market resumes trading.

Volatility safeguard mapping

As of today there is no mandatory reporting by EU trading venues on their implementation of volatility safeguard mechanisms. MiFID II Article 48(5)[16] introduces this requirement and will enter into force in January 2018. In this article, we map the current market practices by looking at the public documents on trading rules from a sample of EU trading venues. As shown in table V.12, there is strong heterogeneity in the volatility safeguard mechanisms applied by EU trading venues.

A few trading venues do not have in place any type of volatility safeguards, the remaining venues under analysis have different types of volatility safeguards: price collars, CBs or both. The types, calibration and volatility safeguard mechanisms across EU trading venues are very different and not harmonised.

In the case of price collars, continuous trading is not halted; instead the orders which would result in a price match breaching the thresholds (either dynamic, static or both) are totally or partially rejected.

On the other hand, CBs halt trading whenever:

− the execution price or the potential execution price lies outside the "dynamic" price range around the reference price. The price range is generally defined individually for each security and specifies the maximum deviation (in either a positive or negative direction) from the reference price. The reference price for the dynamic price range can be the last traded price of a security determined in an auction or during continuous trading;

− the execution price or the potential execution price lies outside the "static" price range, also around the reference price. The reference price for the static price range is generally the last price determined in an auction on the current trading day or, if this price is not available, the last traded price determined on one of the previous trading days.

[12] Draus and Van Achter (2015) "Circuit Breakers and Market Runs".

[13] Subrahmanyam (1994). "Circuit breakers and market volatility: A theoretical perspective." The Journal of Finance 49, No.1, pp.237-254.

[14] Morris (1990), "Coordinating circuit breakers in stock and futures markets." Economic Review, March 1990, pp.35-48.

[15] Gomber et al. (2012), "The effect of single-stock circuit breakers on the quality of fragmented markets."

Enterprise Applications and Services in the Finance Industry. Springer Berlin Heidelberg, pp.71-87.

[16] MiFID II Article 48(5): "[…] Member States shall ensure that a regulated market reports the parameters for halting trading and any material changes to those parameters to the competent authority in a consistent and comparable manner, and that the competent authority shall in turn report them to ESMA. […]".

Two different cases of CBs on continuous trading can be distinguished:

- continuous trading is halted and an auction is immediately triggered;

- continuous trading is halted and the auction is triggered after some time; in this period the order book is frozen, no orders can be modified or cancelled;

The auction phase triggered by CBs can be divided into two sub-phases: call phase and price determination. During a call phase, market participants can react by modifying or deleting existing orders and quotes or by placing new ones. After a minimum duration not disclosed, the call phase ends randomly. However, if the potential execution price still lies outside the acceptable range the call phase will be extended until the volatility interruption is terminated manually. Continuous trading is resumed following the price determination phase, when the price is determined according to the principle of the highest executable volume.

V.11
CBs on continuous trading
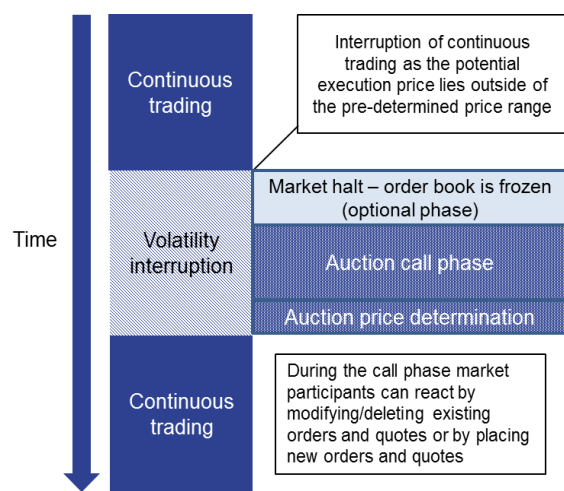
The duration of a trading halt is set by each trading venue and can be extended. In fact, if the potential execution price still lies outside the predetermined acceptable range the auction is extended until the potential price is within the acceptable range.

As shown in the table below, the thresholds for CB triggers are disclosed only by around half of the trading venues under analysis. Reasons for not disclosing the thresholds can be attributed to the magnet effect: If the thresholds are disclosed, as soon as the price approaches the limit investors could react strategically in order to avoid being trapped by the market halt. Investors

would rush to sell their positions, fuelling the falling spiral and triggering the CBs.

The CBs and price collars have different thresholds according to the liquidity profile and the price of the security. Generally, less liquid products require the CBs and price collars to be proportionally larger than on highly liquid products, the reason being that information about fundamentals has a higher impact on the value of less liquid products. Similarly, very low priced (penny stocks) and very high-priced securities generally have *ad-hoc* thresholds.

V.12
Mapping of current volatility safeguard practices

Trading venue	Volatility safeguard	Dynamic price	Static price	Threshold disclosed
Athens Stock Exchange	CBs/price collars	Y	Y	N
BATS Europe	Price collars	N	Y	Y
Borsa Italiana	CBs	Y	Y	N
Bucharest Stock Exchange	Price collars	Y	Y	Y
Budapest Stock Exchange	CBs	Y	Y	N
Chi-X	Price collars	N	Y	Y
Cyprus Stock Exchange	CBs/price collars	Y	Y	N
Equiduct	None	...	...	...
EuroTLX	CBs	Y	Y	Y
Irish Stock Exchange	CBs	Y	Y	N
London Stock Exchange	CBs	Y	Y	Y
Luxembourg Stock Exchange	CBs	Y	Y	N
Madrid Stock Exchange	CBs	Y	Y	N
Malta Stock Exchange	CBs	Y	Y	N
NASDAQ OMX Helsinki	CBs	Y	Y	Y
Nasdaq Stockholm	CBs	Y	Y	Y

NYSE Euronext Amsterdam	CBs/price collars	Y	Y	N
NYSE Euronext Brussels	CBs/price collars	Y	Y	N
NYSE Euronext Lisbon	CBs/price collars	Y	Y	N
NYSE Euronext Paris	CBs/price collars	Y	Y	N
OMX Copenhagen	CBs	Y	Y	Y
Prague Stock Exchange	CBs	Y	Y	N
The Order Machine	CBs	N	Y	Y
Tradegate Exchange	None	...	...	...
Turquoise	price collars	Y	Y	N
Vienna Stock Exchange	CBs	Y	Y	N
Warsaw Stock Exchange	CBs/price collars	Y	Y	Y
XETRA Frankfurt	CBs	Y	Y	N

Note: According to ESMA registers, as of May 2016 there were 98 regulated markets (RMs) and 146 multilateral trading facilities (MTFs) in the EU. The table includes only the main national RMs and MTFs on which CBs were triggered. BATS Chi-X Europe, Euronext and Nasdaq OMX operate with different trading platforms and each trading platform is analysed independently. Y denotes yes; N denotes no; blank fields denote not available.
Sources: Trading rulebooks published on their websites, ESMA.

## Analysis of CB application

Data on CB occurrences comes from the database "Morningstar Real Time". Our sample contains tick-by-tick order book and execution information data for 5,000 financial instruments traded on EU trading venues[17]. The sample is composed of stocks (71%), corporate bonds (9.9%), ETFs (8.1%), futures on EuroStoxx 50 and Stoxx 50 Europe indices (8%), forex EUR – USD/CHF/JPY/EU currencies (0.3%) and sovereign bonds (0.1%). The database reports flags for CB activation for each financial instrument[18]. Our period of analysis is the first quarter of 2016. In order to analyse if the CB trigger events are caused by volatility specific to certain financial instruments, or rather by more widespread market volatility, we complement the analysis on the number of CB trigger events by analysing the number of financial instruments affected by CBs.

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[17]   The number of financial instruments per trading venue is: Athens Derivative Exchange (1), Athens Stock Exchange 15, BATS Europe (254), Börse Berlin (289), Bucharest Stock Exchange (70), Budapest Stock Exchange (24), Chi-X (240), OMX Copenhagen (24), Cyprus Stock Exchange (5), Irish Stock Exchange (9), Börse Düsseldorf (228), EUREX (247), Euro TLX (218), FOREX Data Lite (13), Frankfurter Börse (320), Börse Hamburg (173), NASDAQ OMX Helsinki (18), ICE UK (3), ICE-LIFFE Europe (56), LSE (321), Luxembourg Stock Exchange (26), Madrid (MEFF) Equities and Index Derivatives (8), Madrid Stock Exchange Equities (37), Malta Stock Exchange (6), Borsa Italiana (556), Börse München (213), NASDAQ OMX BX Options (2), NYSE Bond match (15), NYSE Euronext Amsterdam Equities (49), NYSE Euronext Brussels Equities (27), NYSE Euronext Lisbon Equities (19), NYSE Euronext Paris Equities (107), NYSE-LIFFE Amsterdam Equities and Index Derivatives (24), NYSE-LIFFE Brussels Derivatives (5), NYSE-LIFFE Futures (1), NYSE-LIFFE Lisbon Derivatives (3), NYSE-LIFFE Paris Equities and Index Derivatives (17), OTC Markets (82), Prague Stock Exchange (13), Nasdaq Stockholm – Equities (154), Nasdaq Stockholm – Indices (8), Börse Stuttgart (229), The Order Machine (31), Tradegate (135), Turquoise (383), Vienna Stock Exchange (16), Warsaw Stock Exchange (35), Xetra Frankfurt (186).

[18]   We analysed CB activation per trading venue relying on the documentation provided by the commercial data provider Morningstar. The methodology used for the analysis can be summarised as follows: (a) Reporting of CB activation flags is not harmonised across trading venues. On a best-effort basis, by cross-checking the CB flags reported in the Morningstar database with the trading rulebooks of the trading venues concerned, we cleaned the database of those market halts that did not constitute volatility interruptions. (b) Some trading venues report many consecutive messages of CB activation even if they pertain to only one CB trigger event. On the basis of the patterns of CB messages per trading venue, we were able to define rules for each trading venue that save only one CB activation message for a defined period of time (e.g. all the CB messages within 150 seconds pertain to one CB). (c) In order to identify financial instruments cross-listed and associated with those halted, we used the ISIN codes relying on the ESMA Reference database. (d) Every extension of CB is considered a CB. (e) For the analysis of CB impact on market quality, we assumed that the duration of the CB is 5 minutes for all financial instruments in our sample.

V.13
CB trigger events by trading venue (normalised)
Uneven distribution
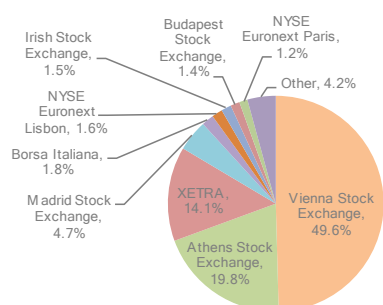
Note: Number of circuit breaker trigger events by EU trading venues, normalised by the financial instruments traded in the respective venues and present in our sample. Data observed in the period from 01/01/2016 to 31/03/2016. The category "Other" includes: EuroTLX, Malta Stock Exchange, NYSE Euronext Amsterdam, NYSE Euronext Brussels, OMX Copenhagen, OMX Helsinki, Prague Stock Exchange, LSE and Warsaw Stock Exchange. The number of financial instruments in our sample per trading venue concerned is: Athens Stock Exchange (15), Borsa Italiana (556), Budapest Stock Exchange (24), EuroTLX (218), Irish Stock Exchange (9), LSE (321), Malta Stock Exchange (6), Madrid Stock Exchange (37), NYSE Euronext Amsterdam (49), NYSE Euronext Brussels (27), NYSE Euronext Lisbon (19), NYSE Euronext Paris (107), OMX Copenhagen (24), OMX Helsinki (18), Prague Stock Exchange (13), Vienna Stock Exchange (16), Warsaw Stock Exchange (35), XETRA (186).
Sources: Morningstar Real Time, ESMA.

Figure V.13 reports CB trigger events by trading venue. The values are normalised by the number of financial instruments present in our sample per trading venue. We observe a large variation in CB activation between trading venues: Vienna Stock Exchange, Athens Stock Exchange and Xetra account respectively for 49.6%, 19.8% and 14.1% of all CB trigger events in our sample. Other trading venues where CBs were activated were mainly Madrid Stock Exchange (4.7%), Borsa Italiana (1.8%), NYSE Euronext Lisbon (1.6%), Irish Stock Exchange (1.5%), Budapest Stock Exchange (1.4%) and NYSE Euronext Paris (1.2%).

V.14
CB trigger events by instrument
Large variations
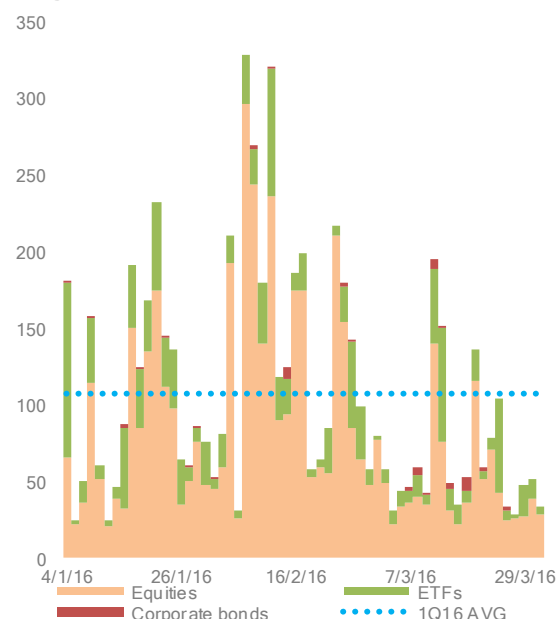
Note: Number of circuit breaker trigger events by type of financial instrument in the period from 01/01/2016 to 31/03/2016.
Sources: Morningstar Real Time, ESMA.

The evolution of CB trigger events in the first quarter of 2016 shows a wide range of values, from 24 CBs triggered on 11 Jan 2016, to a peak of 329 CBs, triggered on 8 Feb 2016. However, we do observe that on average more CBs occurred in February (145 per day) than in January (106 per day) and March (67 per day) (Figure V.14).

Over the period analysed, 4,851 CBs occurred on equities, 1,407 on ETFs and 59 on corporate bonds. Since the sample is composed mostly of equities, we would expect to observe more CBs on this type of instrument. However, it is interesting to observe ETFs registering a proportionally high number of volatility interruptions, especially in January. Particularly in the first two weeks of January 2016, of the total financial instruments halted 35% were ETFs, probably due to market events in China during that time. During the US mini-flash crash of 24 August 2015, we already saw how ETF instruments are vulnerable to CBs.[19] This is due to their particular nature. An ETF is a special type of mutual fund whose shares trade on venues like equities; they invest in a portfolio of assets replicating a reference index (benchmark) pursuing a passive management strategy. Since stocks in the ETF basket may be affected by CBs it becomes difficult to price the ETF itself. This may pressure market makers, such as broker-

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[19] ESMA (2016), "Report on Trends, Risks and Vulnerabilities, No.1, 2016", p.22.

dealers that facilitate trades, to rush to sell ETFs, thus fuelling price decline and triggering CBs.

V.15
Number of financial instruments affected by CBs
Decreasing trend after mid-February

Note: Number of financial instruments affected by circuit breaker trigger events in the period from 04/01/2016 to 31/03/2016.
Sources: Morningstar Real Time, ESMA.

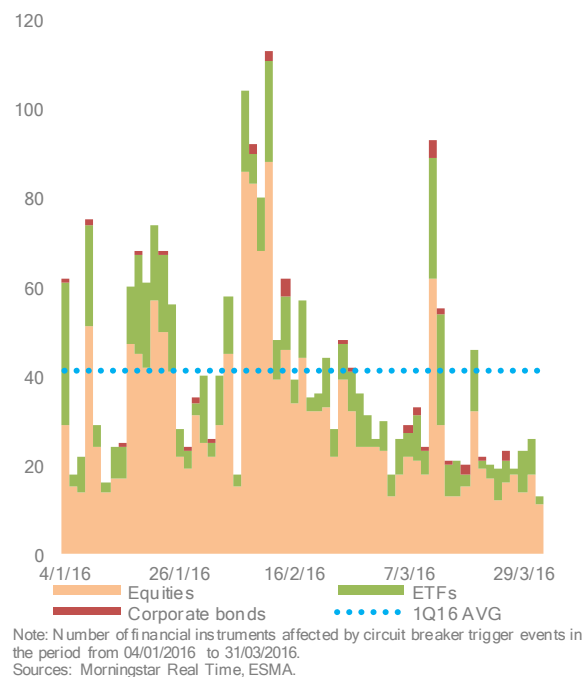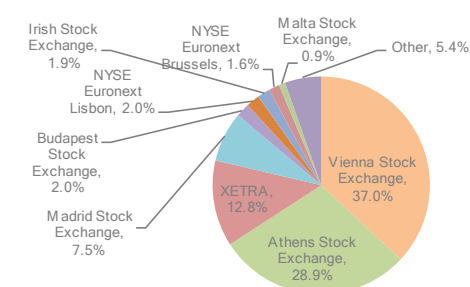In order to examine whether the volatility was spread across financial instruments, we plot the number of financial instruments affected by CBs (V.15). This shows a peak in the second week of February, reflecting high volatility in EU equity markets during that period. Since mid-February we observe a decreasing trend. On average, in January CBs were activated on 44 stocks, 12 ETFs and 1 corporate bond per day. In February, CBs were activated daily on 52 stocks, 9 ETFs and 2 corporate bonds. In March, CBs were activated daily on 29 stocks, 8 ETFs and 1 corporate bond.

V.16
Financial instruments hit by CBs (normalised)
Concentrated in few trading venues

Note: Number of fianncial instruments affected by circuit breaker trigger events, normalised by the financial instruments traded in the respective venues and present in our sample. Data observed in the period from 04/01/2016 to 31/03/2016. The category "Other" includes: Borsa Italiana, EuroTLX, NYSE Euronext Amsterdam, NYSE Euronext Paris, OMX Copenhagen, OMX Helsinki, Prague Stock Exchange, LSE and Warsaw Stock Exchange. The number of financial instruments in our sample per trading venue concerned is: Athens Stock Exchange (15), Borsa Italiana (556), Budapest Stock Exchange (24), EuroTLX (218), Irish Stock Exchange (9), LSE (321), Malta Stock Exchange (6), Madrid Stock Exchange (37), NYSE Euronext Amsterdam (49), NYSE Euronext Brussels (27), NYSE Euronext Lisbon (19), NYSE Euronext Paris (107), OMX Copenhagen (24), OMX Helsinki (18), Prague Stock Exchange (13), Vienna Stock Exchange (16), Warsaw Stock Exchange (35), XETRA (186).
Sources: Morningstar Real Time, ESMA.

Most of the financial instruments affected by CBs were traded on Vienna Stock Exchange (37%), followed by Athens Stock Exchange (28.9%), Xetra (12.8%), Madrid Stock Exchange (7.5%), Budapest Stock Exchange (2%), NYSE Euronext Lisbon (2%), Irish Stock exchange (1.9%), NYSE Euronext Brussels (1.6%) and Malta Stock Exchange (0.9%) (Figure V.16).

Further, we analyse for the first quarter of 2016 whether CBs improved market quality for the halted instruments and for cross-listed and associated ones.[20] We evaluate market quality using two parameters: market volatility and bid-ask spread. Volatility is computed as the standard deviation of mid-prices divided by the average mid-price. The bid-ask spread is the difference between ask- and bid-price over the mid-price. For each halted instrument, market quality parameters computed for the ten minutes preceding the halt are compared with the same ones computed for the ten minutes following the halt. In order to analyse whether the CB had a spillover effect we used the same approach to compute, for every instrument affected by a CB, market quality parameters for the same instruments traded on satellite markets (cross-listed) and for the instruments associated with those halted.[21]

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[20] Due to the low number of CBs observed for instruments other than equities, in this report we do not analyse the impact of CBs on market quality by type of instruments, which may vary.

[21] It has to be noted that some endogenous effects might be at play, as described in Subrahmanyam (1994) or Brogaard and Roshak (2015), in particular for exchanges publicly disclosing the thresholds.

V.17
CB trigger event impact
Lower volatility after the CB

Note: Average of the difference in volatility after (5 to 15 minutes after) and volatility before (0 to 10 minutes before) the CB occurence for the instruments halted. Volatility computed as the standard deviation of mid-prices divided by the average mid-price. Data in basis points.
Sources: Morningstar Real Time, ESMA.

V.18
CB trigger event impact
Positive effect on liquidity

Note: Average of the difference in bid-ask spread after (5 to 15 minutes after) and bid-ask spread before (0 to 10 minutes before) the CB occurence for the instruments halted. Bid-ask spread computed as (Ask Price - Bid Price) / (Bid Price + Ask Price) * 2. Data in basis points.
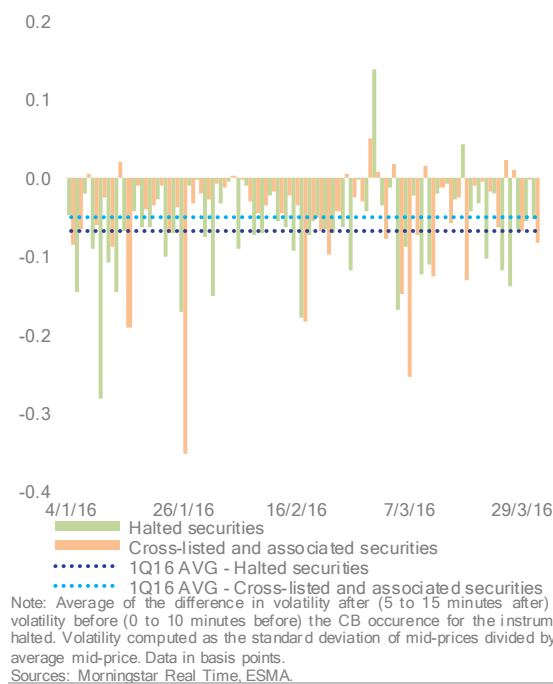Sources: Morningstar Real Time, ESMA.

Figure V.17 shows the difference between the mid-price normalised standard deviation observed during the 10 minutes after the CB and the mid-price normalised standard deviation observed during the 10 minutes before the CB. The measure, computed for the halted instruments and for the cross-listed/associated ones, is negative for most of the trading days under analysis. We thus observed that during our sample period CBs were on average efficient in setting calmer trading conditions in the 10 minutes following the halt.
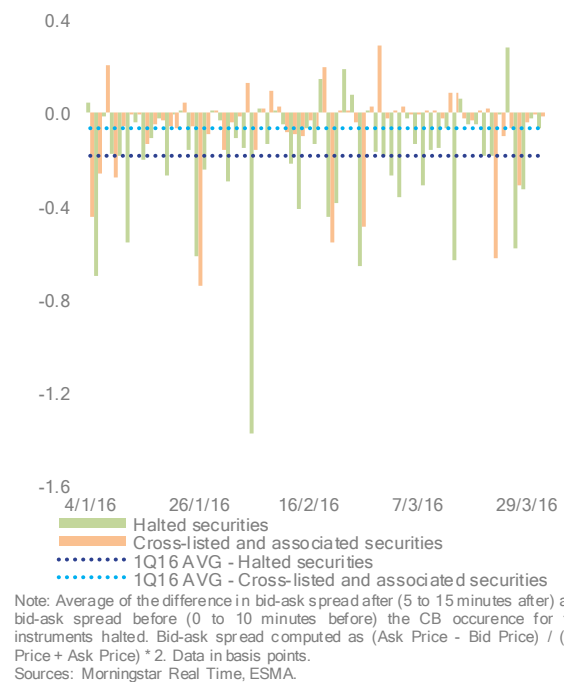
In order to assess the effect of CBs on liquidity, we plot the difference of the relative bid-ask spread[22] levels 10 minutes after the CB minus the relative bid-ask spread 10 minutes before the CB. We compute this difference for the halted instruments and the cross-listed/associated ones (V.18). The results show that over the period of analysis the CB activation generally had a positive effect on liquidity (in terms of reduction of the bid-ask spread) of both the halted instruments and the cross-listed/associated ones in the 10 minutes following the CB trigger event.

[22]   The relative bid-ask spread is computed as the ratio of the difference between the best bid and the best ask price over the mid-price.

V.19
CB trigger event impact
Positive effects on short and long time horizons

	Instruments halted		Correlated instruments	
	Before CB	After CB	Before CB	After CB
10min standard deviation	0.282	0.221	0.238	0.194
	0.156	0.135	0.164	0.149
5min standard deviation	0.214	0.166	0.170	0.140
	0.105	0.094	0.111	0.104
2min standard deviation	0.148	0.110	0.107	0.094
	0.062	0.054	0.068	0.066
10min relative spread	0.007	0.005	0.005	0.004
	0.003	0.002	0.002	0.002
5min relative spread	0.006	0.005	0.005	0.004
	0.003	0.002	0.002	0.002
2min relative spread	0.006	0.006	0.004	0.004
	0.002	0.003	0.002	0.002

Note: The table presents mean (upper line, respectively) and median (lower line, respectively) parameters before and after CB activation on the financial instruments in our sample. Standard deviation is computed as in Chart V.10 and expressed in basis points. The relative spread is computed as the ratio of the difference between the best ask and the best bid quote over the mid-price.

We also compute the average and the median of the market quality parameters around the CB at different time intervals (V.19). All measures are calculated before the CB was triggered and after continuous trading restarted. In line with Gomber et al. (2012)[23], three intervals were chosen: a two-minute interval, a five-minute interval and a ten-minute interval.

Results show that the average and the median mid-price normalised standard deviation for the halted instruments is lower after the CB activation, indicating more stable trading conditions after the CB in the short run as well as in the long run. Looking at the effect of CBs on the satellite markets, cross-listed and associated instruments present lower average normalised standard deviation for all time intervals. For the ten-minute window the reduction in the average normalised standard deviation is more pronounced compared to the shorter time intervals; this result holds for both halted and cross listed/associated instruments.

Analysing the average and median bid-ask spread around the CBs for the halted and the cross-listed and associated instruments, we observe that it decreased after the CB activation on the five-minute and ten-minute intervals. The positive effect on liquidity increases as the time horizon of the analysis lengthens. However, on the two-minute interval the bid-ask values before

and after the CBs are very close; here we do not observe any clearly positive effect on liquidity.

Conclusion

The article provides an overview of volatility safeguard mechanisms used by EU trading venues to manage periods of excess volatility. The volatility safeguard mechanisms used by EU trading venues can be divided into two types: CBs and price collars. CBs halt trading if the price of individual securities falls outside a predetermined range while price collars do not halt trading, but rather constrain it by rejecting an order if the potential execution price is outside predetermined price ranges. However, CBs are not the only cases in which trading is halted. The wider category of trading halts also comprises regulatory and technical halts.

The theoretical literature on CBs states that they are not effective if they address fundamental volatility. In this case a trade halt prevents prices from reflecting the new information on fundamental values. Conversely, CBs are effective if they address transitory volatility, defined as the tendency for prices to fluctuate around their fundamental values. The recent empirical literature on CB efficacy in increasing market quality provides mixed evidence. There is some evidence that CBs did not calm the market and caused a reduction in liquidity. However, by analysing the effect of CBs on price paths approaching the limit, there is evidence that the presence of CBs reduces extreme price movements and increases market liquidity.

In the EU regulatory framework, although MiFID I did not specifically require trading venues to put in place mechanisms to halt or constrain trading, it did provide for "fair and orderly trading" in Article 39(d). This concept has been clarified in the ESMA Guidelines specifying that this includes trading halts in particular. MiFID II, which enters into force in January 2018, will specifically introduce this requirement. As of today, various EU trading venues provide in-house implementation of volatility safeguards; desk-based research on current market practices has found that volatility interruption mechanisms are set heterogeneously by EU trading venues. They differ in the type of volatility interruption (price collars, CBs or both), in reference price specification, thresholds and their disclosure to market participants.

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[23]   Gomber et al. (2012), "The effect of single-stock circuit breakers on the quality of fragmented markets."

Enterprise Applications and Services in the Finance Industry. Springer Berlin Heidelberg, pp.71-87.

We compute descriptive analysis of CBs' impacts on market volatility and liquidity by exploiting data on CB trigger events for a large sample of financial instruments traded on EU trading venues. Given the lack of regulatory reporting on CB activation, for this analysis we rely on the data provided by the commercial data provider Morningstar. We observe that CB trigger events are mostly concentrated in a number of large trading venues. Over the period of analysis, CBs had on average a positive impact on the subsequent trading conditions of the halted securities and the cross-listed and associated ones. In fact, measuring the CB effect at different time intervals (10, 5 and 2 minutes after the CB), we observe that the CB led on average to a reduction in volatility, measured by the normalised standard deviation of mid-prices, and an increase in liquidity, measured by the bid-ask spread, especially on the longer time intervals.

From now on, the indicators developed in this paper will be found in forthcoming ESMA TRVs and Risk Dashboards, where they will complement our ongoing risk monitoring. CB effectiveness in managing periods of excess volatility will be more thoroughly analysed in future ESMA research.

Financial stability

EU corporate bond market liquidity – recent evidence

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The role of corporate bond markets in financing the economy in the EU has acquired greater prominence in recent years. At the same time periods of high volatility associated with short-term illiquidity in different market segments have increased concerns over the deterioration of liquidity, in particular for traditionally less liquid segments such as the corporate bond market. However, studies for US, UK and French bonds find that liquidity measures have improved in the period following the financial crisis. Against this background, this article investigates secondary market liquidity developments in EU corporate bond markets between March 2014 and March 2016, a period for which – to our knowledge – no analysis has been carried out. We can observe no systematic, significant positive or negative trends in liquidity levels during this period. However, when wider market conditions deteriorate, we observe episodes of decreasing market liquidity.

Introduction

Surges of volatility associated with short-term illiquidity in a number of financial markets over the past few years have increased concerns that secondary market liquidity, especially for inherently less liquid market segments, may have become more fragile.[2] This has sparked debate among market participants, regulators and academics on the deterioration in secondary market liquidity on EU corporate bond markets.

Following the 2008 financial crisis, EU corporate bond markets have been affected by a number of structural changes, such as regulatory reforms, changes in dealer business models, electronification, and bond holding concentration. These factors, together with cyclical dynamics, can affect market liquidity conditions.

Well-functioning corporate bond markets are important to facilitate the financing of investment in the real economy and support economic growth and stability.[3] This lies at the core of the EU Capital Markets Union (CMU) project seeking to develop deep and liquid capital markets across borders that complement banks as a source of financing.[4]

Understanding liquidity dynamics in the EU corporate bond markets is increasingly important, as market financing has become a significant source of funding for the economy in recent years and in view of the relationship between liquidity risk and cyclical developments. Cyclical factors may impact underlying liquidity risk: In the past few years, benign monetary policy conditions, the low interest rate environment and related strong investor risk appetite have bolstered bond valuations and contained volatility in many fixed income market segments, sustaining market liquidity. However, shifts in policies and market confidence can significantly affect liquidity conditions and liquidity resilience, especially in an environment subject to frequent market swings and where spillovers across asset classes have increased.[5] Evidence on spillover effects across asset categories shows how corporate bond markets are exposed to illiquidity shocks in equities as well as sovereign bond markets.[6] Thus, there could be challenges to financial

[2] There have been a number of episodes of short-term volatility and illiquidity in different markets: the US equity and derivatives market on 6 May 2010, US Treasuries on 15 October 2014, the Swiss franc in January 2015, German bunds in April 2015, and equities and ETFs in August 2015.

[3] Limited liquidity in secondary corporate bond markets can translate into higher trading costs and consequently higher borrowing costs, slowing the development of debt capital markets.

[4] The European Commission under the CMU work will review the functioning of EU corporate bond markets, focusing on how market liquidity can be improved, the potential impact of regulatory reforms, market developments and voluntary standardisation of offer documentation (CMU Action plan).

[5] IMF, Global Financial Stability Report, October 2015.

[6] See for example: De Jong and Driessen (2005) and Dick-Nielsen et al. (2011).

stability, and consistent and effective market monitoring is crucial.

Previous studies investigating the liquidity of US, UK and French bonds between 2008 and 2015 find that although liquidity measures have improved in the period following the financial crisis, they have not yet recovered to their pre-crisis levels (2005-2007).[7]

In this article, we investigate the market liquidity of the EU corporate bond market between March 2014 and March 2016, a period for which – to our knowledge – no analysis has been carried out. We develop several measures and proxies for liquidity and construct a composite liquidity index. Our analysis is focused on Investment Grade (IG) corporate bonds. This article does not therefore aim to contribute to current discussion on market liquidity bifurcation, with liquidity deteriorating mostly in those market segments that have historically been less deep than others.[8] However, to the best of our knowledge it does provide for the first time a broad spectrum of corporate bond market liquidity indicators for the EU market in more recent years. [9]
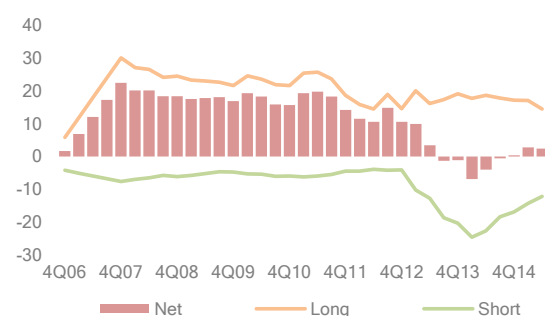
EU corporate bond market

In fixed income markets, and especially in the corporate bond segment, dealers play an important role as intermediaries between clients wishing to execute trades. Indeed, given the large number of non-standardised corporate bonds often characterised by small outstanding amounts, the probability of trading any given bond is lower than for other asset classes. Dealers, however, seem to have reduced their market-making activities following changes in their attitude to risk taking and also in response to new regulation.[10]

This is confirmed by a decreasing longer-term trend in both gross and net market-maker inventories of EU corporate bonds in recent years (V.20). However, EU non-financial corporate bond inventories have recovered slightly since 3Q14, though remaining at a very low level compared to the period before 2013. Even though inventory levels provide only a rough approximation of dealers' capacity to build up large trading or market-making positions, the net inventory position reflects the level of risk that a market maker is willing or able to assume. The size of gross short and long inventories reflects market makers' ability to take short and long positions. Overall, the decrease in either gross or net inventories could lead to reduced liquidity provisioning due to a bank's lessened ability or willingness to function as a market maker.

V.20
Non-financial corporate bond inventories
Decrease in net inventories

Note: Investment grade non-financial inventories data collected for 13 EU market makers. EUR bn.
Sources: ESRB.

Related to the above developments is the growth in electronic trading in corporate bond markets.[11] Electronification has started to affect the traditional corporate bond markets' structure in recent years. Trading on the three main electronic platforms in the EU corporate bond markets (Bloomberg, MarketAxess and Tradeweb) is estimated to account for more than 40% of total transactions in the IG corporate bond

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[7] Trebbi and Xiao (2016) analyse secondary corporate bond market transactions in the US from April 2005 to December 2014. Aquilina and Suntheim (2016) study the evolution of liquidity in the UK corporate bond market for the period 2008-2014. AMF (2015) focus on liquidity in French bond markets between 2005 and September 2015.

[8] We can also see liquidity bifurcation across IG corporate bonds. However, the data we use represents the most liquid part of the IG corporate bond market (Markit Iboxx constituents). For a discussion on liquidity bifurcation, see for instance BIS (2016).

[9] Analyses of market liquidity have recently been published for UK and French corporate bonds (see Aquilina and Suntheim (2016), Anderson et al. (2015), and AMF (2016), for more details).

[10] For instance, the liquidity coverage ratio introduced by the Basel Committee (BIS (2013), "Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools").

[11] Electronification may result in further changes in market structure and market making activities, possibly making them more similar to EU equity markets. Regarding equity markets, ESMA (2014) and ESMA (2016) look at high-frequency trading activity and some of the associated impacts on market structure and market making activities. The starting point for both reports is the change in the trading landscape of equity markets over the last decade. The defining features of this change are increased competition between trading venues, fragmentation of trading in the same financial instruments across EU venues and the increased use of fast and automated trading technologies.

market.[12] However, the percentage of total value traded is estimated to be significantly lower and the vast majority of bonds continue to be traded over-the-counter (OTC). At the same time, traditional dealers are also using technology to improve the efficiency of their market making activities, and non-bank liquidity providers are searching for ways to trade directly with end-investors using direct electronic connections.[13]

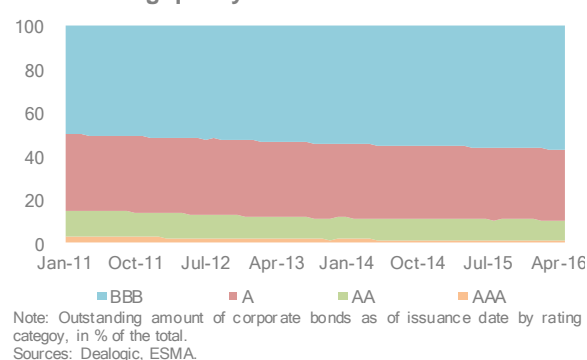Supported by historically low interest rates, total issuance of EUR-denominated corporate bonds by non-financial corporations more than doubled from EUR 110bn in 2010 to EUR 225bn in 2015. In the same period the number of deals likewise increased to almost 350 in 2015 from less than 200 in 2010 (V.21). In 1H16, however, issuance remained broadly stable compared to the same period of 2015, probably reflecting higher uncertainty and risk sensitivity.

V.21
Non-financial corporate bond market issuance
Increasing issuance over the last 5 years

Note: EU investment-grade corporate bond deal value, EUR bn, and number of deals (rhs).
Sources: Dealogic, ESMA.
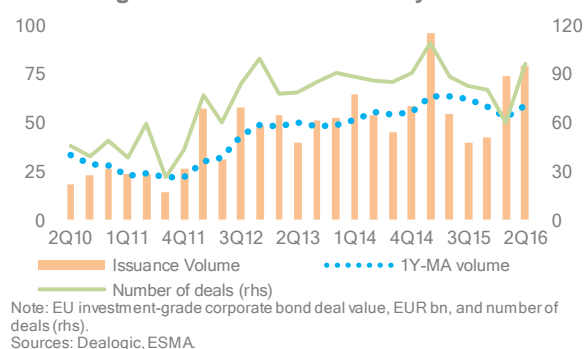
The rating distribution of EU non-financial corporate bonds has worsened in recent years. The share of AAA-rated bonds fell from 2.6% to less than 1% while the share of lower rated bonds increased from 51% to 57% (V.22).

V.22
Rating distribution of non-financial corporate bonds
Deteriorating quality

Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
Sources: Dealogic, ESMA.

Overall, the rapid increase in the size of the primary market is outpacing secondary market trading activity growth, creating concerns for reverse effects. Indeed, limited liquidity could translate into higher illiquidity premiums and higher borrowing costs. If credit conditions were to deteriorate, some companies could quickly find it harder to access debt markets.[14]

Data

Our analysis is based on the Markit iBoxx database merged with Euroclear data on traded volumes. The resulting database comprises 2,230 EUR-denominated corporate bonds[15] over the period March 2014 to March 2016.[16] The sample is almost equally balanced in terms of outstanding amounts between financial and non-financial corporate bonds, while the non-financial sector makes up the largest number of corporate bonds (around 60% of the total number of bonds; V.23).

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[12]   ICMA (2014), "The current state and future evolution of the European investment grade corporate bond secondary market: perspectives from the market".

[13]   BIS (2016), "Report on electronic trading in fixed income markets".

[14]   IOSCO (2016) and European Commission (2015).

[15]   This sample includes a subset of trades cleared by Euroclear, the trades of bonds composing the Markit iBoxx index.

[16]   The period of analysis has been selected so as to shed light on the recent development in liquidity. Other sample periods may be selected, and outcomes of such analyses may differ from the findings presented here.

V.23
Sample distribution – outstanding amounts and sector share
Balanced sample

Note: Outstanding amount, EUR bn. Share of non-financial bonds in percentage of total number of bonds (rhs).
Sources: Markit, ESMA.
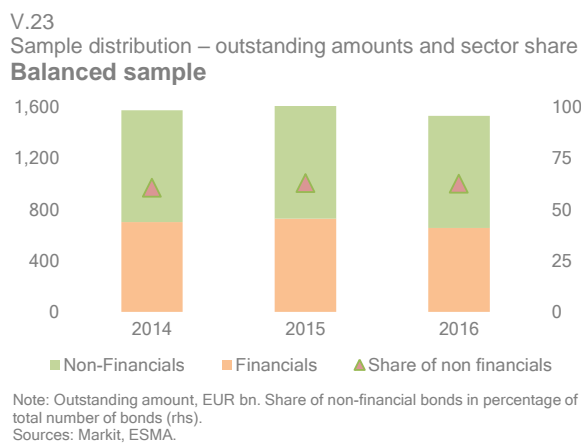
Our sample includes only EUR-denominated IG corporate bonds, from AAA to BBB. The rating distribution is heterogeneous, consistent with the aggregate data. BBB and A bonds account for 87% of the sample, equally split among the two rating classes; AAA represents only 0.4% both in terms of the number of bonds and the outstanding amount, in line with the overall corporate bond market (V.24).

V.24
Sample distribution - Rating classes
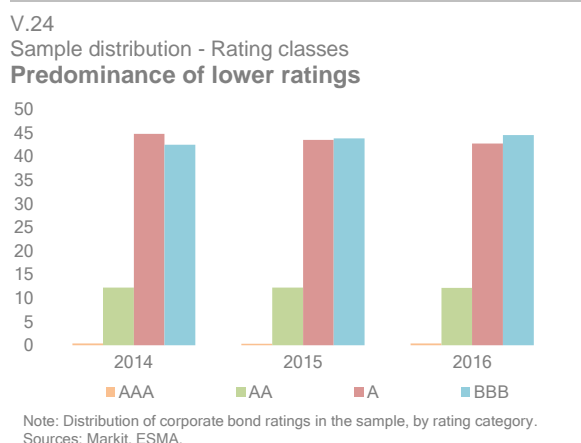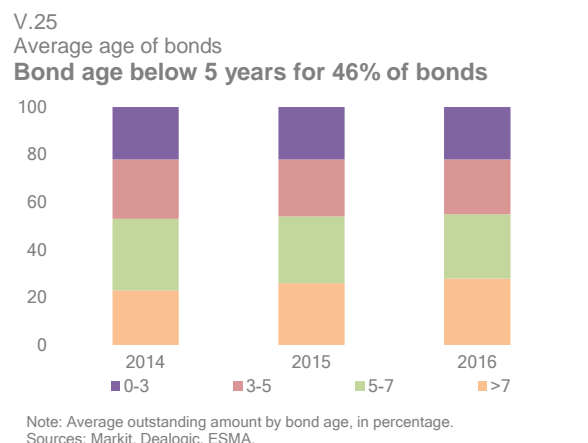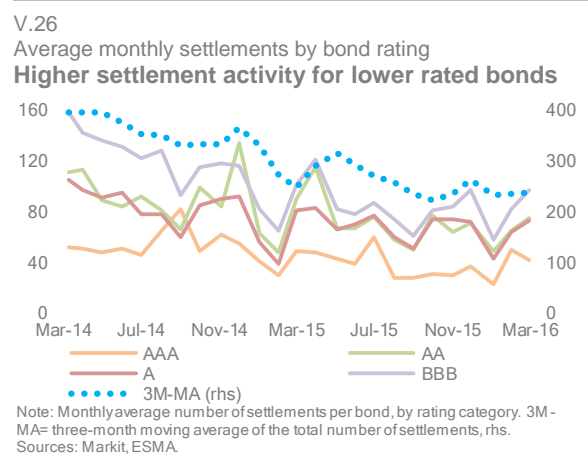**Predominance of lower ratings**

Note: Distribution of corporate bond ratings in the sample, by rating category.
Sources: Markit, ESMA.

Bond age, i.e. the time that has elapsed since issuance[17], matters for liquidity, with newly issued bonds expected to be more liquid than older ones.[18] In the sample we use, 22% of the outstanding amount of bonds were issued less than three years before the observation period, 24% were issued between three and five years before, 28% between five and seven years and about 26% more than seven years before the observation period (V.25).

V.25
Average age of bonds
Bond age below 5 years for 46% of bonds

Note: Average outstanding amount by bond age, in percentage.
Sources: Markit, Dealogic, ESMA.

Overall the average monthly number of settlements per bond declined in the period analysed across different rating categories.[19] Between March 2014 and March 2016 the drop referred mainly to lower rated bonds (-39%), while it was less significant for AAA bonds (-19%; V.26).[20]

V.26
Average monthly settlements by bond rating
Higher settlement activity for lower rated bonds

Note: Monthly average number of settlements per bond, by rating category. 3M-MA= three-month moving average of the total number of settlements, rhs.
Sources: Markit, ESMA.

The average transaction size declined in the period under analysis from almost EUR 1.5mn in 2014 to less than EUR 1.1mn in 4Q15 before increasing again to almost EUR 1.5mn in 1Q16. The average daily trading volume shrank from almost EUR 7bn in 2014 to EUR 5bn at the end of 2015. In 1Q16 it almost tripled in the first month to EUR 14bn before declining to EUR 11bn at the end of February (V.27).

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[17]   Bond age is therefore a different concept from bond maturity, i.e. the period of time for which a bond remains outstanding.

[18]   See for example Houweling et al. (2003).

[19]   From Markit Euroclear Liquidity Fields the following data is available and used as a proxy for trade number: the number of settled instructions generated from standard settlement instructions over a 30-day period. As with the

definition from Markit – Euroclear this is also used to calculate Time to Unwind metrics.

[20]   The decrease in number of settlements and transaction size coupled with the increase in trading volume may appear contradictory. However, these figures are not directly comparable. Trading volume is aggregated across bonds while the number of settlements and the average transaction size refer to an average bond in the sample.

V.27
Trading volume and average transaction size
Aggregate trading volume increased in 1Q16

Note: Daily volumes of transactions on the constituents of the Markit iBoxx EU corporate bond aggregate index, in the current composition, EUR bn; transaction size for the corporate bond segment as the ratio of nominal amount of settlement instructions to number of settled instructions, EUR mn; 3M-MA volume (transaction size)= three-month moving average of the volume (transaction size) series.
Sources: Markit, ESMA.

The trading of large amounts has become more complex and time-consuming as many dealers are reluctant to warehouse large positions (BIS, 2016). This is corroborated by evidence that – in certain phases – it has become more difficult to unwind large positions in secondary markets.[21] Averaging across the constituents of the Markit iBoxx aggregate EU corporate bond index, in March 2015 it would have taken 55 days to close a position of USD 50mn, while in March 2016 more than 70 days would have been needed to unwind the same amount (V.28). For lower amounts the time to unwind has also increased over the last year. To unwind USD 10mn and USD 20mn positions, four and eight days more respectively were needed in March 2016 than in March 2015.

V.28
Time to unwind large corporate bond positions
Increase in time to unwind positions

Note: Average of the number of days to exit a position of EUR 5mn, 10mn, 20mn and 50mn across the constituents of the Markit iBoxx corporate bond aggregate index. 1M-MA= one-month moving average of the time to unwind across the four time series.
Source: Markit, ESMA.

Measures of market liquidity

Most of the literature defines market liquidity, which is a concept not directly observable, as the ability to trade an asset at short notice, at low cost and with little impact on its price. From this definition it emerges that market liquidity is a multidimensional concept and cannot be captured by one single metric. There are several aspects that need to be considered in order to consistently measure liquidity: elements of volume, time, as well as transaction costs.

Market liquidity may be measured along three dimensions which incorporate these elements: depth, breadth (or tightness) and resilience.[22] A market is deep when a large number of transactions can occur without affecting the price. A tight market is one in which transaction prices do not diverge from mid-market prices.[23] Last but not least, in a resilient market, price fluctuations from trades quickly dissipate and imbalances in order flows are quickly adjusted.[24]

We provide several measures for market liquidity and construct a composite liquidity index, based on principal component analysis. We find evidence of episodes of increasing illiquidity in the period analysed.[25]

Transaction costs are measured by bid-ask spreads showing how much a trader pays by buying and immediately selling a given security. This indicator points to lower liquidity, with bid-ask spreads increasing in the past year by 12 basis points (V.29).

V.29
Corporate bond bid-ask spread
High and increasing spreads

Note: EUR Markit Iboxx corporate bond index bid-ask spread in bp, computed as the weighted sum of the bid-ask spread of its components in the current composition. 1Y MA = 1Y moving average.
Sources: Markit, ESMA.

Transaction cost measures are complemented with volume-based measures in order to gain a more complete picture of the market. The average turnover ratio of the constituents of the Markit iBoxx index is thus computed. The

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[21] Among the Markit Euroclear Liquidity Fields, indicative time to unwind in USD is available. It is defined as the number of days to exit an *X* USD position in a particular ISIN. We aggregate by computing the daily average across all ISINs included in the Markit iBoxx Index.
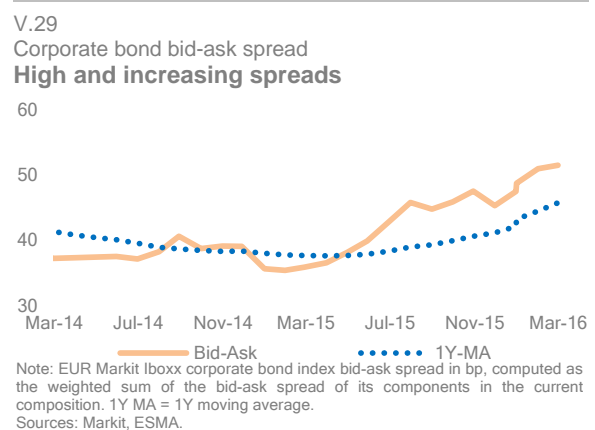
[22] See Foucault et al. (2013) for a review of the techniques used empirically to measure liquidity.

[23] Market characterised by active trading, large volumes and narrow bid-ask spreads.

[24] See Acharya et al. (2014) for an analysis of the exposure of US corporate bond returns to liquidity shock.

[25] The main limit to our analysis is represented by the short time series available.

average turnover ratio declined from 7% in 2014 to 4% in 1Q16, signalling a deterioration in this specific measure of liquidity for the period under consideration (V.30). Moreover, aiming to add an additional layer of information to our analysis, the number of zero trading days is calculated.[26] The number of zero trading days increased by 3.5 percentage points between 2014 and 2015, and then remained broadly constant between 1Q15 and 1Q16.

Overall, these indicators do not suggest that a systematic and significant drop in market liquidity occurred in the reporting period. At the same time, phases of lower liquidity can be discerned in some indicators. As already pointed out in other sections, it is again worth noting that the analysis focuses on a partial segment of the EU corporate bond market. The sample is based on the constituents of the Markit iBoxx aggregate EU corporate bond index for the last two years. This index includes only the most liquid segment of the IG market. Future research, integrated by extending the time-series, will be undertaken to ensure greater robustness of the current results and deepen the analysis.

V.30
Zero trading days and turnover ratio
Decreasing turnover ratio since 2Q15
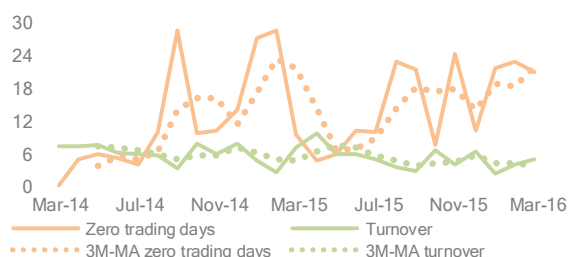
Note: Zero trading days is the number of ISINs not traded over the total for the Markit iBoxx corporate aggregate index, in %. Turnover is the ratio of trading volume over outstanding amount, in %. 3M-MA zero trading days (turnover)= three-month moving average of the zero trading days (turnover) series.
Sources: Markit, ESMA.

To capture aspects related to the depth and resilience of the market, we use the Amihud illiquidity coefficient, which measures the average price impact on a given day, and the Bao Pan Wang illiquidity measure, which estimates the magnitude of price reversals (V.31). These estimates, based on our limited sample, support the previous findings: Several episodes of increasing illiquidity can be detected in the period

analysed, corresponding to phases of high volatility in EU financial markets.

Using aggregate measures of illiquidity we can capture the systematic component of bond illiquidity which can only be singled out when many bonds become illiquid around the same time. In 4Q15 and 1Q16 we observe that both the Amihud coefficient and the Bao Pan Wang measures point to an increase in market illiquidity, which is in line with the increased volatility observed in the market (A.3).[27]

V.31
Amihud index and Bao Pan Wang measure
Periods of increasing illiquidity
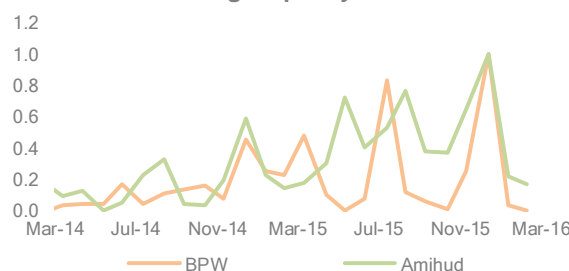
Note: Bao Pan Wang and Amihud illiquidity indicators for the constituents of the Markit IBoxx corporate bond index, normalised between 0 and 1, computed on a monthly basis. Higher levels indicate increased illiquidity.
Sources: Markit, ESMA.

As expected, the figures reported in table V.32 show a high positive correlation between Amihud and Bao Pan Wang measures, while the turnover ratio is negatively correlated with the Amihud index. Overall turnover is not significantly correlated with other measures except the Amihud index (by construction).[28]

V.32
Correlation of market liquidity measures

	Bid-Ask	BPW	Amihud	ZTD	Turnover
Bid-Ask	1				
BPW	0.17	1			
Amihud	0.49*	0.50*	1		
ZTD	0.29	0.33	0.44*	1	
Turnover	-0.33	-0.33	-0.75*	-0.57	1

Note: BPW= Bao Pan Wang measure, ZTD= zero trading days. * indicates a level of significance of 5%.
Sources: ESMA.

We use principal component analysis to build a composite measure of market liquidity in the EU

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[26] Zero trading days are calculated by focusing on the number of days within a month for which a record was missing for volumes in our dataset.

[27] Further analysis is required to better investigate the comovement of this aggregate illiquidity measure with aggregate market conditions.

[28] Both the Amihud and the turnover ratio are a function of volumes traded.

corporate bond market (V.33). The composite measure is based on the Amihud index, Bao Pan Wang measure, bid-ask spreads and zero trading days.[29] The composite indicator shows that market liquidity has generally deteriorated in the last two years, with a spike of illiquidity at the end of 4Q15 and beginning of 1Q16 in line with an overall increase in volatility in financial markets.

V.33
The composite liquidity measure
Episodes of decreasing liquidity
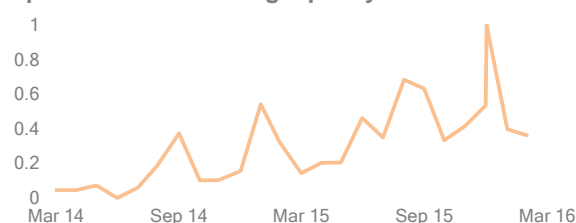
Note: Composite indicator of market liquidity in the corporate bond market for the constituents of the Markit IBoxx corporate index, computed by applying the principal component methodology to four input liquidity measures (Amihud illiquidity coefficient, bid-ask spreads, Bao Pan Wang illiquidity indicator, zero trading days). The indicator range is between 0 (higher liquidity) and 1 (lower liquidity).
Sources: Markit, ESMA.

Conclusion

Market liquidity has been more and more at the centre of debate among market practitioners, academics and regulators. The 2008 financial crisis has clearly shown how liquidity, both market and funding, is crucial in guaranteeing orderly and efficient markets. Moreover, liquidity can suddenly vanish moving from normal to stressed financial market times, and a shortage of liquidity can significantly exacerbate market stress and financial instability. Therefore, understanding liquidity developments is becoming increasingly important, especially in those segments of the market that are inherently less liquid but play a crucial role in financing the economy.

Previous studies for US bonds, UK bonds and French bonds investigating liquidity between 2008 and 2015 find that liquidity measures improved in the period following the financial crisis, albeit without recovering their pre-crisis levels (2005-2007).

Against this background, in this article we investigate the market liquidity of EU corporate bonds. Importantly, market liquidity has many dimensions that cannot be captured by one single measure. To address this, we provide several measures of market liquidity for EU corporate bonds. To the best of our knowledge, previous empirical studies have mainly focused on the US

market or single EU countries. This is an initial attempt to identify and measure the main trends in liquidity in the EU corporate bond market by focusing on the liquid end of the market, namely the constituents of the Markit iBoxx EU corporate bond index. Even by focusing on the more liquid segment of the market for a limited time series, our metrics seem to capture expected liquidity dynamics under calmer and more stressed market conditions.

Overall, our findings do not suggest a systematic and significant drop in market liquidity in the reporting period. At the same time, phases of lower liquidity can be discerned in some indicators. When wider market conditions deteriorate, we observe episodes of decreasing market liquidity. This emerges from the analysis of both price-based and quantity-based indicators. For example, our composite indicator records increased illiquidity in 4Q15 and 1Q16 in line with the overall increase in volatility in financial markets during that period. Further work will aim at refining the composite indicator with a view to including it for risk monitoring purposes in TRV and RD.

Further research will investigate the specific features determining market liquidity such as the characteristics of the bonds (e.g., issuance amount, trading activity, rating, time to maturity and age of the bond), the ways they are traded or the market participants.

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[29] Turnover is not included in the composite measure given the absence of correlation with other liquidity measures

and the fact that the aspects related to volume are included, by construction, in the Amihud coefficient.

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Financial stability

Synthetic leverage in the asset management industry

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The use of leverage has been common practice in financial markets for many years. Usually measured as debt over equity, high leverage ratios in individual financial institutions have in the past led to episodes of balance sheet and systemic stress. This prompted stronger oversight by global regulators and, in some instances, the introduction of quantitative limits. However, the nature of leverage has evolved and off-balance sheet leverage, built through the use of derivative instruments, has gained traction in recent years. The growth of the EU asset management industry, the size of global derivatives markets, and anecdotal evidence suggest that reliance on what has become known as "synthetic leverage" by investment funds is becoming an increasingly relevant issue, potentially requiring greater regulatory scrutiny. This article looks into the use, measures, regulatory treatments and financial stability risks of synthetic leverage, through the particular prism of investment funds.

Defining synthetic leverage

Synthetic leverage is a specific form of leverage, which differs from financial leverage in so far as exposures are gained *synthetically* (through the use of derivative instruments)[2] and it does not involve direct borrowing from counterparties. Derivatives, e.g. options, futures and swaps, are essential components of funds' investment strategies. They are used mainly for risk mitigation, or to gain exposures to the underlying asset.

Irrespective of its form, leverage is relevant from a systemic risk perspective for several reasons. First, it may give rise to a higher likelihood of default by amplifying the impact of asset price changes on the solvency of the institution. In addition, margining practices can contribute to procyclicality by reinforcing asset price movements, possibly involving fire sales during sell-offs.[3] Lastly, by creating contagion channels it may also give rise to negative externalities for market participants not directly dealing in these markets.[4]

Currently, there is no formal definition of synthetic leverage at an international level. In its *Hedge Fund Survey*, the UK FCA has described

synthetic leverage as obtained by borrowing money or securities from counterparties by using derivative instruments, as opposed to financial leverage, which is obtained by borrowing money or securities directly from counterparties.[5]

One of the main issues with synthetic leverage is that the underlying exposures built through the use of derivatives are mainly off-balance sheet.[6] As a result, traditional on-balance sheet metrics such as debt-to-equity ratios do not adequately capture the risks associated with synthetic exposures. In addition, since market participants are able to enter into certain types of derivatives contracts at no or very little cost, there is a natural incentive to increase leverage synthetically in order to multiply gains, at the risk of magnifying losses. This might create financial stability risks in the following situations:

− when individual institutions hold very large derivatives positions, especially if exposures are highly concentrated (by asset or by counterparty) or correlated;

− when system-wide leverage becomes excessive due to synthetic exposures increasing across many financial institutions.

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1   This article was authored by Julien Mazzacurati and Jean-Baptiste Haquin.

2   Synthetic financial instruments are generally understood to be a collection of financial assets with combined features that replicate the behaviour (e.g. price movements, cash flows) of another instrument.

3   Brunnermeier and Pedersen (2009).

4   For example, the collapse of Long-Term Capital Management in 1988 had repercussions that went far

beyond the hedge fund industry or derivatives markets. See for example Edwards (1999).

5   Investment fund leverage ratios are usually measured by dividing total leverage by the fund's NAV.

6   Commitments are only realised on-balance sheet based on market values, when margins are raised or where changes in the underlying assets result in profits or losses.

The distinction between gross and net leverage is key here. The netting process allows market participants to reduce gross exposures and offset some of the risks, such as counterparty credit risk. While this reduces the default risk of individual entities, gross exposures are also relevant for macro-prudential regulators. The simultaneous unwinding of gross derivative positions by entities under stress may indeed create negative externalities for other market participants, with broader implications for the financial system.

Derivatives and investment funds

Investment funds mainly rely on derivatives to gain exposures and bet on future market movements, or to net out existing (physical or synthetic) exposures and hedge against risks. As of today, it is not yet possible for EU regulators to assess the reliance on derivatives by funds, or to identify the purpose, based on regulatory data. However, data collected under the Alternative Investment Fund Managers Directive (AIFMD) will help to shed light on these aspects in the case of alternative investment funds (AIFMs), including hedge funds.

The use of derivative instruments varies greatly by type of investment fund. In 2015 EU leveraged funds managed EUR 154bn in total assets, nearly twice as much as in 2011, including EUR 119bn managed by UCITS (and EUR 16bn by AIFMs).[7] This compares with EUR 13tn for the European investment fund industry as a whole.[8] Bond funds were by far the main type (42% of all EU leveraged funds), followed by alternative funds (18%) and mixed funds (16%, Chart V.34). In terms of domicile they are concentrated in Luxembourg (57%) and France (30%).

V.34
EU leveraged funds
AuM doubled in four years
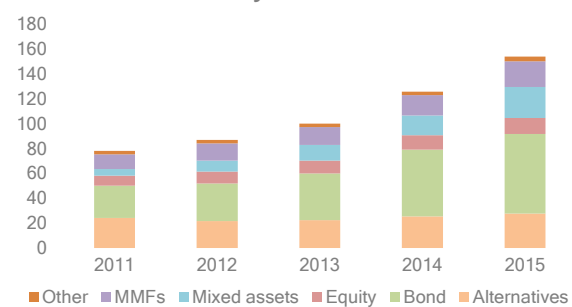
Note: AuM of EU investment funds self-reporting as "leveraged", EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

V.35
EU leveraged funds
Domicile of EU leveraged funds

- Luxembourg
- France
- Ireland
- Sweden
- Netherlands
- Other countries
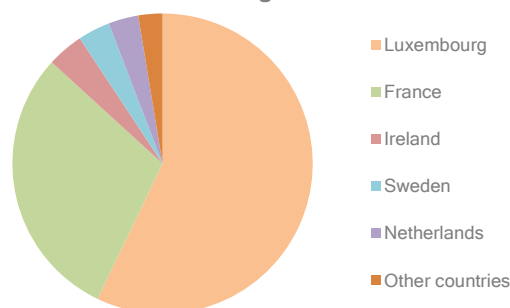
Note: AuM of EU funds self-reporting as "leveraged" by country, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

Derivatives play a key role for funds that implement strategies based on synthetic structures, such as alternative investment funds (AIFs) – and in particular hedge funds – or synthetic exchange-traded funds (ETFs).[9] In June 2015, closed-end funds and ETFs domiciled in the US had derivative exposures (measured by gross notional amounts) of 47% and 29% of NAV respectively, compared with a 20% average for the industry as a whole.[10] In contrast, 68% of US mutual funds had zero exposure. Reliance on derivatives seemed to be particularly concentrated in funds that rely on alternative investment strategies (with an average derivative exposure of 121% of NAV).

However, it is unclear whether the use of derivatives will remain limited to a subset of collective investment vehicles. A combination of factors may indeed lead to greater recourse to such instruments than used to be the case. These factors include:

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[7] Data based on Thomson Reuters Lipper. The data likely understates the AuM of hedge funds, which typically report to industry-specific databases.

[8] EFAMA Industry Fact Sheet, March 2016.

[9] Synthetic ETFs use synthetic replication strategies based on swaps to receive the returns of the index they track from a counterparty, instead of holding the underlying securities.

[10] Deli et al. (2015).

- structural changes in the functioning of financial markets, including the development of automated trading strategies;

- changes in the behaviour of market participants, including search for yield, in part driven by the low interest rate environment;

- new incentives introduced by prudential requirements in the banking sector.

In particular, the emergence of *synthetic prime brokerage* reflects an attempt by banks to diversify away from physical financing (i.e. securities financing transactions), as business models continue to adapt to the new trading environment and to regulatory requirements.

One of the main services that prime brokers offer to their clients is financing, a component of leverage. Physical financing of e.g. hedge funds has become expensive from the perspective of bank capital. In contrast, derivatives allow banks to create similar exposures at a cheaper cost, since the market value of instruments such as swaps or futures is comparably much smaller. *Synthetic financing* therefore facilitates prime broker clients' access to derivatives while helping banks to reduce capital requirements.[11]

Greater recourse to leverage by some types of EU investment funds in recent years is already apparent in conventional measures of (non-synthetic) leverage (V.36). Changes in the incentive structure of a key counterparty sector such as banks would presumably also impact funds' recourse to derivatives, and thus facilitate the build-up of synthetic leverage.

V.36
EA investment funds: Financial leverage
Increased leverage in bond funds
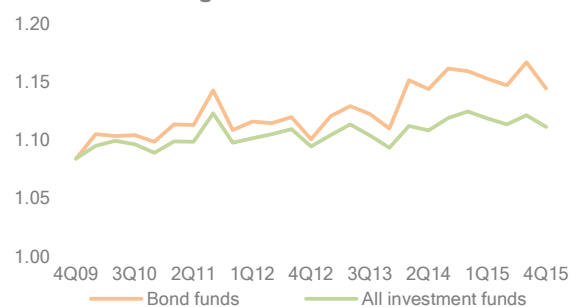
Note: EA investment fund leverage ratio computed as AuM/NAV.
Sources: ECB, ESMA.

Some recent market trends suggest that synthetic risk exposures may be gaining ground relative to cash trades, such as cash bond purchases, which are kept on balance sheet and must be financed through the use of repos.[12] These trends include for example negative asset swap spreads, reflecting high demand for derivatives, declining turnover in US repo markets, and increased trading activity on exchanges – except in interest rate swaps, where declining notional values outstanding reflect increased central-clearing and multilateral netting by CCPs.[13]

Additionally, changes in investor risk appetite (or tolerance) could contribute to the development of alternative vehicles or strategies in order to compensate for lower returns from traditional investments. Growing interest in such vehicles was recently documented by the SEC, which reported that the number of funds using alternative strategies grew by 17% annually (compared with 8% for the entire industry) between 2010 and 2014. Industry reports also highlighted the strong growth of the European hedge fund industry in 2015, with AuM growth of 9% despite mixed returns,[14] although recent evidence suggests that the trend might be slowing somewhat this year.

Analysis of leveraged strategies

As previously indicated, assessing the magnitude of leverage by investment funds is challenging. Future regulatory data collected under AIFMD will offer a comprehensive overview of the hedge fund industry, including derivative exposures and leverage based on the gross and the commitment methods (see next section). However, data on UCITS, by far the largest part of the fund industry, are not available at EU level.

In addition, synthetic leverage does not show up on funds' balance sheets. Relying on publicly available balance-sheet data (see e.g. A.112) thus offers little insight into leverage from the use of derivatives. This section therefore proposes a tentative methodology for identifying funds that

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[11]   Securities Financing Monitor (2016).

[12]   Goldman Sachs (2016).

[13]   Avalos et al. (2015).

[14]   Eurekahedge (2016).

are potentially synthetically leveraged, using commercial data[15], based on two main criteria.[16]

First, we look at the *beta* of self-reported leveraged funds and compare it with their non-leveraged peers*. The *beta* coefficient is a measure of the sensitivity of a fund portfolio to its benchmark, i.e. to market risk. It is obtained by regressing past returns on the fund's benchmark. A low beta ($\beta<1$) shows limited covariance between returns and the benchmark, which may reflect e.g. poor performance or the fund's strategy (protection against downturns or market volatility). For a given benchmark, there are several ways to achieve a higher *beta*, including greater weight on high-*beta* (more volatile) assets and increasing overall portfolio leverage.

For the analysis we use a sample of around 10,000 funds which take the S&P 500 index as benchmark, from April 2013 to April 2016.[17]. A high *beta* (e.g., $\beta=1.5$) would therefore indicate amplified positive and negative fund returns (e.g. by a 1.5 multiple) compared to S&P 500 index returns. High-*beta* funds tend to be riskier from an investor perspective, due to the higher average volatility of returns and potential for large losses. We find that the average monthly *beta* is 0.75 for the whole sample, while it stands at 1.26 for the 97 self-reported leveraged funds.[18] The difference gets larger in the higher percentiles, e.g. with a *beta* of 1.2 for the 90th percentile of all funds compared with 3.9 for the 90th percentile of leveraged funds (V.37).

V.37
Sample funds: *beta*
**Leveraged funds have higher *beta***
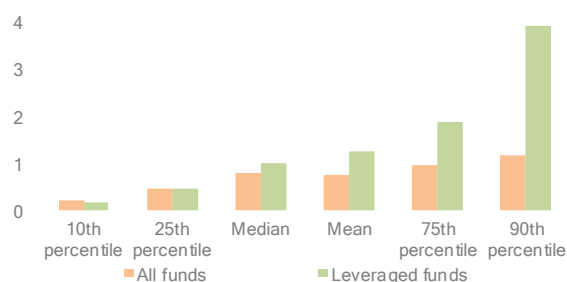
Note: Distribution of average monthly *beta* (in absolute terms) over the last three years for funds benchmarked against the S&P 500 index. Leveraged funds are self-reported.
Sources: Thomson Reuters Lipper, ESMA.

Second, we look at portfolio cash holdings reported by investment funds in the sample as a percentage of AuM. "Cash" also includes cash equivalents and money market securities. Cash allows funds to meet large redemptions without having to liquidate assets, while guaranteeing investors a certain degree of protection. This is prudent management as large investor redemptions might arise in times of stress, i.e. when assets are more likely to be sold at a loss. Such cash buffers are particularly relevant when a fund is invested in less-liquid assets, given their potentially higher price volatility, and the longer liquidation time they require.

Conversely, funds that are benchmarked against a liquid index such as the S&P 500 are less likely to hold large amounts of cash in their portfolio for this specific purpose, while cash is key for funds that use derivatives: it can be used as an offset to net out futures positions and other derivatives exposures on the liabilities side, or as a buffer to meet changes in variation margins and daily margining requirements. We find that average cash holdings in fund portfolios are 5.2% for the whole sample, while they stand at 44.4% for leveraged funds. As was the case with *beta*, this difference gets larger in the higher percentiles (V.38).

V.38
Sample funds: cash holdings
Leveraged funds rely heavily on cash
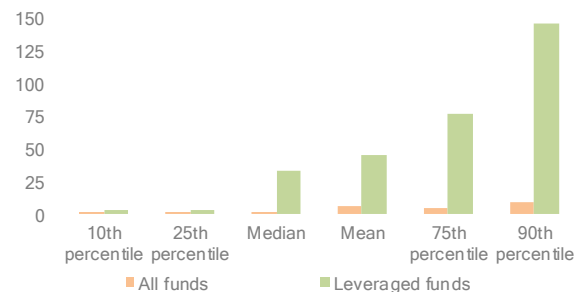
Note: Distribution of cash holdings as of May 2016 for funds benchmarked against the S&P 500 index, in % of AuM. Leveraged funds are self-reported.
Sources: Thomson Reuters Lipper, ESMA.

Based on these observations, we propose to use the highest decile of the whole sample to identify potentially synthetically leveraged funds, i.e.:

− a *beta* greater than 1.19;

− a portfolio share in cash greater than 9.1% of AuM.

The resulting sample contains 63 funds, based mainly in the US, with an average *beta* of 1.94

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[15] The analysis is based on data from Thomson Reuters Lipper.

[16] This methodology aims to identify funds that potentially make use of synthetic leverage, but does not assess to what extent they actually rely on it.

[17] We use the S&P 500 index as benchmark for robustness of the analysis, given that this is the most-used benchmark by investment funds.

[18] For funds using "inverse" strategies, *beta* tends to be negative. Since this is of little relevance to our analysis but affects the descriptive statistics, the calculations are based on absolute values.

and a portfolio share in cash of 54%. 32 of these funds are self-reported leveraged funds. As regards other funds, the prospectuses confirm that they do indeed rely on derivatives for portfolio management.

There are some clear limitations to this approach. Neither *beta* or cash holdings are good proxies for synthetic leverage, so the methodology might capture funds with e.g. a high *beta* and large cash holdings that are not using derivatives. However, both variables tend to be higher for leveraged funds – especially so for the top of the distribution – and using the two in combination increases the probability of accurately identifying synthetically leveraged funds, which is confirmed in the sample by quality checks.[19] In addition, the methodology does not distinguish between gross and net leverage. Funds that use derivatives strictly for hedging or netting purposes are likely to be bundled together with funds with net synthetic exposures.

Nonetheless, the proposed empirical approach offers a tractable methodology that can be refined to identify potentially synthetically leveraged funds for analytical purposes and replicated to a broader investment fund universe. For example, we observe that flows (net of valuation effects) tend to be much more volatile for leveraged funds, and even more so for the potentially synthetically leveraged ones, which is relevant from a financial stability point of view (V.39).[20]

V.39
Sample funds: Net flows
Volatile flows for leveraged funds
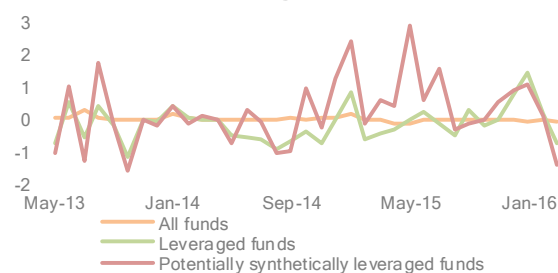
Note: Median net flows of funds benchmarked against the S&P 500 index. Monthly data, in % of AuM. Leveraged funds are self-reported. Potentially synthetically leveraged funds are identified using *beta* greater than 1.19 and cash holdings greater than 9.1% of AuM.
Sources: Thomson Reuters Lipper, ESMA.

Regulatory treatment of investment fund leverage

Some of the challenges in terms of data availability and analytical capacity to measure synthetic leverage in investment funds also reflect differences in the approach used under UCITS and AIFMD.

In the EU regulatory framework, leverage is calculated using the concept of global exposures,[21] which encompass both on-balance sheet (i.e. collateralised and uncollateralised borrowing) and off-balance sheet (derivatives) exposures. Synthetic leverage is therefore a subset of overall leverage which is neither explicitly identified in EU regulation nor calculated separately from financial leverage.

EU transparency requirements include three main approaches for the calculation of investment fund exposures:

–   The commitment approach, used in both UCITS and AIFMD, includes: i) the sum of cash-equivalent positions to those of derivatives' underlying assets, after netting and hedging arrangements; ii) the market value of the cash collateral reinvested or, for AIFs, non-cash collateral reused; and iii) for AIFs, all other assets and the reuse of cash borrowing.

–   The gross approach, used only in AIFMD, includes the absolute value of all AIF assets without applying netting and hedging arrangements.

–   The Value-at-Risk approach, used in UCITS for funds with complex investment strategies, and in AIFMD (when required by NCAs). This is not a direct measure of leverage but of the maximum potential loss due to market risk; therefore, UCITS using this approach are also required to disclose their maximum realised leverage calculated as the absolute value of derivatives notional divided by Net Asset Value.

For UCITS, limits to leverage exist or risks are mitigated through risk management requirements, e.g. by securing trades. At the micro-prudential level, UCITS are subject to strict rules on the extent to which they can increase their exposures. Concerning on-balance sheet

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[19]   The use of static thresholds, as well as missing data fields for many investment funds, also implies that some synthetically leveraged funds are likely not captured using this approach, therefore coverage is only partial.

[20]   *Beta* is calculated using returns; therefore we use net flows rather than the volatility of returns to provide an illustration of risks from leverage.

[21]   CESR (2010).

leverage, UCITS can only borrow up to 10% of their assets provided that such borrowing takes place on a temporary basis. In addition, plain vanilla fund exposures relating to derivative instruments calculated under the commitment approach cannot exceed the total net value of the portfolio. This means that the combined leverage from borrowing and derivatives cannot exceed 2.1 times the UCITS Net Asset Value.

An important distinction exists between funds with complex investment strategies[22] (or funds investing in so-called exotic products), and plain-vanilla funds. The first category may rely on synthetic leverage to a larger extent, with leverage calculated using a different approach than in the case of plain-vanilla funds. For UCITS using complex investment strategies, the commitment approach does not adequately capture risks, and funds may choose between the relative and the absolute Value-at-Risk (VaR) approaches.[23] The relative VaR allows funds to double the risk of loss compared to a similar but unleveraged portfolio or benchmark. The absolute VaR, on the other hand, is more appropriate for UCITS investing in multi-asset classes and cannot exceed 20% of a fund Net Asset Value. Depending on the type of derivative and volatility of the underlying assets, the VaR approach may in some cases allow for higher leverage.

AIFs, on the other hand, can be significantly leveraged, either through direct borrowing or derivatives, and are not subject to EU-wide regulatory limits.[24] Real estate funds typically invest in physical assets, but (depending on the national regulatory regime) may acquire so-called "property derivatives" to invest in sectors where they would not normally operate.[25] Similarly, private equity funds may rely on derivatives, e.g. for leveraged buy-outs,[26] although these funds are typically focused on extracting value from long-term investments. Hedge funds tend to create large synthetic exposures, both for hedging and speculative purposes, and may build significant leverage depending on their strategy

and risk appetite. NCAs may require AIFs to report their VaR and other risk measures, and the Directive foresees the possibility for them to impose limits on leverage in order to ensure the stability and integrity of the financial system.[27]

Financial stability risks

As recently highlighted by the US Financial Stability Oversight Council, "[…] the relationship between a hedge fund's level of leverage and risk, and whether that risk may have financial stability implications, is highly complex […]".[28] Several factors may reinforce risks from leverage, including among others concentration, margining requirements and liquidity of the underlying assets. Other aspects of derivatives markets may also create or contribute to systemic risks.

By creating contagion channels between market participants that may have very different reasons for dealing in these markets, synthetic leverage contributes to interconnectedness. For example, a hedge fund may offer to pay a fixed rate to an insurance company against a floating rate, using an interest rate swap. The insurer intends to hedge against downside movements in the floating rate, while the fund seeks to make a profit from upside movements. While derivatives can be used to hedge against risks (e.g. interest rate, counterparty credit or currency risk), they can also be part of a trading strategy. The swap allows both counterparties to satisfy their needs, but also changes the nature of the risk faced by the insurer.

As highlighted in the ESMA TRV No.1, 2016, strategies that are sensible from the risk management perspective of individual financial institutions may have consequences for the stability of financial markets. [29] *Gamma-hedging* strategies, which can involve index options, volatility-targeting portfolios and volatility hedging, can thus amplify intraday market movements, contributing to volatility and creating self-reinforcing price trends.

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[22] Complex investment strategies include for example option strategies, arbitrage strategies, or complex long/short strategies.

[23] Under the CESR Guidelines, funds are responsible for choosing the appropriate approach, as well as the VaR model, based on their investment strategy and complexity of instruments used. Common VaR models include the parametric model, historical simulation model and Monte Carlo simulation model.

[24] Unless a real estate or private equity fund opts to qualify for the European Long-Term Investment Funds (ELTIF), in which case restrictions will apply.

[25] Fabozzi et al. (2009).

[26] ECB (2007).

[27] ESMA may also issue advice to an NCA setting out measures that it believes should be taken.

[28] Financial Stability Oversight Council (2016).

[29] ESMA (2016), "Report on Trends, Risks and Vulnerabilities, No.1, 2016", p.10.

A comprehensive risk assessment would be required to identify and address all potential issues arising from recourse to synthetic leverage by investment funds. Such an assessment would require analysing:

- the specific features of each class of derivatives (options, swaps, futures), including cash flows, margining and collateralisation requirements, valuation standards, etc. and the potential risks entailed;

- the size (open interest) and turnover by asset class and type of underlying (interest rates, currencies, equities, etc.), the share of on-exchange versus OTC derivatives trading, and the share of central clearing for OTC derivatives, to assess the systemic relevance of each class of instruments;

- investment fund balance sheets to assess gross and net derivative exposures based on the different measures available, and leverage concentration of individual entities, and on aggregate by investment strategy to identify the purpose of their use.

While analytical work on derivatives markets using EMIR TR data is already underway, such a thorough risk assessment is not yet feasible based on current data availability and granularity at an EU level. However, upcoming AIFMD data will help to improve analysis of AIFs for which leverage limits do not exist and where the risks may be concentrated.

Conclusion

This article provided an overview of some of the issues related to the use of derivatives by investment funds and aspects to be considered in the assessment of systemic risk from synthetic leverage in the asset management industry.

Leverage is a complex notion that the literature is far from having fully explored. The off-balance sheet nature of synthetic exposures adds an additional layer of complexity, both in terms of the measurement, data availability and analysis of potential systemic risks.

However, the preliminary analysis and anecdotal evidence presented in this article on the growing use of derivatives in the asset management industry point to potential investor and financial stability risks which, through exploitation of upcoming regulatory data and regular market monitoring, warrant the attention of regulatory authorities going forward.
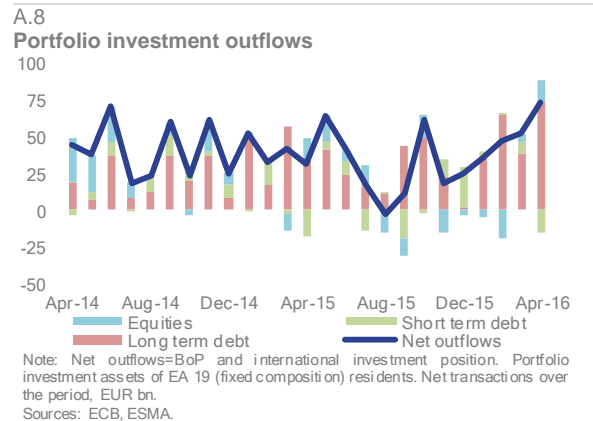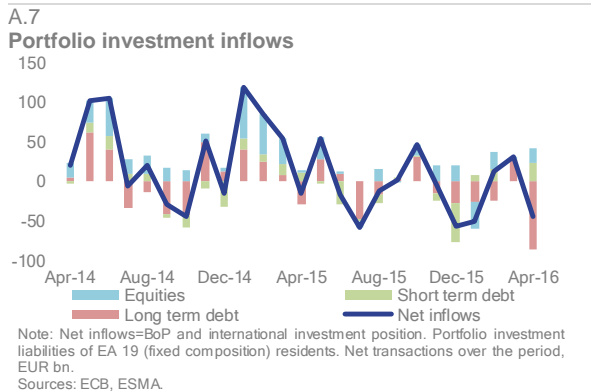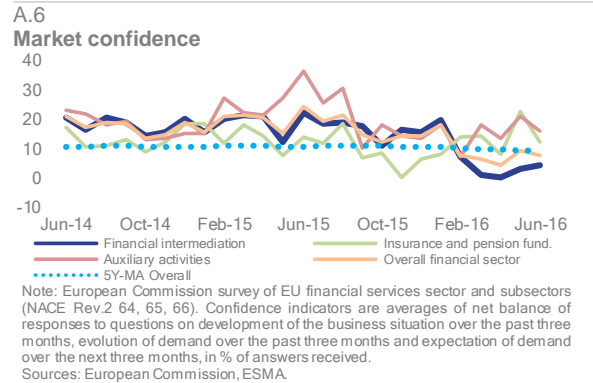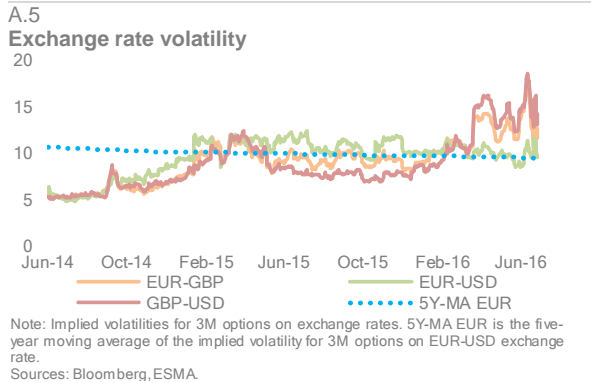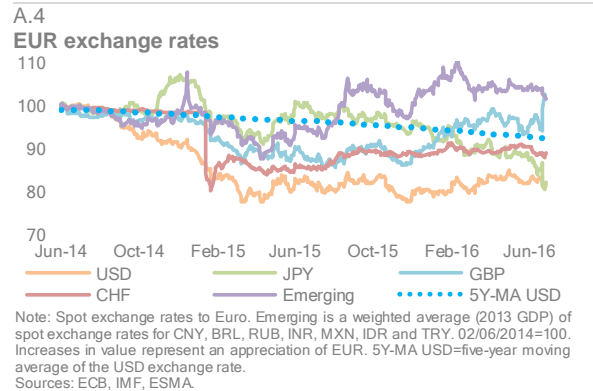
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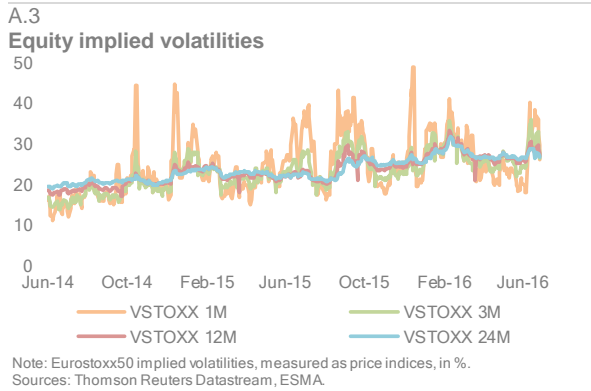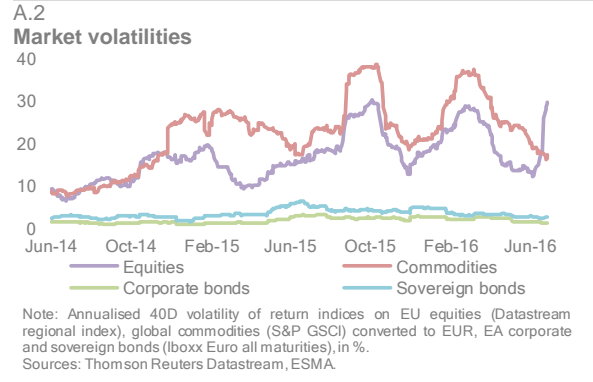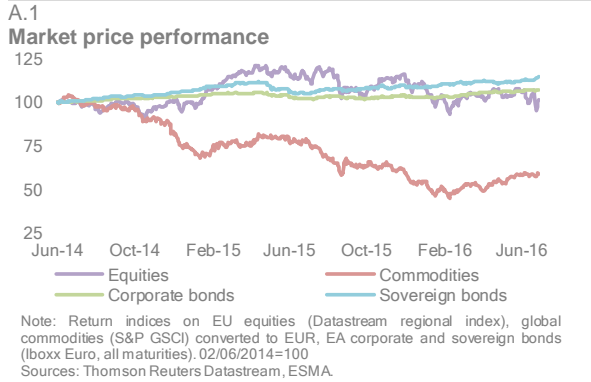
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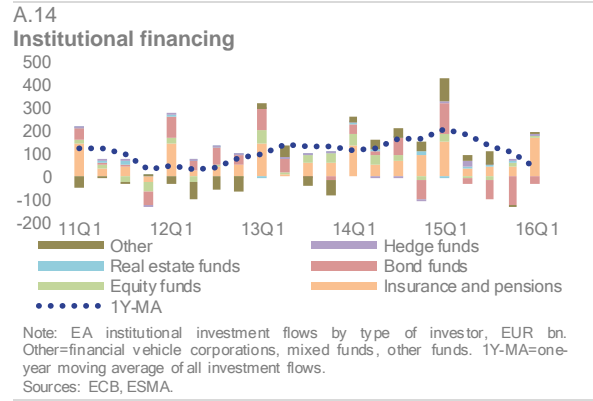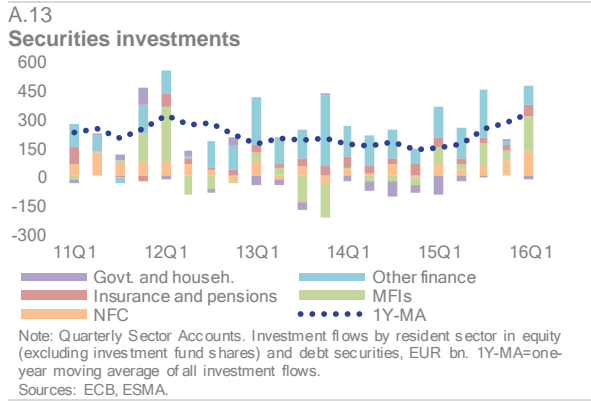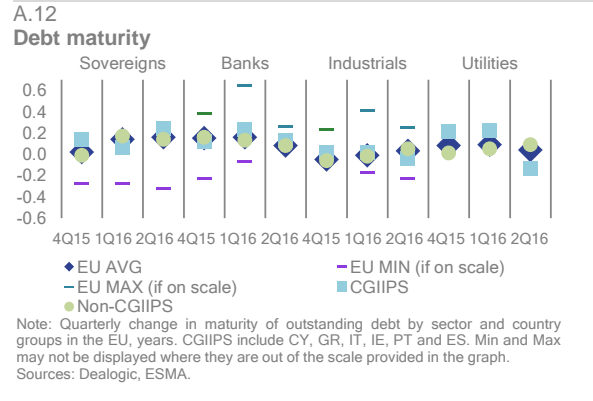
Annexes

Statistics

Securities markets

Market environment

A.1
Market price performance

Note: Return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro, all maturities). 02/06/2014=100
Sources: Thomson Reuters Datastream, ESMA.

A.2
Market volatilities

Note: Annualised 40D volatility of return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro all maturities), in %.
Sources: Thomson Reuters Datastream, ESMA.

A.3
Equity implied volatilities

Note: Eurostoxx50 implied volatilities, measured as price indices, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.4
EUR exchange rates

Note: Spot exchange rates to Euro. Emerging is a weighted average (2013 GDP) of spot exchange rates for CNY, BRL, RUB, INR, MXN, IDR and TRY. 02/06/2014=100. Increases in value represent an appreciation of EUR. 5Y-MA USD=five-year moving average of the USD exchange rate.
Sources: ECB, IMF, ESMA.

A.5
Exchange rate volatility

Note: Implied volatilities for 3M options on exchange rates. 5Y-MA EUR is the five-year moving average of the implied volatility for 3M options on EUR-USD exchange rate.
Sources: Bloomberg, ESMA.

A.6
Market confidence

Note: European Commission survey of EU financial services sector and subsectors (NACE Rev.2 64, 65, 66). Confidence indicators are averages of net balance of responses to questions on development of the business situation over the past three months, evolution of demand over the past three months and expectation of demand over the next three months, in % of answers received.
Sources: European Commission, ESMA.

A.7
Portfolio investment inflows

Note: Net inflows=BoP and international investment position. Portfolio investment liabilities of EA 19 (fixed composition) residents. Net transactions over the period, EUR bn.
Sources: ECB, ESMA.

A.8
Portfolio investment outflows

Note: Net outflows=BoP and international investment position. Portfolio investment assets of EA 19 (fixed composition) residents. Net transactions over the period, EUR bn.
Sources: ECB, ESMA.

A.9
Securities issuance

Note: Net issuance of debt securities, equities and securitised assets in the EA, by type of instrument and sector, in EUR bn. Securitised assets include ABS, MBS and covered bonds. Due to different netting and consolidation methodologies, the data may not be fully reconcilable. 1Y-MA markets=one-year moving average of the aggregate of all assets displayed in columns. 1Y-MA loans=one-year moving average of loan-based financing.
Sources: ECB, Dealogic, ESMA.

A.10
Debt issuance

Note: Growth rates of issuance volume, in %, normalised by standard deviation for the following bond classes: asset backed securities (ABS); high-yield (HY); investment grade (IG); covered bonds (CB); mortgage backed securities (MBS); money market (MM); sovereign (SOV). Percentiles computed from 12Q rolling window. All data include securities with a maturity higher than 18M. Bars denote the range of values between the 10th and 90th percentiles.
Sources: Dealogic, ESMA.

A.11
Credit terms in SFTs and OTC derivatives

Note: Weighted average of responses to the question: "Over the past three months, how have terms offered as reflected across the entire spectrum of securities financing and OTC derivatives transaction types changed?" 1=tightened considerably, 2=tightened somewhat, 3=remained basically unchanged, 4=eased somewhat and 5=eased considerably.
Sources: ECB, ESMA.

A.12
Debt maturity

Note: Quarterly change in maturity of outstanding debt by sector and country groups in the EU, years. CGIIPS include CY, GR, IT, IE, PT and ES. Min and Max may not be displayed where they are out of the scale provided in the graph.
Sources: Dealogic, ESMA.

A.13
Securities investments

Note: Quarterly Sector Accounts. Investment flows by resident sector in equity (excluding investment fund shares) and debt securities, EUR bn. 1Y-MA=one-year moving average of all investment flows.
Sources: ECB, ESMA.

A.14
Institutional financing

Note: EA institutional investment flows by type of investor, EUR bn. Other=financial vehicle corporations, mixed funds, other funds. 1Y-MA=one-year moving average of all investment flows.
Sources: ECB, ESMA.

Equity markets

A.15
Issuance by deal type

Note: EU deal value and number of deals in IPO and follow-on issuance. EUR bn. 5Y-MA=five-year moving average of the sum of deal values.
Sources: Dealogic, ESMA.

A.16
Issuance by sector

Note: EU equity issuance by sector, EUR bn. Finance includes closed-end funds, finance corporations, holding companies and insurance companies.
Sources: Dealogic, ESMA.

A.17
Price performance

Note: Datastream regional equity indices for the EU, the US and Japan, indexed with 02/06/2014=100. Indices in their regional currency.
Sources: Thomson Reuters Datastream, ESMA.

A.18
Price performance of national indices

Note: National equity indices, selected EU members, indexed with 02/06/2014=100.
Sources: Thomson Reuters Datastream, ESMA.

A.19
Price-earnings ratios

Note: Monthly earnings adjusted for trends and cyclical factors via Kalman filter methodology based on OECD leading indicators; units of standard deviation; averages computed from 8Y. Data available until the end of April 2016.
Sources: Thomson Reuters Datastream, ESMA.

A.20
Returns dispersion

Note: Dispersion of the weekly returns of the 26 main equity indices in the EU.
Sources: Thomson Reuters Datastream, ESMA.

A.21
Volatility

Note: Implied volatility of EuroStoxx50 (VSTOXX) and S&P 500 (VIX), in %.
Sources: Thomson Reuters Datastream, ESMA.

A.22
Illiquidity indicator

Note: Composite indicator of liquidity in the equity market for the current Eurostoxx 200 constituents, computed by applying the principal component methodology to six input liquidity measures (Amihud illiquidity coefficient, bid-ask spread, Hui-Heubel ratio, turnover value, inverse turnover ratio, MEC). The indicator range is between 0 (higher liquidity) and 1 (lower liquidity).
Sources: Thomson Reuters Datastream, ESMA.

A.23
Bid-ask spreads

Note: Liquidity measures as median of the bid-ask price percentage difference for the current EU constituents of Stoxx Europe Large 200, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.24
Liquidity dispersion

Note: Dispersion across EU countries of the national median bid-ask price percentage difference for the current EU constituents of the main national indices, in %. Truncated at 4% for clarity purposes. No data for CY, EE, LV, LT, MT and SK.
Sources: Thomson Reuters Datastream, ESMA.

Sovereign-bond markets

A.25
Issuance and outstanding

Outstanding EA
Euro area issuance (rhs)
5Y-MA EU (rhs)
Outstanding EU ex.EA
EU ex.EA issuance (rhs)

Note: Quarterly issuance (rhs), EUR bn, and outstanding debt (lhs), EUR tn. Amounts outstanding after 15Q4 forecasted.
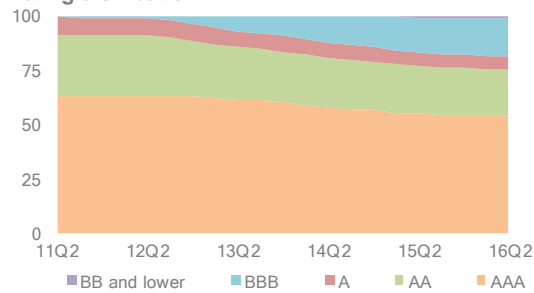Sources: Dealogic, Eurostat, AMECO, ESMA.

A.26
Issuance by credit rating

Below AA-
AAA
Avg Rating (rhs)
AA+ to AA-
5Y-MA

Note: Quarterly issuance in the EU, ratings at launch, EUR bn. Weighted average rating computed by converting ratings into a numeric scale (AAA=1, AA+=2, etc).
Sources: Dealogic, ESMA.

A.27
Rating distribution

BB and lower   BBB   A   AA   AAA

Note: Outstanding amount of sovereign bonds as of issuance date by rating category, in % of the total.
Sources: Dealogic, ESMA.

A.28
Equity-sovereign bond correlation dispersion

Top 25%   Core 50%   Bottom 25%   Median
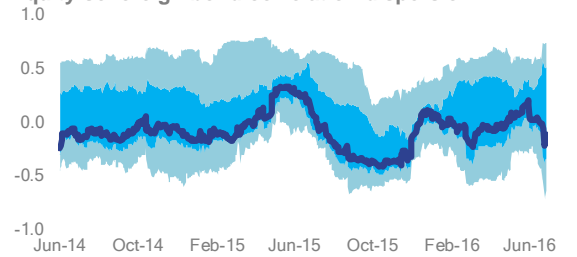
Note: Dispersion of the correlation between daily returns of national equity indices and national sovereign debt return index, for 16 countries in the EU, over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

A.29
Net issuance by country
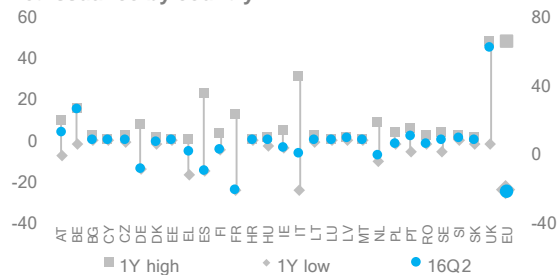
1Y high   1Y low   16Q2

Note: Quartely net issuance of EU sovereign debt by country, EUR bn. Net issuance calculated as the difference between new issuance over the quarter and outstanding debt maturing over the quarter. Highest and lowest quarterly net issuance in the past year are reported. EU total on right-hand scale.
Sources: Dealogic, ESMA.

A.30
10Y yields

DE   BE   ES
FR   IT   SE
GB   5Y-MA
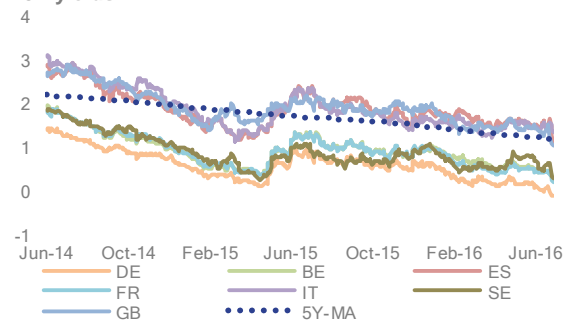
Note: Yields on 10Y sovereign bonds, selected EU members, in %. 5Y-MA=five-year moving average of EA 10Y bond indices computed by Datastream.
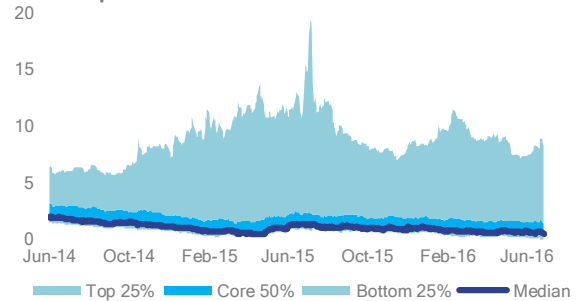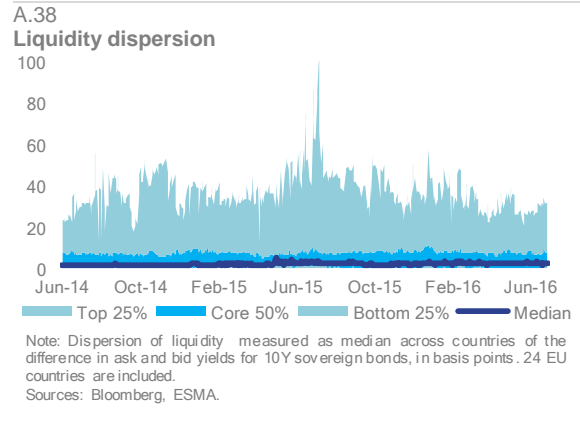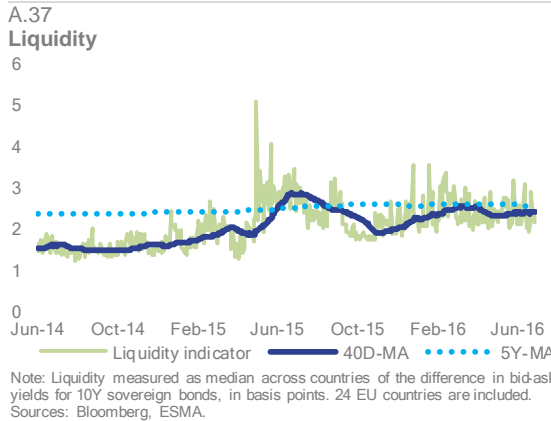Sources: Thomson Reuters Datastream, ESMA.

A.31
10Y spreads
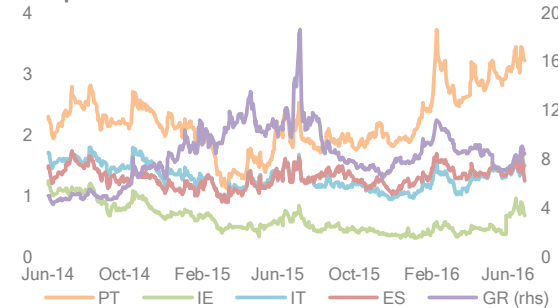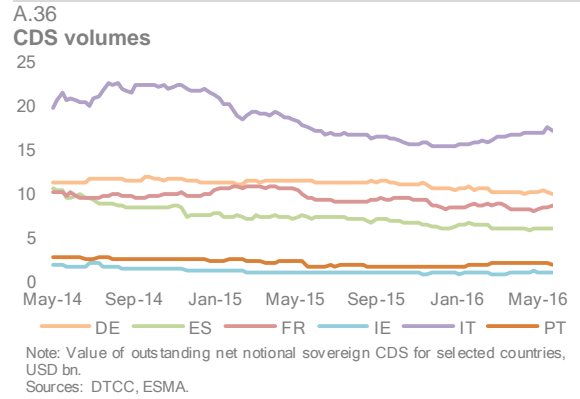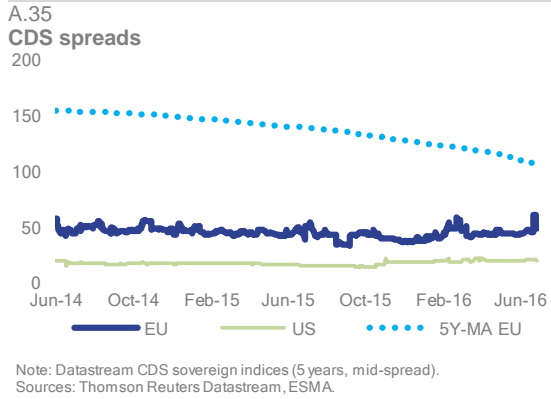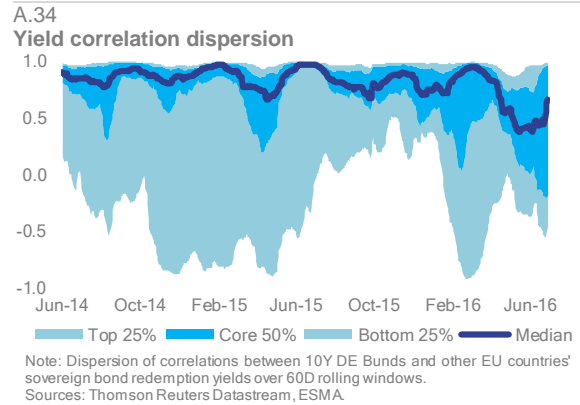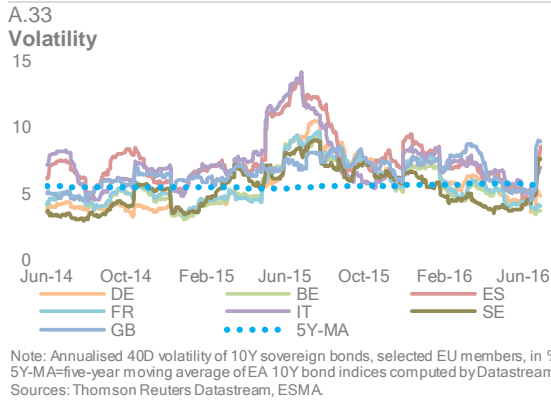

PT   IE   IT   ES   GR (rhs)

Note: Selected 10Y EA sovereign bond risk premia (vs. DE Bunds), in %.
Sources: Thomson Reuters Datastream, ESMA.
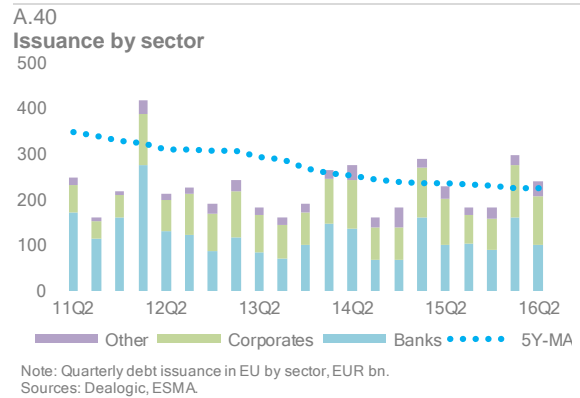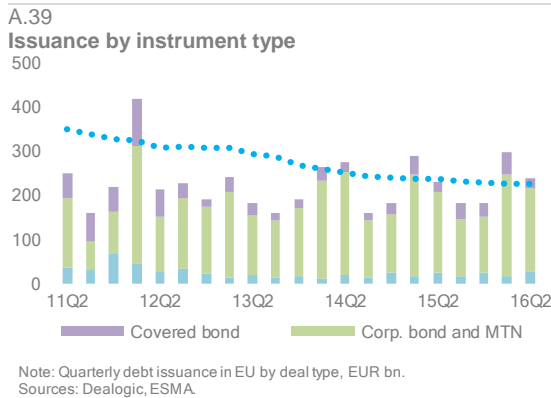
A.32
Yield dispersion

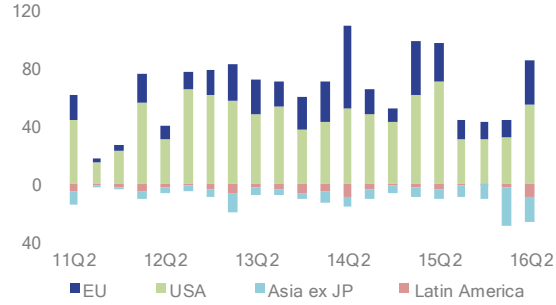Top 25%   Core 50%   Bottom 25%   Median

Note: Dispersion of yields on 10Y sovereign bonds of EU 17 countries, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.33
Volatility

Note: Annualised 40D volatility of 10Y sovereign bonds, selected EU members, in %.
5Y-MA=five-year moving average of EA 10Y bond indices computed by Datastream.
Sources: Thomson Reuters Datastream, ESMA.

A.34
Yield correlation dispersion

Note: Dispersion of correlations between 10Y DE Bunds and other EU countries'
sovereign bond redemption yields over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

A.35
CDS spreads

Note: Datastream CDS sovereign indices (5 years, mid-spread).
Sources: Thomson Reuters Datastream, ESMA.

A.36
CDS volumes

Note: Value of outstanding net notional sovereign CDS for selected countries,
USD bn.
Sources: DTCC, ESMA.

A.37
Liquidity

Note: Liquidity measured as median across countries of the difference in bid-ask
yields for 10Y sovereign bonds, in basis points. 24 EU countries are included.
Sources: Bloomberg, ESMA.

A.38
Liquidity dispersion

Note: Dispersion of liquidity measured as median across countries of the
difference in ask and bid yields for 10Y sovereign bonds, in basis points. 24 EU
countries are included.
Sources: Bloomberg, ESMA.

Corporate-bond markets

A.39
Issuance by instrument type

Note: Quarterly debt issuance in EU by deal type, EUR bn.
Sources: Dealogic, ESMA.

A.40
Issuance by sector

Note: Quarterly debt issuance in EU by sector, EUR bn.
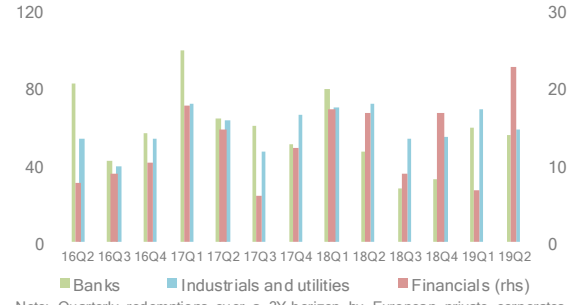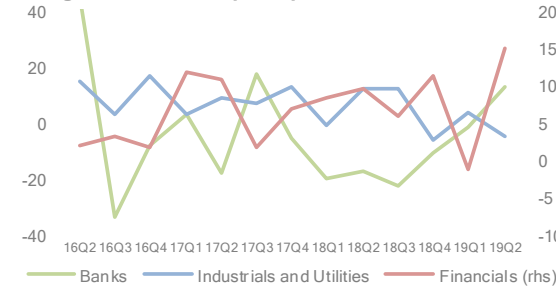Sources: Dealogic, ESMA.

A.41
High-yield issuance

Note: Quarterly data on high-yield corporate bond issuance by region of issuance, EUR bn.
Sources: Dealogic, ESMA.

A.42
**Debt redemption profile by sector**

Note: Quarterly redemptions over a 3Y-horizon by European private corporates (banks, non-bank financials, and industrials and utilities), EUR bn. Excluding bank redemptions to central banks.
Sources: Dealogic, ESMA.

A.43
Change in debt redemption profile

Note: Quarterly redemptions over a 3Y-horizon by European private corporates (banks, non-bank financials, and industrials and utilities), annual change, EUR bn. Excluding bank redemptions to central banks.
Sources: Dealogic, ESMA.

A.44
Hybrid capital instruments
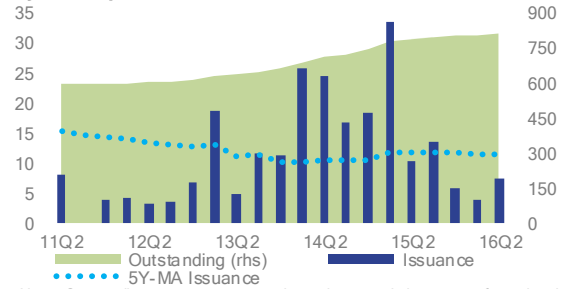
Note: Outstanding amount computed as the cumulative sum of previously issued debt minus the cumulative matured debt prior to reference date, EUR bn. According to Dealogic classification, hybrid capital refers to subordinated debt Tier 1 capital mainly with perpetual maturity.
Sources: Dealogic, ESMA.

A.45
Rating distribution
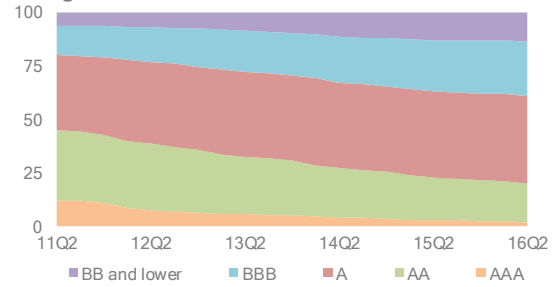
Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
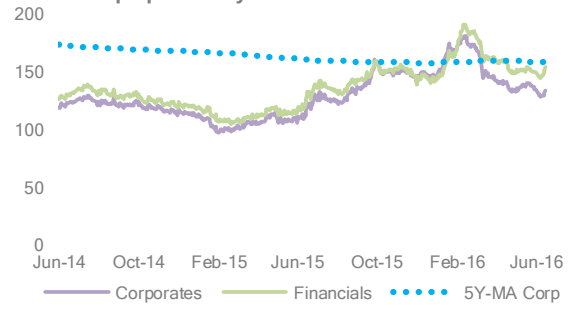Sources: Dealogic, ESMA.

A.46
Default rates
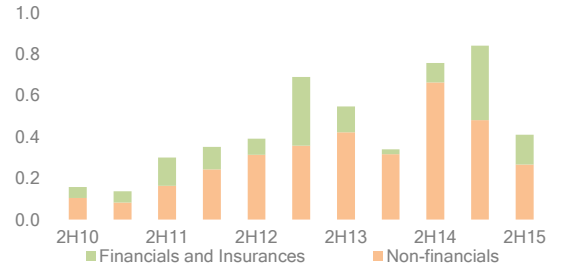
Note: Default rate of rated corporate bond issuers by sub-asset class, in % of total number of rated corporate bond issuers. Data from ICAP and CERVED are excluded as most rated entities are small corporates.
Sources: CEREP, ESMA.

A.47
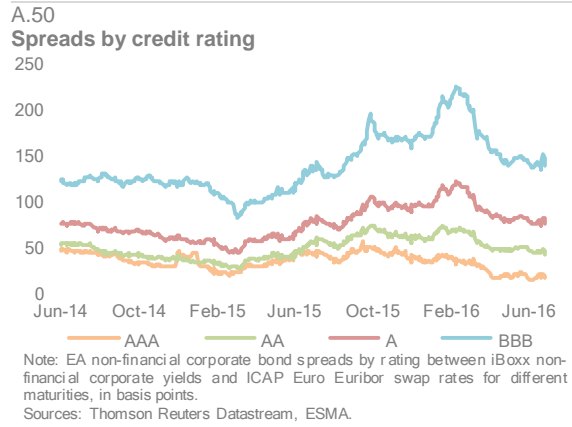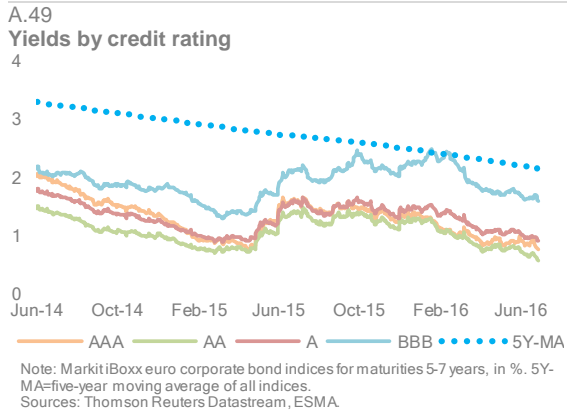**Sovereign-corporate yield correlation**
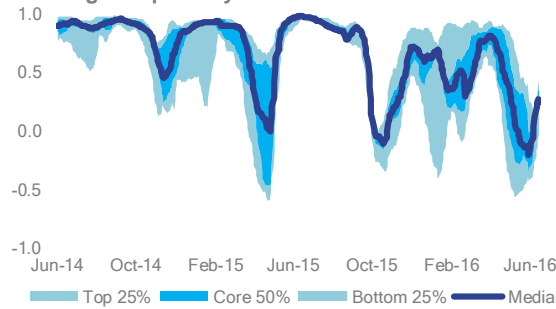
Note: Dispersion of correlation between Barclays Aggregate for corporate and 10Y sovereign bond redemption yields for BE, ES, FI, FR, IT, NL.
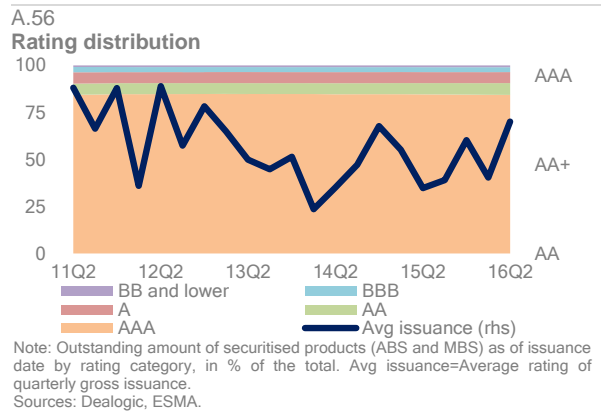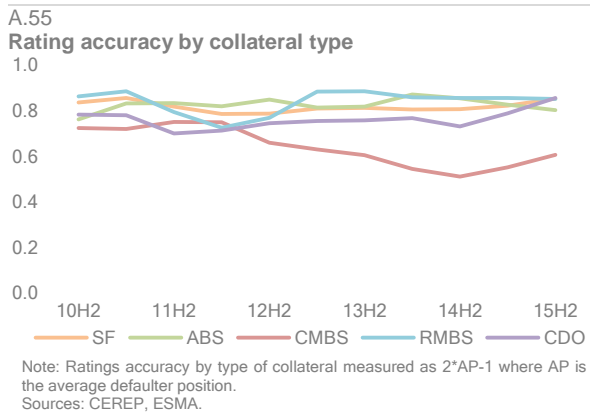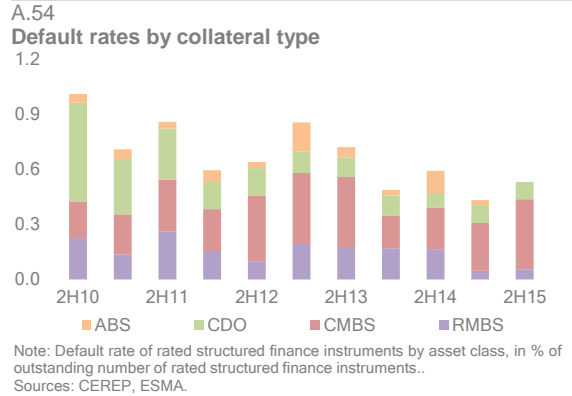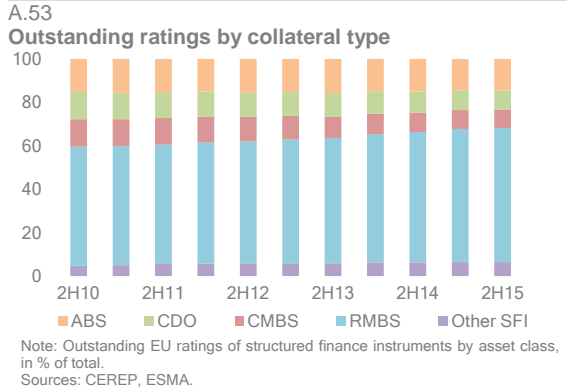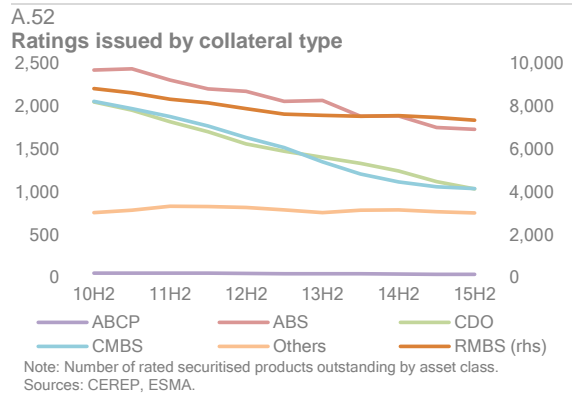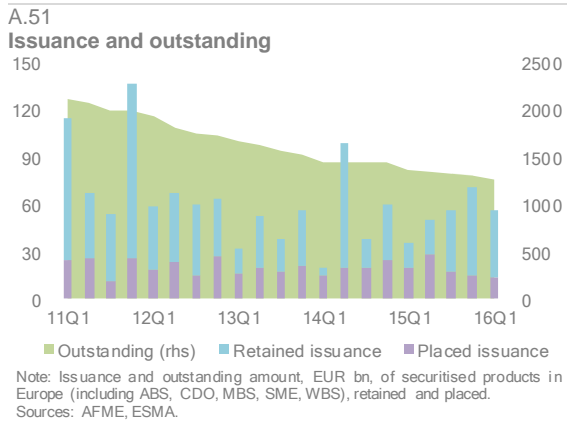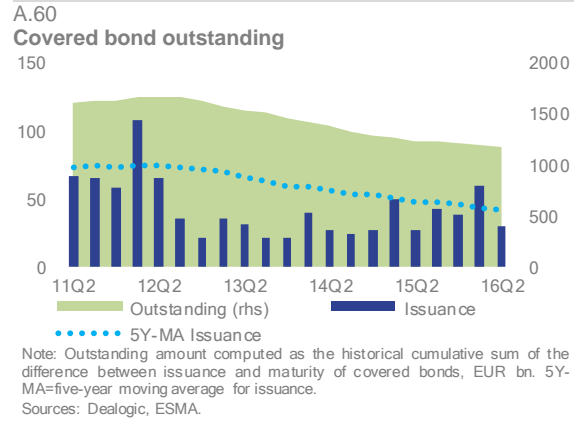Sources: Thomson Reuters Datastream, ESMA.

A.48
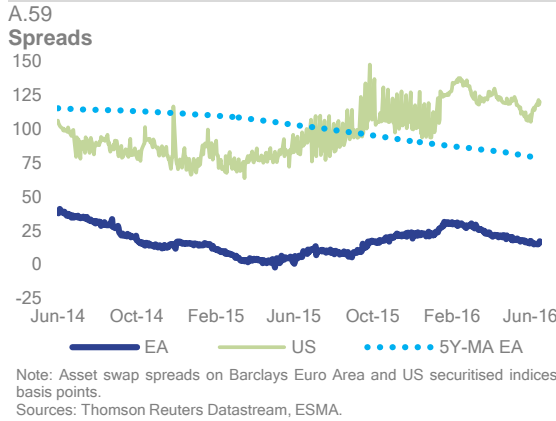**Asset swap spreads by sector**

Note: Asset swap spreads on Barclays Pan-European bond indices, basis points. 5Y-MA Corp=five-year moving average of corporate bond spreads.
Sources: Thomson Reuters Datastream, ESMA.

A.49
Yields by credit rating

Note: Markit iBoxx euro corporate bond indices for maturities 5-7 years, in %. 5Y-MA=five-year moving average of all indices.
Sources: Thomson Reuters Datastream, ESMA.

A.50
Spreads by credit rating

Note: EA non-financial corporate bond spreads by rating between iBoxx non-financial corporate yields and ICAP Euro Euribor swap rates for different maturities, in basis points.
Sources: Thomson Reuters Datastream, ESMA.

Securitised assets and covered bonds

A.51
Issuance and outstanding

Note: Issuance and outstanding amount, EUR bn, of securitised products in Europe (including ABS, CDO, MBS, SME, WBS), retained and placed.
Sources: AFME, ESMA.

A.52
Ratings issued by collateral type

Note: Number of rated securitised products outstanding by asset class.
Sources: CEREP, ESMA.

A.53
Outstanding ratings by collateral type

Note: Outstanding EU ratings of structured finance instruments by asset class, in % of total.
Sources: CEREP, ESMA.

A.54
Default rates by collateral type

Note: Default rate of rated structured finance instruments by asset class, in % of outstanding number of rated structured finance instruments..
Sources: CEREP, ESMA.

A.55
Rating accuracy by collateral type

Note: Ratings accuracy by type of collateral measured as 2*AP-1 where AP is the average defaulter position.
Sources: CEREP, ESMA.

A.56
Rating distribution

Note: Outstanding amount of securitised products (ABS and MBS) as of issuance date by rating category, in % of the total. Avg issuance=Average rating of quarterly gross issuance.
Sources: Dealogic, ESMA.

A.57
Rating changes

Note: Number of rating changes on securitised assets.
Sources: CEREP, ESMA.

A.58
Size of rating changes

Note: Average size of upgrades and downgrades when credit rating agencies took rating actions on securitised assets, number of buckets traversed.
Sources: CEREP, ESMA.

A.59
Spreads

Note: Asset swap spreads on Barclays Euro Area and US securitised indices, basis points.
Sources: Thomson Reuters Datastream, ESMA.

A.60
Covered bond outstanding

Note: Outstanding amount computed as the historical cumulative sum of the difference between issuance and maturity of covered bonds, EUR bn. 5Y-MA=five-year moving average for issuance.
Sources: Dealogic, ESMA.

A.61
Rating distribution of covered bonds

Note: Outstanding amount of covered bonds as of issuance date by rating category, in % of the total. Avg issuance=Average rating of quarterly gross issuance.
Sources: Dealogic, ESMA.

A.62
Covered bond spreads

Note: Asset swap spreads based on iBoxx covered bond indices, basis points. 5Y-MA=five-year moving average of all bonds.
Sources: Thomson Reuters Datastream, ESMA.

Credit quality

A.63
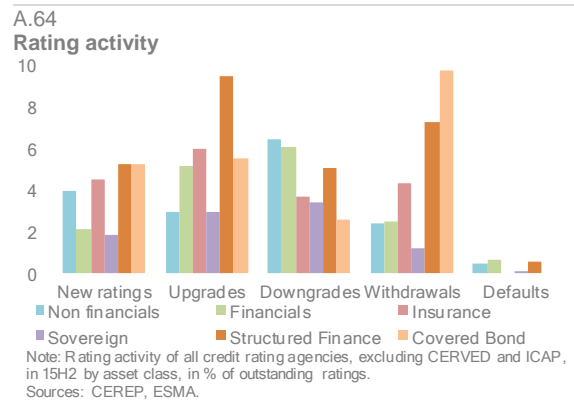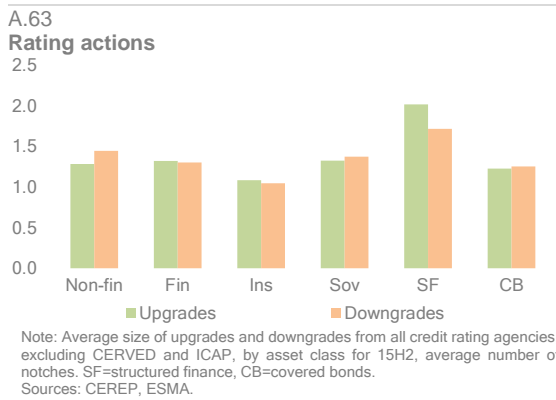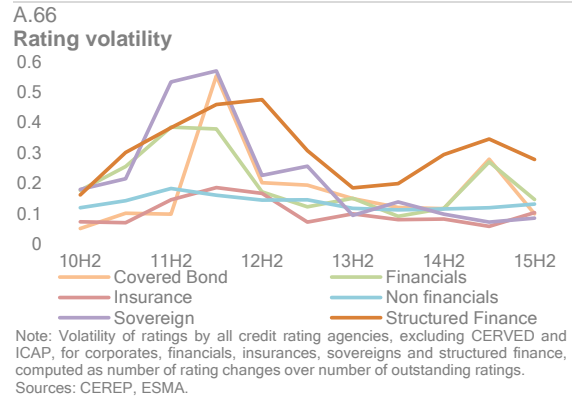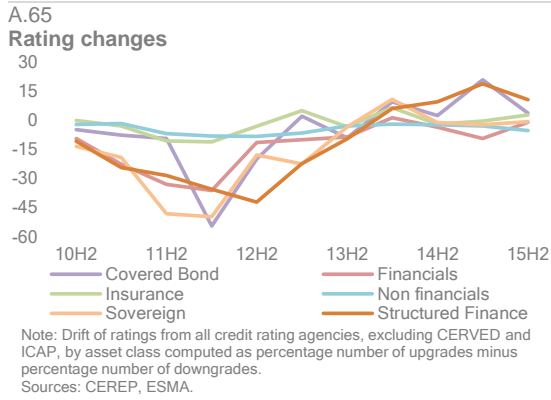**Rating actions**

Note: Average size of upgrades and downgrades from all credit rating agencies, excluding CERVED and ICAP, by asset class for 15H2, average number of notches. SF=structured finance, CB=covered bonds.
Sources: CEREP, ESMA.

A.64
Rating activity

Note: Rating activity of all credit rating agencies, excluding CERVED and ICAP, in 15H2 by asset class, in % of outstanding ratings.
Sources: CEREP, ESMA.

A.65
Rating changes

Note: Drift of ratings from all credit rating agencies, excluding CERVED and ICAP, by asset class computed as percentage number of upgrades minus percentage number of downgrades.
Sources: CEREP, ESMA.

A.66
Rating volatility

Note: Volatility of ratings by all credit rating agencies, excluding CERVED and ICAP, for corporates, financials, insurances, sovereigns and structured finance, computed as number of rating changes over number of outstanding ratings.
Sources: CEREP, ESMA.

Securities financing and collateral

A.67
Securities lending by instrument type

Note: Total value of EU securities on loan, EUR bn.
Sources: Markit Securities Finance, ESMA.

A.68
Securities lending by region

Note: Total value of EU and US securities on loan, EUR bn. 5Y-MA EU=five-year moving average for EU securities.
Sources: Markit Securities Finance, ESMA.

A.69
Securities utilisation rates

Note: European securities lending utilisation rate, computed as outstanding value of securities on loan over outstanding total lendable value, in %. Corporate bonds comprise EUR denominated bonds only.
Sources: Markit Securities Finance, ESMA.

A.70
Securities lending against cash collateral

Note: Ratio of European securities on loan collateralised with cash over total securities on loan, outstanding values, in %.
Source: Markit Securities Finance, ESMA.

A.71
Securities lending with open maturity

Note: Ratio of European securities on loan at open maturity over total securities on loan, outstanding values, in %.
Sources: Markit Securities Finance, ESMA.

A.72
Sovereign repo rates dispersion

Note: Dispersion of seven sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), volume-weighted average of fixed rates index value, in %.
Sources: RepoFunds Rate (BrokerTec, MTS, ICAP), ESMA.

A.73
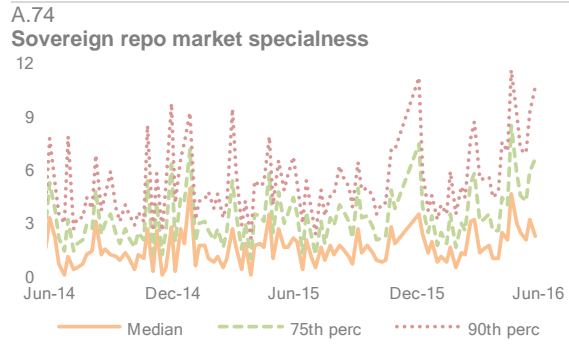**Sovereign repo volumes**

Note: 20D-MA of specific and general collateral transaction volumes executed through CCPs in seven sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), EUR bn. Index volumes filter out atypical transactions.
Sources: RepoFunds Rate (BrokerTec, MTS, ICAP), ESMA.

A.74
Sovereign repo market specialness

Note: Median, 75th and 90th percentile of weekly specialness, measured as the difference between general collateral and special collateral repo rates on government bonds in selected countries, in basis points.
Sources: RepoFunds Rate (BrokerTec, MTS, ICAP), ESMA.

A.75
**Securities financing conditions**
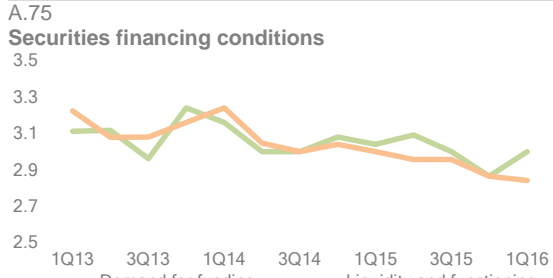
Note: Weighted average of responses to the questions: "Over the past 3M, how has demand for funding / how have liquidity and functioning for all collateral types changed?" 1= decreased / deteriorated considerably, 2= decreased / deteriorated somewhat, 3= remained basically unchanged, 4= increased / improved somewhat, and 5= increased / improved considerably.
Sources: ECB, ESMA.

A.76
High-quality collateral outstanding
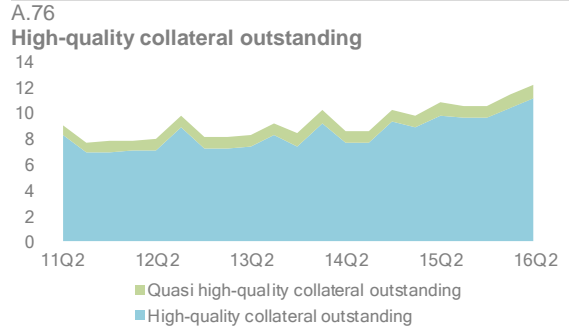
Note: Amount outstanding and quarterly change, EUR tn. High-quality collateral is the sum of outstanding debt securities issued by EU governments with a rating equal to or higher than BBB-.Quasi high-quality is outstanding corporate debt with rating equal to or higher than AA-.
Sources: Dealogic, Eurostat, AMECO, Standard & Poor's, ESMA.

Short selling

A.77
**Value of short selling positions on shares**
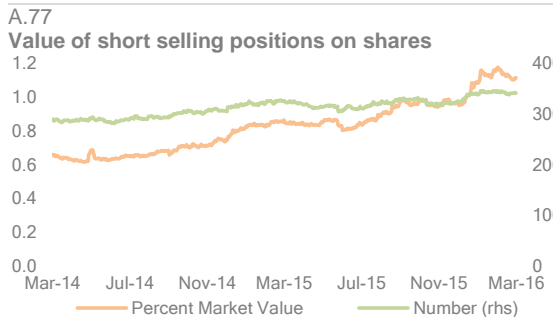
Note: Market value of short selling positions as percentage of total market value in the EU (lhs). Number of listed shares on which short positions were reported by NCAs under EU Short Selling Regulation (rhs).
Sources: National Competent Authorities, Datastream, ESMA.

A.78
Dispersion of net short positions on shares
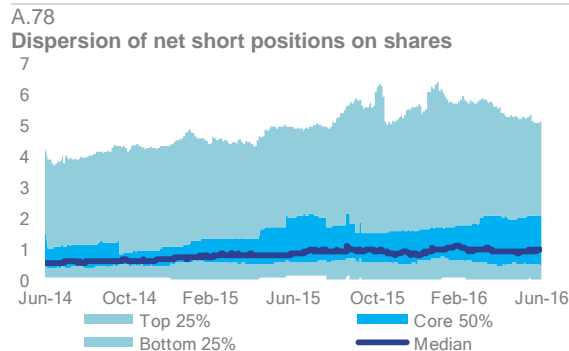
Note: Dispersion of net short positions by country as percentage of market value of those positions relative to each country's blue chip index market value. Sample consists of all equities that were reported since 01/11/2012.
Sources: National Competent Authorities, Datastream, ESMA.

A.79
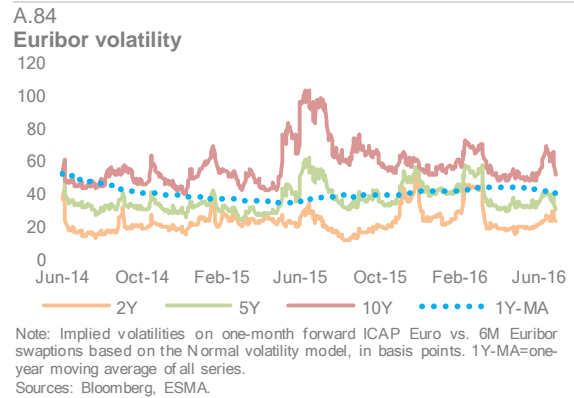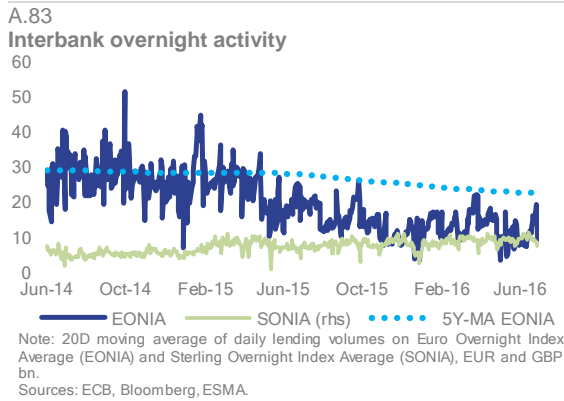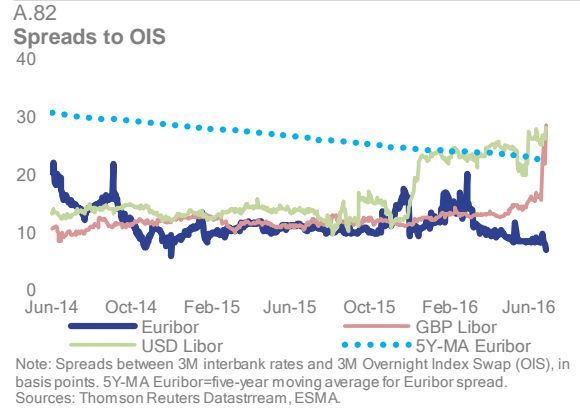**Net short positions on sovereigns**
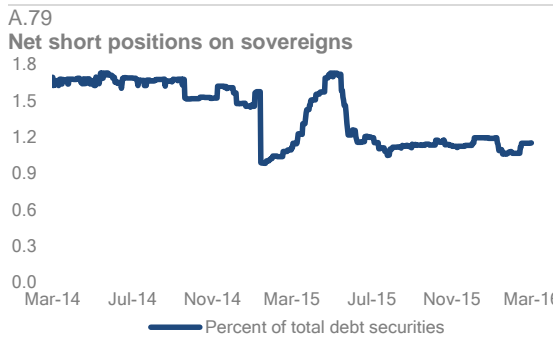
Note: Net short positions held on sovereigns, in % of total debt securities in EU. Sample consists of all EU Member States that reported since 01/11/2012.
Sources: National Competent Authorities, ESMA.

A.80
Dispersion of net short positions on sovereigns
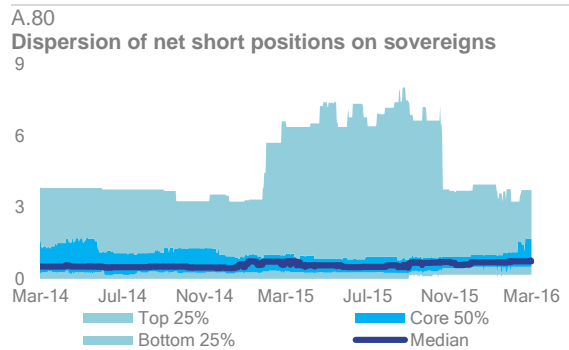
Note: Dispersion of net short positions held on selected sovereigns, in % of each country's total debt securities. Sample consists of all equities that were reported since 01/11/2012.
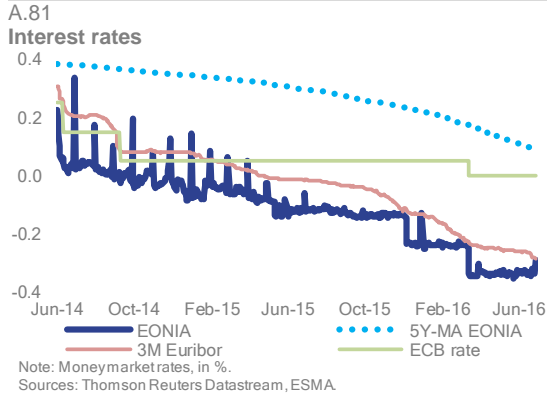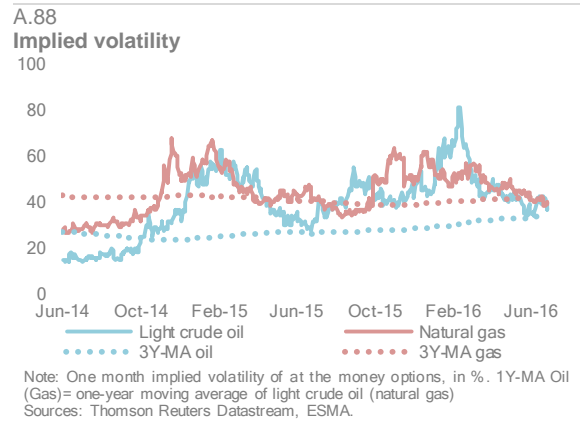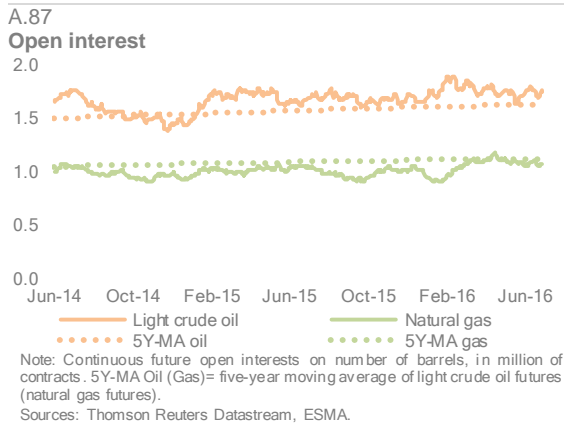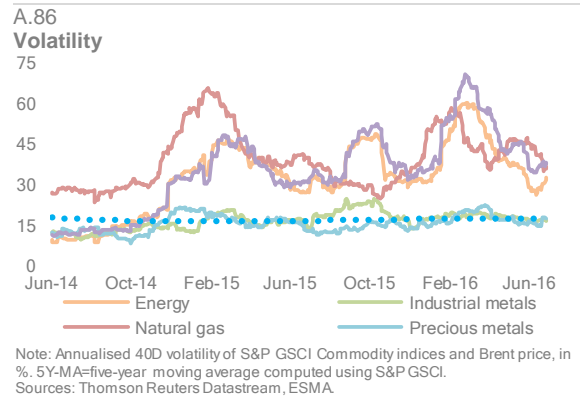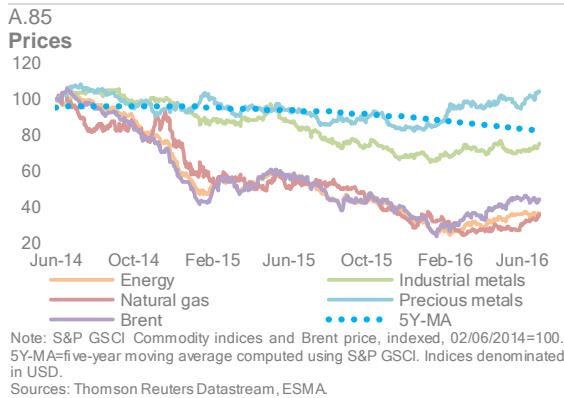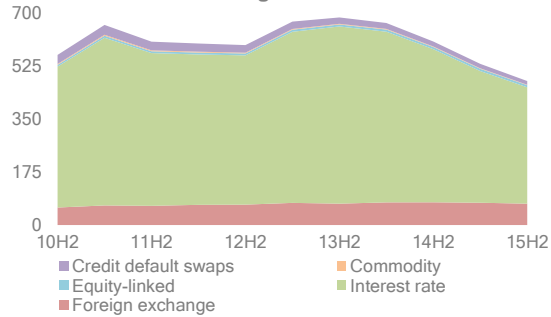Sources: National Competent Authorities, ESMA.

Money markets

A.81
Interest rates

Note: Money market rates, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.82
Spreads to OIS

Note: Spreads between 3M interbank rates and 3M Overnight Index Swap (OIS), in basis points. 5Y-MA Euribor=five-year moving average for Euribor spread.
Sources: Thomson Reuters Datastrream, ESMA.

A.83
Interbank overnight activity

Note: 20D moving average of daily lending volumes on Euro Overnight Index Average (EONIA) and Sterling Overnight Index Average (SONIA), EUR and GBP bn.
Sources: ECB, Bloomberg, ESMA.

A.84
Euribor volatility

Note: Implied volatilities on one-month forward ICAP Euro vs. 6M Euribor swaptions based on the Normal volatility model, in basis points. 1Y-MA=one-year moving average of all series.
Sources: Bloomberg, ESMA.

Commodity markets

A.85
Prices

Note: S&P GSCI Commodity indices and Brent price, indexed, 02/06/2014=100. 5Y-MA=five-year moving average computed using S&P GSCI. Indices denominated in USD.
Sources: Thomson Reuters Datastream, ESMA.

A.86
Volatility

Note: Annualised 40D volatility of S&P GSCI Commodity indices and Brent price, in %. 5Y-MA=five-year moving average computed using S&P GSCI.
Sources: Thomson Reuters Datastream, ESMA.

A.87
Open interest

Note: Continuous future open interests on number of barrels, in million of contracts. 5Y-MA Oil (Gas)= five-year moving average of light crude oil futures (natural gas futures).
Sources: Thomson Reuters Datastream, ESMA.

A.88
Implied volatility

Note: One month implied volatility of at the money options, in %. 1Y-MA Oil (Gas)= one-year moving average of light crude oil (natural gas)
Sources: Thomson Reuters Datastream, ESMA.

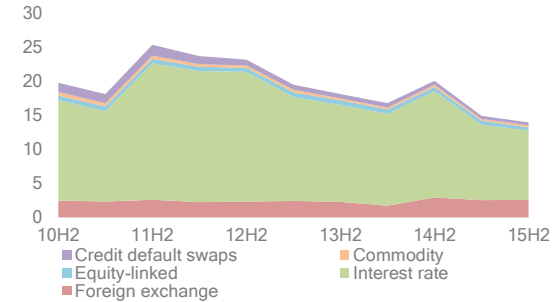# Derivatives markets

A.89
OTC notional outstanding

Note: Gross notional amounts of outstanding OTC derivatives by product category, USD tn.
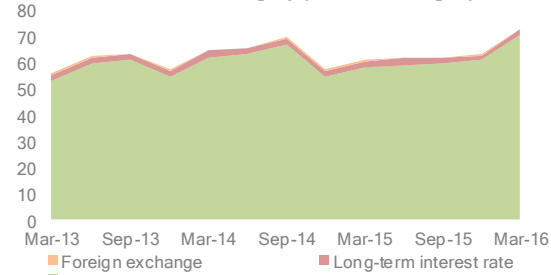Sources: Bank for International Settlements, ESMA.

A.90
OTC market value

Note: Gross market values of outstanding OTC derivatives by category, USD tn. Gross market values represent the cost of replacing all open contracts at the prevailing market prices.
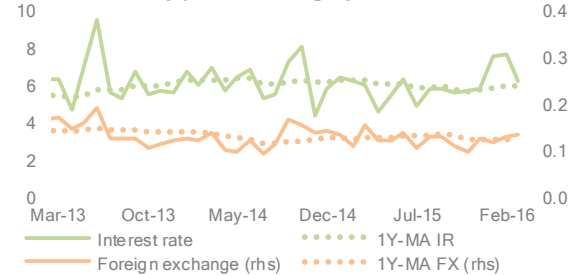Sources: Bank for International Settlements, ESMA.

A.91
ETD notional outstanding by product category

Note: Open interest in exchange-traded derivatives by risk category, quarterly data, in USD tn.
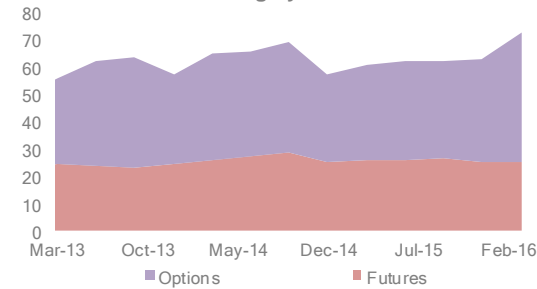Sources: BIS, ESMA.

A.92
ETD turnover by product category

Note: Global average daily turnover in exchange-traded derivatives by risk category, monthly data, in USD tn. 1Y-MA IR=one-year moving average for interest rate, 1Y-MA FX=one-year moving average for foreign exchange.
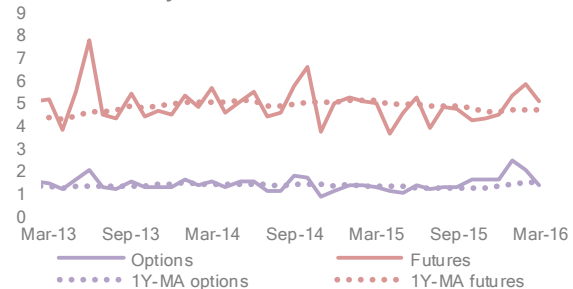Sources: BIS, ESMA.

A.93
ETD notional outstanding by asset class

Note: Open interest in exchange-traded derivatives by asset class, quarterly data, in USD tn.
Sources: BIS, ESMA.

A.94
ETD turnover by asset class

Note: Global average daily turnover in exchange-traded derivatives by asset class, monthly data, in USD tn.
Sources: BIS, ESMA.

A.95
ETD notional outstanding by exchange location
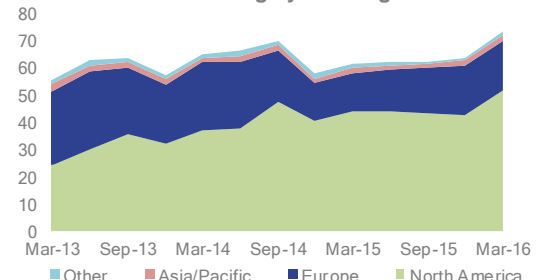
Note: Open interest in exchange-traded derivatives by exchange location, quarterly data, in USD tn.
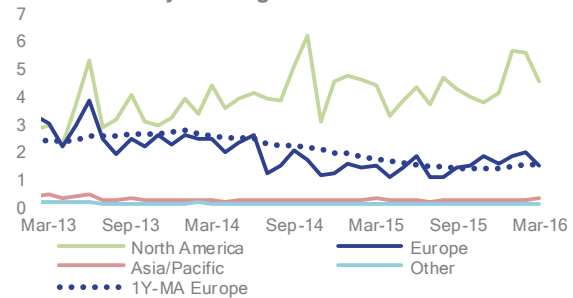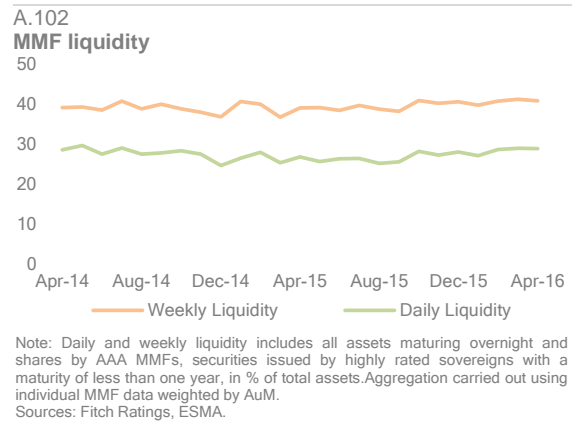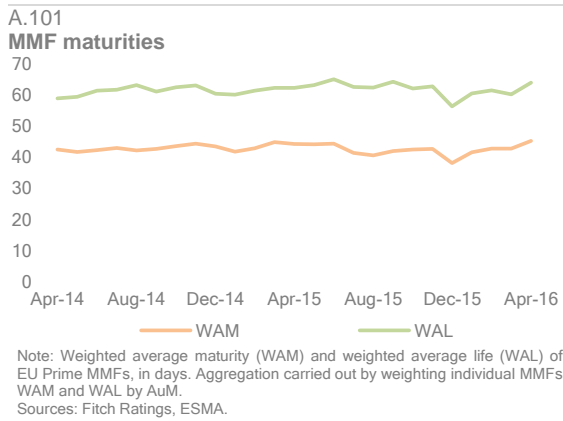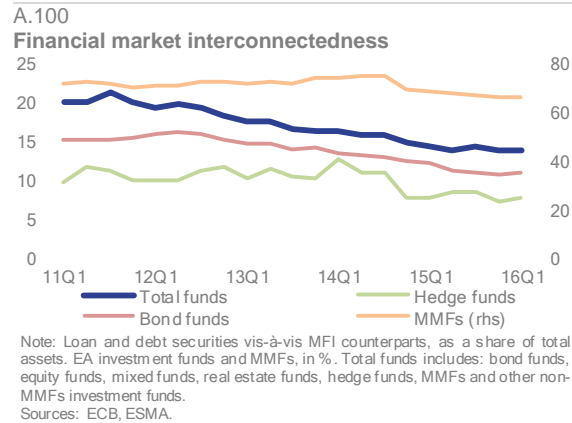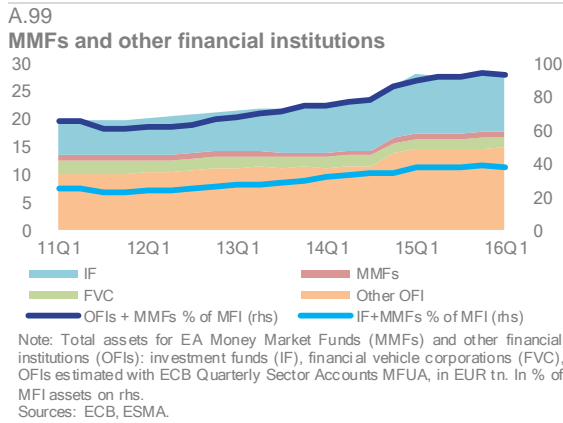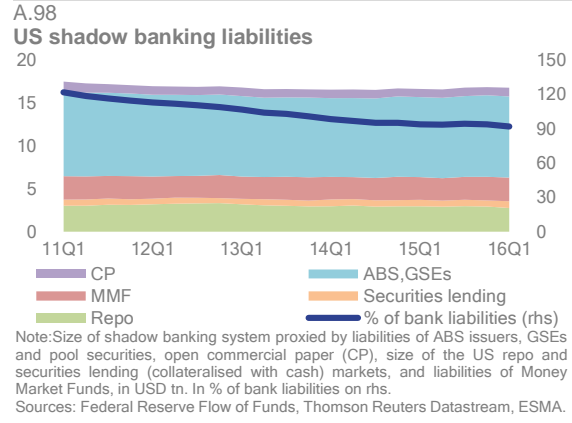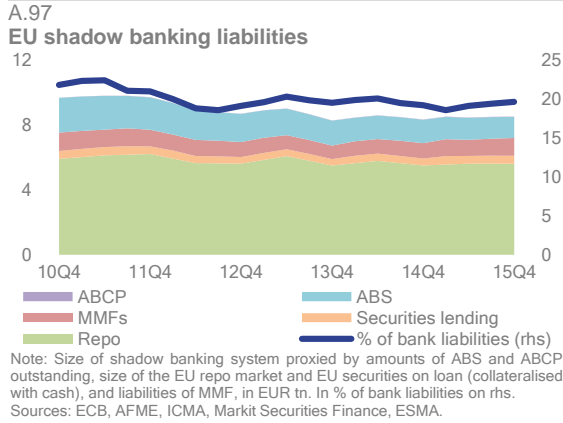Sources: BIS, ESMA.
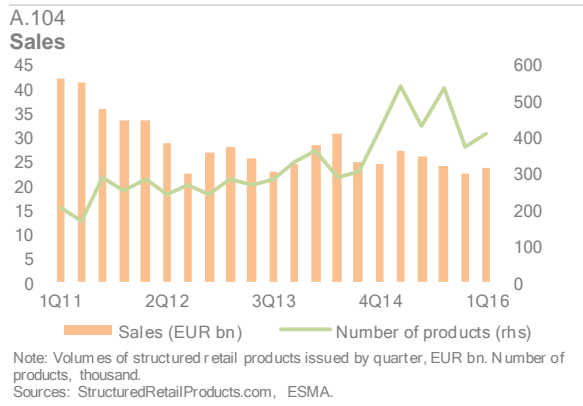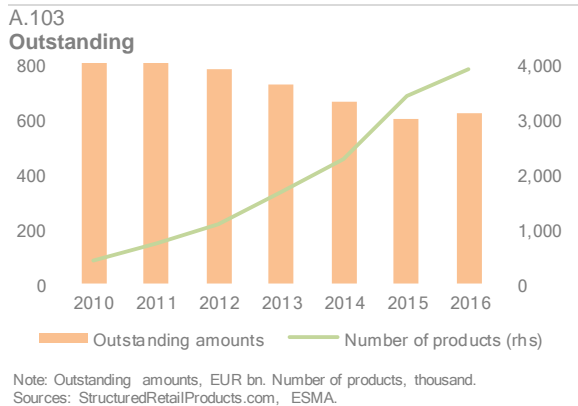
A.96
ETD turnover by exchange location

Note: Global average daily turnover in exchange-traded derivatives by exchange location, monthly data in USD tn. "Europe" as defined by BIS.
Sources: BIS, ESMA.

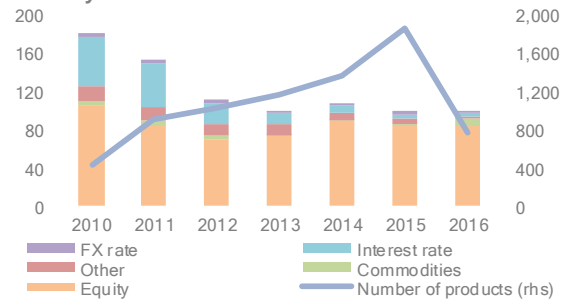# Shadow banking and market-based credit intermediation

A.97
EU shadow banking liabilities

ABCP
MMFs
Repo
ABS
Securities lending
% of bank liabilities (rhs)

Note: Size of shadow banking system proxied by amounts of ABS and ABCP outstanding, size of the EU repo market and EU securities on loan (collateralised with cash), and liabilities of MMF, in EUR tn. In % of bank liabilities on rhs.
Sources: ECB, AFME, ICMA, Markit Securities Finance, ESMA.

A.98
US shadow banking liabilities

CP
MMF
Repo
ABS,GSEs
Securities lending
% of bank liabilities (rhs)

Note:Size of shadow banking system proxied by liabilities of ABS issuers, GSEs and pool securities, open commercial paper (CP), size of the US repo and securities lending (collateralised with cash) markets, and liabilities of Money Market Funds, in USD tn. In % of bank liabilities on rhs.
Sources: Federal Reserve Flow of Funds, Thomson Reuters Datastream, ESMA.

A.99
MMFs and other financial institutions

IF
FVC
OFIs + MMFs % of MFI (rhs)
MMFs
Other OFI
IF+MMFs % of MFI (rhs)

Note: Total assets for EA Money Market Funds (MMFs) and other financial institutions (OFIs): investment funds (IF), financial vehicle corporations (FVC), OFIs estimated with ECB Quarterly Sector Accounts MFUA, in EUR tn. In % of MFI assets on rhs.
Sources: ECB, ESMA.

A.100
Financial market interconnectedness

Total funds
Bond funds
Hedge funds
MMFs (rhs)

Note: Loan and debt securities vis-à-vis MFI counterparts, as a share of total assets. EA investment funds and MMFs, in %. Total funds includes: bond funds, equity funds, mixed funds, real estate funds, hedge funds, MMFs and other non-MMFs investment funds.
Sources: ECB, ESMA.

A.101
MMF maturities

WAM
WAL

Note: Weighted average maturity (WAM) and weighted average life (WAL) of EU Prime MMFs, in days. Aggregation carried out by weighting individual MMFs WAM and WAL by AuM.
Sources: Fitch Ratings, ESMA.

A.102
MMF liquidity

Weekly Liquidity
Daily Liquidity

Note: Daily and weekly liquidity includes all assets maturing overnight and shares by AAA MMFs, securities issued by highly rated sovereigns with a maturity of less than one year, in % of total assets.Aggregation carried out using individual MMF data weighted by AuM.
Sources: Fitch Ratings, ESMA.

Structured retail products

A.103
Outstanding

Outstanding amounts
Number of products (rhs)

Note: Outstanding amounts, EUR bn. Number of products, thousand.
Sources: StructuredRetailProducts.com, ESMA.

A.104
Sales

Sales (EUR bn)
Number of products (rhs)

Note: Volumes of structured retail products issued by quarter, EUR bn. Number of products, thousand.
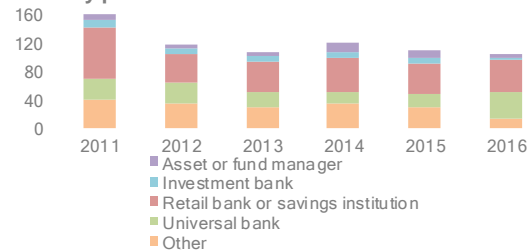Sources: StructuredRetailProducts.com, ESMA.

A.105
Sales by asset class

Note: Volumes of structured products sold to retail investors by asset class, EUR bn. Number of products sold, thousand. 2016 data year-to-date.
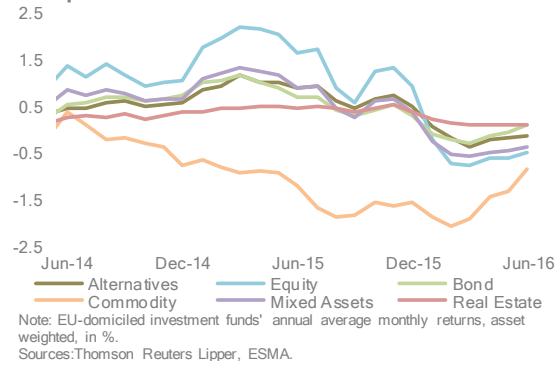Sources: StructuredRetailProducts.com, ESMA.

A.106
Sales by provider

Note: Annual volumes of structured products sold to retail investors by provider, EUR bn. Others include: academic institutions; asset or fund managers; brokerage; commercial banks; independent financial advisers; insurance and pension companies; private banks or wealth managers; securities companies; SPV.
Sources: StructuredRetailProducts.com, ESMA.
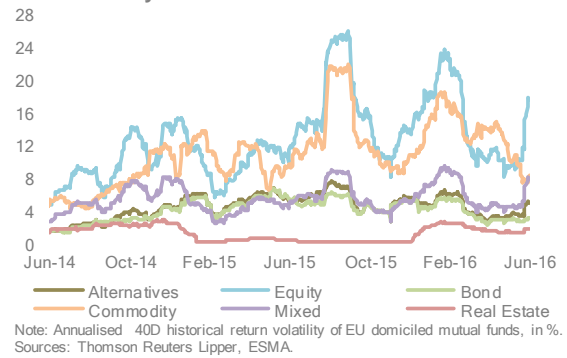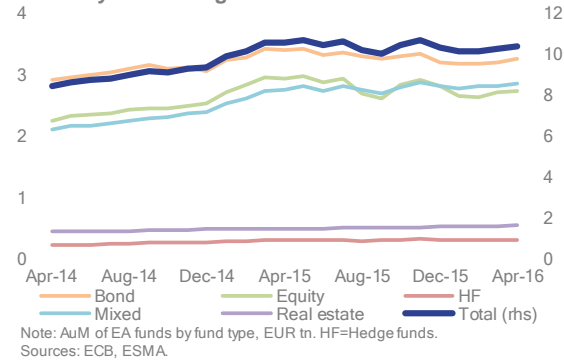
Investors
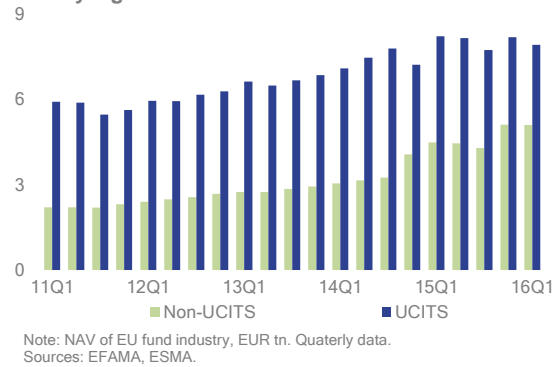
Fund industry

A.107
Fund performance

Note: EU-domiciled investment funds' annual average monthly returns, asset weighted, in %.
Sources: Thomson Reuters Lipper, ESMA.

A.108
Fund volatility

Note: Annualised 40D historical return volatility of EU domiciled mutual funds, in %.
Sources: Thomson Reuters Lipper, ESMA.

A.109
Assets by market segment

Note: AuM of EA funds by fund type, EUR tn. HF=Hedge funds.
Sources: ECB, ESMA.

A.110
NAV by legal form

Note: NAV of EU fund industry, EUR tn. Quaterly data.
Sources: EFAMA, ESMA.

A.111
NAV by fund market segment

Note: EA Investment funds' NAV by fund type, EUR tn.
Sources: ECB, ESMA.
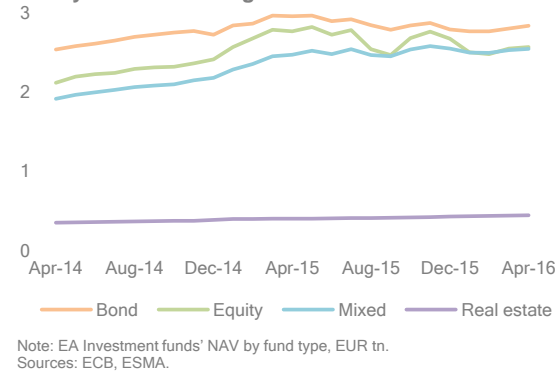
A.112
Leverage by market segment

Note: EA Investment funds' leverage by fund type computed as the AuM/NAV ratio.
Sources: ECB, ESMA.
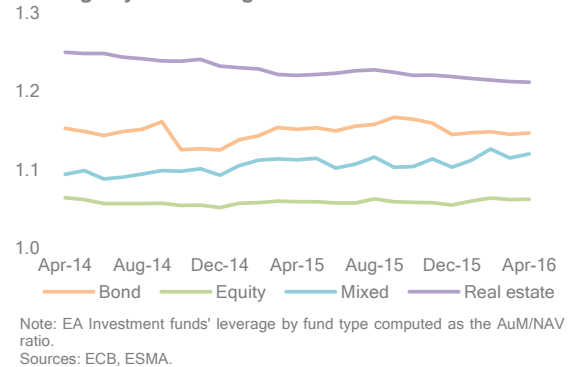
A.113
Fund flows by fund type

Note: EU-domiciled funds' 2M cumulative net flows, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.
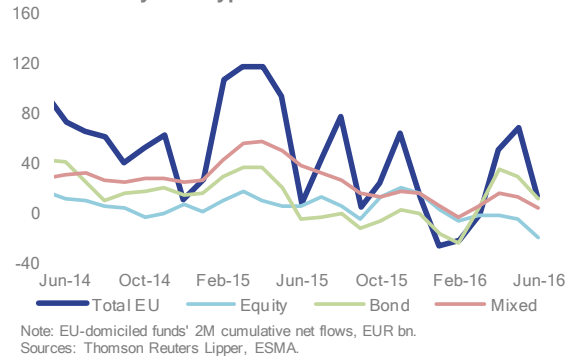
A.114
Fund flows by regional investment focus

Note: Cumulative net flows into bond and equity funds (BF and EF) over time since 2004 by regional investment focus, EUR bn. Data until May 2016.
Sources: Thomson Reuters Lipper, ESMA

A.115
Bond fund flows by regional investment focus

■ Western Europe ■ North America ■ Global ■ Emerging markets
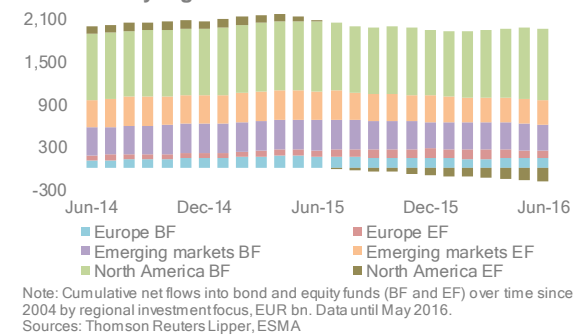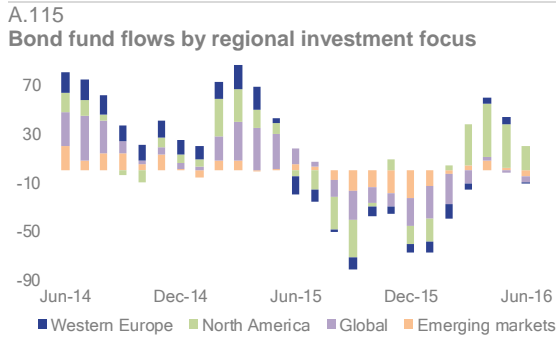
Note: 2M cumulative bond flows by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.116
Equity fund flows by regional investment focus

■ Western Europe ■ North America ■ Global ■ Emerging markets
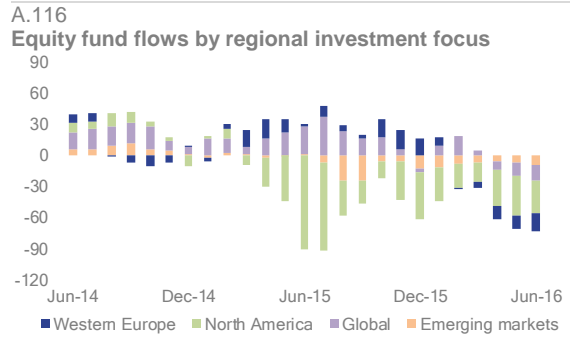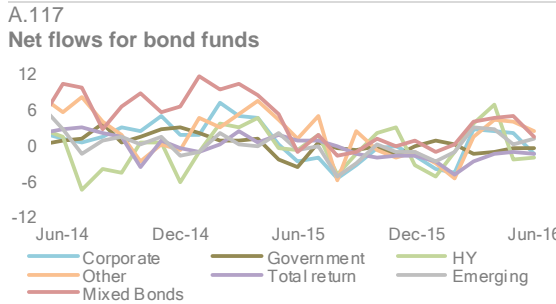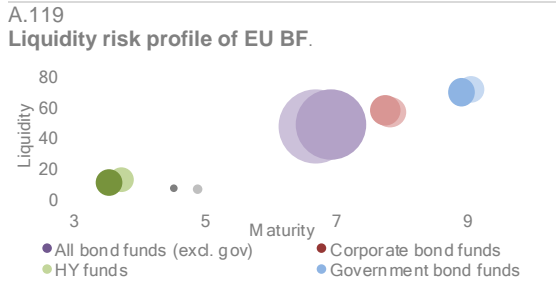
Note: 2M cumulative equity flows by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.117
Net flows for bond funds

Corporate — Government — HY
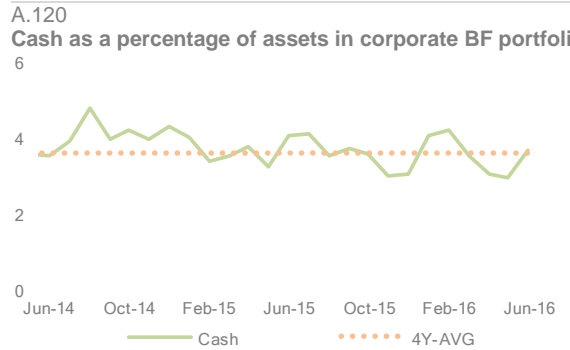Other — Total return — Emerging
Mixed Bonds

Note: Net flows for bond funds, EUR bn. Funds investing in corporate and government bonds that qualify for another category are only reported once (e.g. funds investing in emerging government bonds will be reported as Emerging; funds investing in HY corporate bonds will be reported as HY).
Sources: Thomson Reuters Lipper, ESMA.

A.118
Net asset valuation

■ AuM (rhs) — Capital flows — Valuation effect
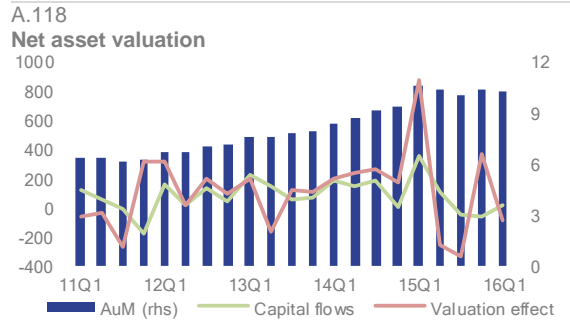
Note: Net valuation effect related to the AuM of EA investment funds, computed as the intraperiod change in AuM, net of flows received in the respected period. Capital flows and valuation effects in EUR bn. AuM expressed in EUR tn.
Sources: ECB, ESMA.

A.119
Liquidity risk profile of EU BF.

● All bond funds (excl. gov)   ● Corporate bond funds
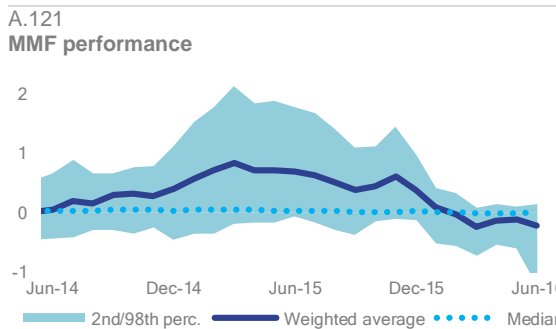● HY funds   ● Government bond funds
● Loan funds

Note: Fund type is reported according to their average liquidity ratio, as a percentage (Y-axis), the effective average maturity of their assets (X-axis) and their size. Each series is reported for 2 years, i.e. 2015 (mid tones) and 2016 (hue). "All bond funds" also include mixed bond funds, convertible bond funds, total return bond funds and other bond funds.
Sources: Thomson Reuters Lipper, ESMA.

A.120
Cash as a percentage of assets in corporate BF portfolio

— Cash   ⋯ 4Y-AVG

Note: Cash held by EU corporate bond funds, in % of portfolio holdings. Short positions can have a negative value.
Sources: Thomson Reuters Lipper, ESMA.

Money market funds

A.121
MMF performance

■ 2nd/98th perc. — Weighted average ⋯ Median

Note: EU domiciled MMF's average yearly returns by month, asset weighted, in %. The graph shows the median and average asset weighted returns and the difference between the returns corresponding to the 98th and the 2nd percentile (light blue corridor).
Sources: Thomson Reuters Lipper, ESMA.

A.122
MMF flows by domicile

— EU   — US

Note: MMF 2M cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.123
MMF flows by geographical focus

Note: MMF 2M cumulative net flows by geographical focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.124
Assets and leverage

Note: NAV and AuM of EA MMFs, EUR tn. Leverage computed as the AuM/NAV ratio. 5Y-MA lev=five-year moving average for the leverage ratio.
Sources: ECB, ESMA.

Alternative funds

A.125
Hedge fund returns

Note: EU domiciled hedge funds' monthly returns, %. The graph shows the returns' median, the difference between the returns corresponding to the 98th and 25th percentiles (light blue corridor) and the difference between the returns corresponding to the 1st and 3rd quartiles (dotted line corridor).
Sources: TASS Lipper, Eurekahedge, BarclayHedge, HFR, ESMA.

A.126
Hedge fund performance by strategy

Note: Growth of hedge fund performance indices by strategy: Hedge fund index, arbitrage, Commodity Trading Advisor, distressed debt, event driven, fixed income, long/short equity, macro, multi-strategy, relative value; %.
Sources: Eurekahedge, ESMA.

A.127
Fund flows by domicile

Note: Alternative mutual funds' 2M cumulative net flows by domicile, EUR bn. Data on alternative mutual funds represents only a subset of the entire alternative fund industry.
Sources: Thomson Reuters Lipper, ESMA.

A.128
AuM by strategy

Note: Market share of hedge funds' AuM by strategy: Fund of hedge funds, Commodity Trading Advisor, distressed debt, emerging market, event driven, fixed income, long/short equity, equity long bias, macro, multi-strategy, other. Funds of hedge funds are not included in the total. in % of total.
Sources:BarclayHedge, ESMA.

A.129
Assets and leverage

Note: NAV and AuM of EA hedge funds, EUR bn. Leverage computed as the AuM/NAV ratio. 5Y-MA Lev=five-year moving average for the leverage ratio.
Sources: ECB, ESMA.

A.130
Hedge fund interconnectedness

Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coeffcient individual fund return's impact on average return of sector significant at 99% level and respective average estimators. Coefficients stem from VAR models regressing individual fund returns on lags and general financial market indices. Measures aggregated across individual regressions. Data until September 2015.
Sources: Barclayhedge, Eurekahedge, TASS, HFR, ESMA.

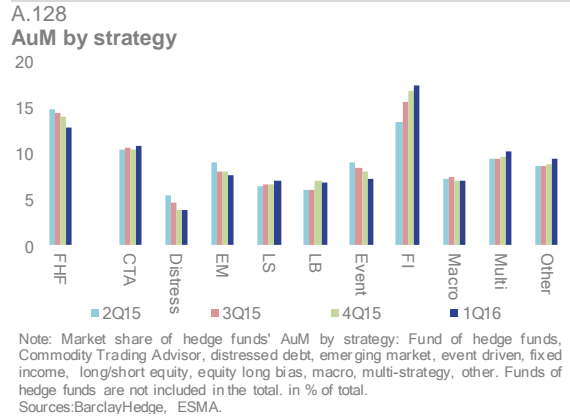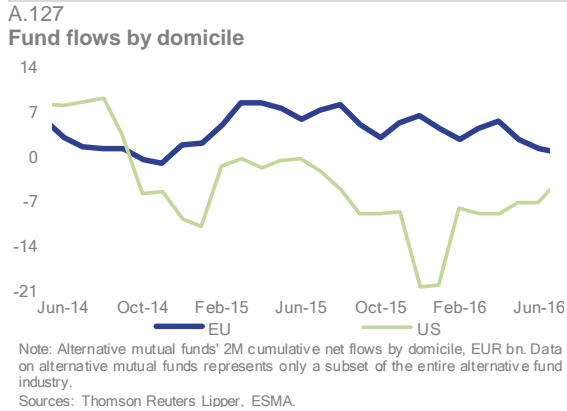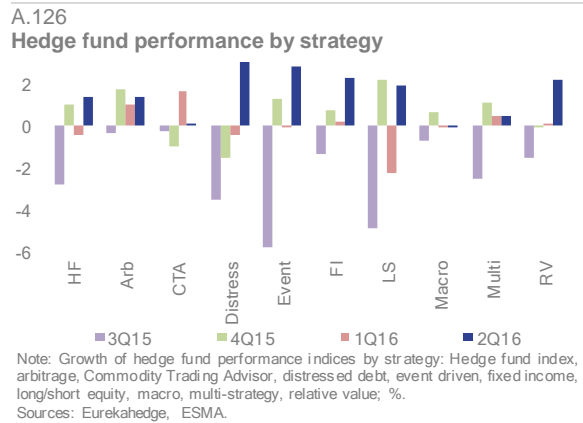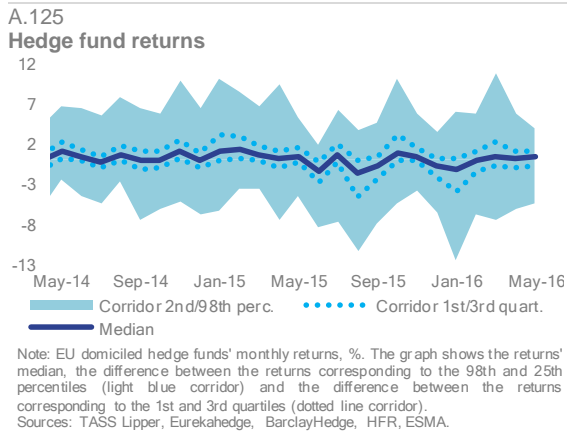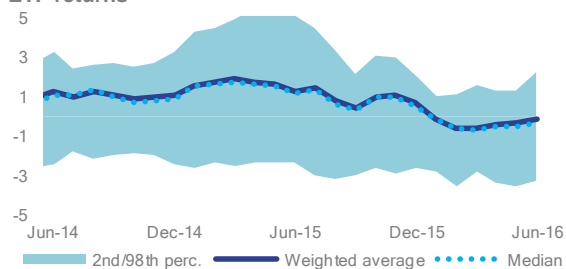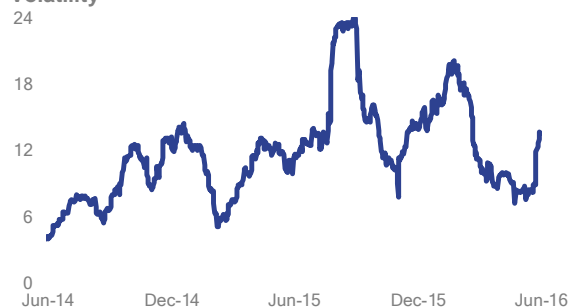# Exchange-traded funds

A.131
ETF returns

Note: EU domiciled ETFs' average yearly returns by month, asset weighted, %. The graph shows the median and average asset weighted returns and the difference between the returns corresponding to the 98th and the 2nd percentile (light blue corridor).
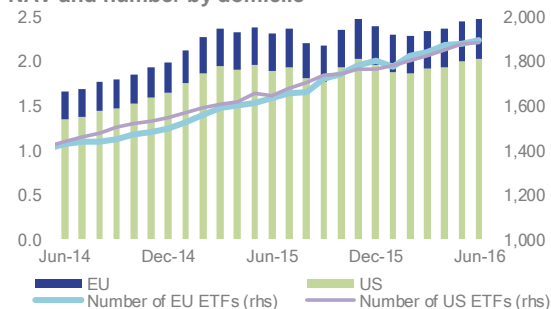Sources: Thomson Reuters Lipper, ESMA.

A.132
Volatility

Note: Annualised 40D historical return volatility of EU domiciled ETFs, in %.
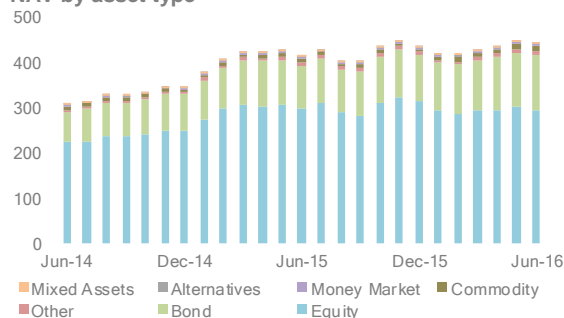Sources: Thomson Reuters Lipper, ESMA.

A.133
NAV and number by domicile

Note: NAV of ETFs, EUR tn, and number of ETFs.
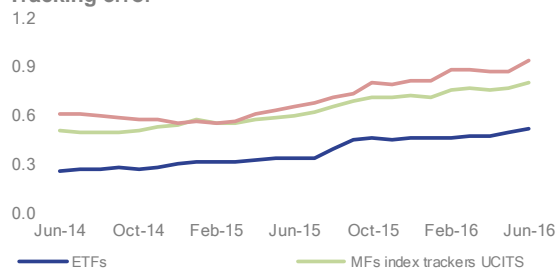Sources: Thomson Reuters Lipper, ESMA.

A.134
NAV by asset type

Note: NAV of EU ETFs by asset type, EUR bn.
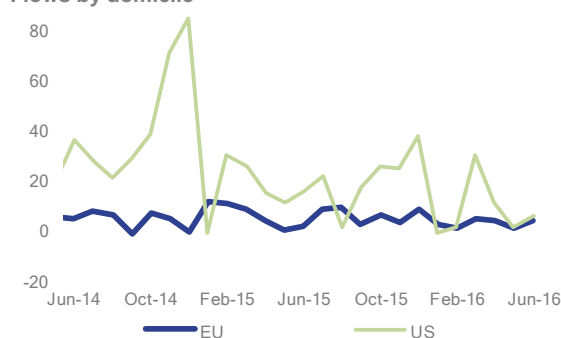Sources: Thomson Reuters Lipper, ESMA.

A.135
Tracking error

Note: Tracking error defined as standard deviation of fund excess returns compared to benchmark. The graph shows the tracking error for ETF and mutual funds both UCITS and non-UCITS. Yearly standard deviation reported on monthly frequency. End of month data.
Sources: Thomson Reuters Lipper, ESMA.

A.136
Flows by domicile

Note: ETF not cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

Retail investors

A.137
Portfolio returns
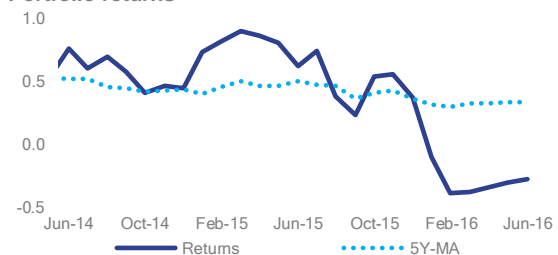
Note: Annual average monthly returns for a representative portfolio for households, in %. Asset weights, computed using ECB Financial Accounts by Institutional Sectors, are 37% for collective investment schemes (of which 12% mutual funds and 25% insurance and pension funds), 31% for deposits, 22% for equity, 7% debt securities and 3% for other assets.
Sources: Thomson Reuters Datastream, Thomson Reuters Lipper, ECB, ESMA.

A.138
Investor sentiment

Note: Sentix Sentiment Indicators for Euro Area private and institutional investors for a 10Y horizon. The zero benchmark marks a risk-neutral position. Monthly frequency.
Sources: Thomson Reuters Datastream, ESMA.

A.139
Disposable income

Note: Annualised growth rate of weighted-averaged gross disposable income for14 EU countries (AT, BE, CZ, DE, ES, FI, FR, GB, IE, IT, NL, PT, SE, SI), in %.
Sources: Eurostat, ESMA.

A.140
Asset growth

Note: Annualised growth rates of EA-19 households' real and financial assets, in %.
5Y-MA=five-year moving average of the growth rate.
Sources: ECB, ESMA.

A.141
Financial assets and liabilities

Note: EU households' financial assets and liabilities, EUR tn. Liabilities/Assets ratio, in %.
Sources: ECB, ESMA.

A.142
Growth rates in financial assets

Note: Average annualised growth rates of financial asset classes held by EU households, in %.
Sources: ECB, ESMA.

A.143
Retail fund synthetic risk and reward indicator

Note: The calculated Synthetic Risk and Reward Indicator is based on ESMA SRRI guidelines. It is computed via a simple 5-year annualised volatility measure which is then translated into categories 1-7 (with 7 representing higher levels of volatility).
Sources:Thomson Reuters Lipper, ESMA.

A.144
Share ownership by age and income

Note: Dispersion of the national percentages of households owning shares by their income group. Data for EA member states (excl. IE, EE) for 2008-2011, %. Bottom 25% represents the range of values from minimum to 1st percentile, Core 50% from 1st percentile to 3rd percentile, and Top 25% from 3rd percentile to maximum.
Sources:ECB HFCS, ESMA.

A.145
Financial numeracy

Note: X-axis: Numeracy = share of respondents with correct answers (three numerical questions asked). Y-axis = EA households (excl. IE, EE) holding debt in 2008-2011, %.
Sources: Special Eurobarometer 342 2011, ECB HFCS, ESMA.

A.146
Investment taxation

Note: Unweighted average rate of Personal Income tax (PIT) and Corporate Income tax (CIT) over 21 countries (AT, BE, CZ, DE, DK, EE, ES, FI, FR, GR, HU, IE, IT, LU, NL, PL, PT, SE, SI, SK, UK) plotted with lines. Shares of total tax rate on dividend income via PIT and CIT plotted with bars.
Sources: OECD, ESMA.

A.147
Complaints data by cause

Unauthorised Business   ■ Other causes
■ Investment Advice   ■ Execution of Orders
■ Fees/Charges   ■ Quality/Lack of Information

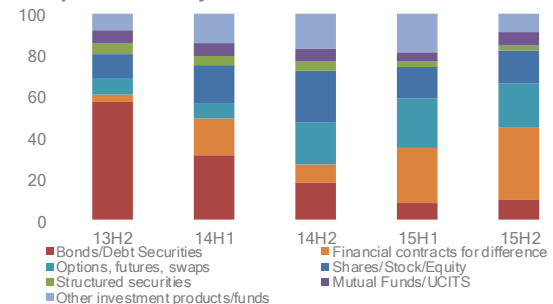Note: Complaints data by cause of complaint in % over the total. Data collected from NCAs, firms and Ombudsmen of up to 26 EU countries (AT, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LI, LU, LV, MT, NO, PL, PT, RO, SE, SI, SK, UK).
Sources: ESMA Complaints data collection by EU NCAs.

A.148
Complaints data by financial instrument

■ Bonds/Debt Securities   ■ Financial contracts for difference
■ Options, futures, swaps   ■ Shares/Stock/Equity
■ Structured securities   ■ Mutual Funds/UCITS
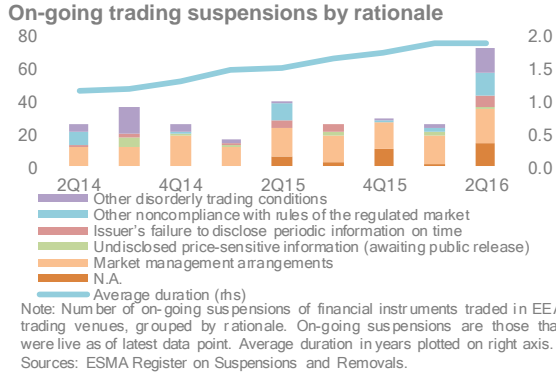■ Other investment products/funds

Note: Complaints data by financial instrument in % over the total. Data collected from NCAs, firms and Ombudsmen of up to 26 EU countries (AT, BG, CY, DE, EE, EL, ES, FI, FR, HR, HU, IE, IT, LI, LU, LV, MT, NO, PL, PT, RO, SE, SI, SK, UK).
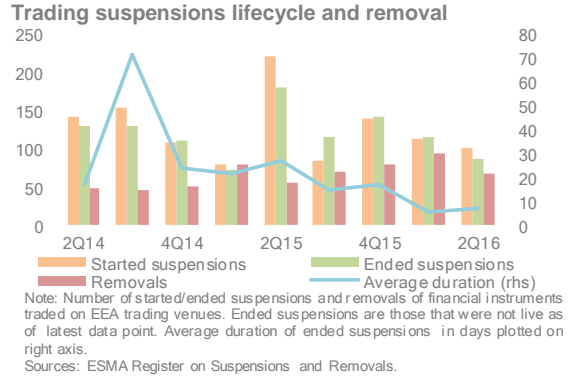Sources: ESMA Complaints data collection by EU NCAs.
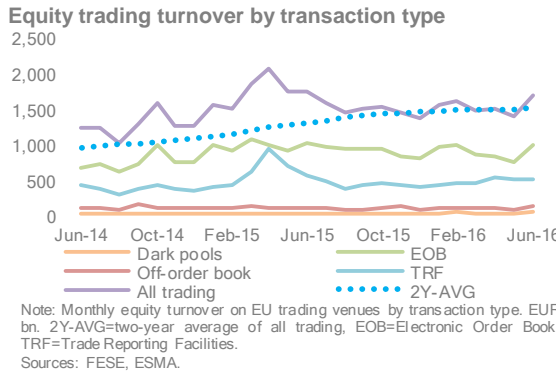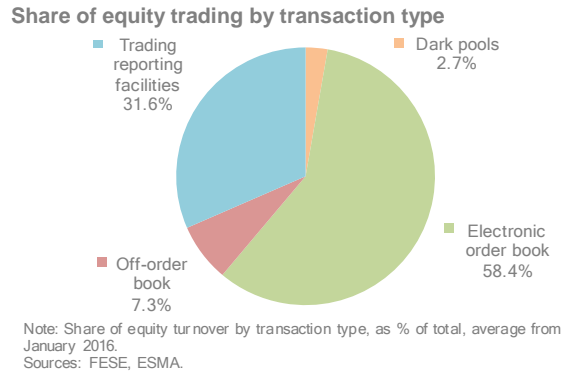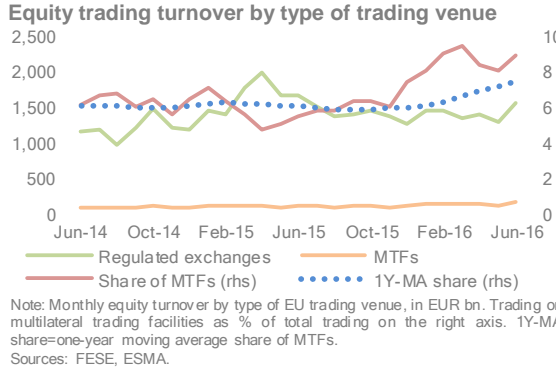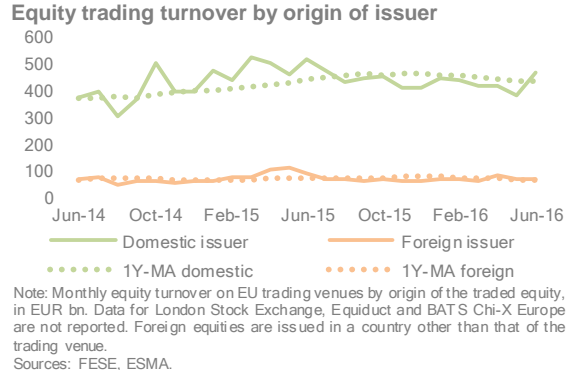
Infrastructures and services

Trading venues

A.149

On-going trading suspensions by rationale

Note: Number of on-going suspensions of financial instruments traded in EEA trading venues, grouped by rationale. On-going suspensions are those that were live as of latest data point. Average duration in years plotted on right axis.
Sources: ESMA Register on Suspensions and Removals.

A.150

Trading suspensions lifecycle and removal

Note: Number of started/ended suspensions and removals of financial instruments traded on EEA trading venues. Ended suspensions are those that were not live as of latest data point. Average duration of ended suspensions in days plotted on right axis.
Sources: ESMA Register on Suspensions and Removals.

A.151

Equity trading turnover by transaction type

Note: Monthly equity turnover on EU trading venues by transaction type. EUR bn. 2Y-AVG=two-year average of all trading, EOB=Electronic Order Book, TRF=Trade Reporting Facilities.
Sources: FESE, ESMA.

A.152

Share of equity trading by transaction type

Note: Share of equity turnover by transaction type, as % of total, average from January 2016.
Sources: FESE, ESMA.

A.153

Equity trading turnover by type of trading venue

Note: Monthly equity turnover by type of EU trading venue, in EUR bn. Trading on multilateral trading facilities as % of total trading on the right axis. 1Y-MA share=one-year moving average share of MTFs.
Sources: FESE, ESMA.

A.154

Equity trading turnover by origin of issuer

Note: Monthly equity turnover on EU trading venues by origin of the traded equity, in EUR bn. Data for London Stock Exchange, Equiduct and BATS Chi-X Europe are not reported. Foreign equities are issued in a country other than that of the trading venue.
Sources: FESE, ESMA.

A.155

Turnover by type of assets

Note: Monthly turnover on EU trading venues by type of assets, EUR bn. Data for London Stock Exchange, Equiduct, BATS Chi-X Europe, Aquis Exchange, TOM MTF and Turquoise are not reported for bonds, UCITS and ETFs.
Sources: FESE, ESMA.

A.156

Share of turnover by type of assets

Note: Share of turnover by asset classes, in % of total turnover, average from January 2016. Data for London Stock Exchange, Equiduct, BATS Chi-X Europe, Aquis Exchange, TOM MTF and Turquoise are not reported for bonds, UCITS and ETFs.
Sources: FESE, ESMA.
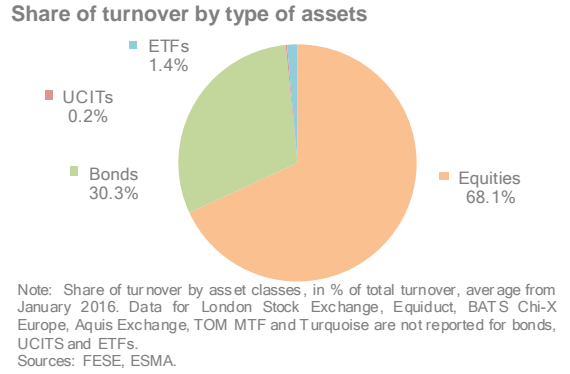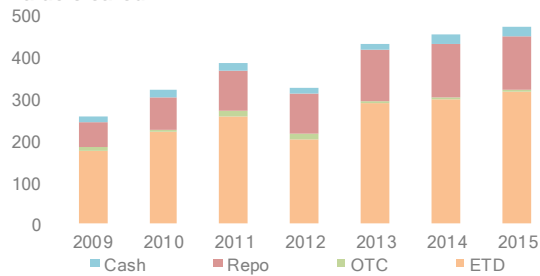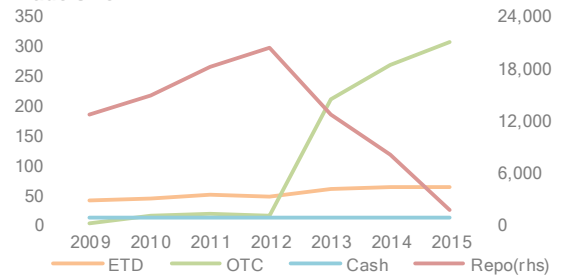
Central counterparties

A.157
Value cleared

Note: Volume of transactions cleared by reporting CCPs. Annual data, EUR tn, for Cash, Repos, non-OTC and OTC derivatives. LCH. Clearnet Ltd. not included as there is uneven reporting during the period.
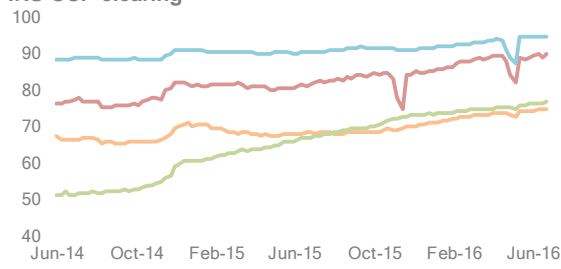Sources: ECB, ESMA.

A.158
Trade size

Note: Average size of transactions cleared by reporting CCPs, for Cash, Repos, non-OTC and OTC derivatives. Annual data, EUR thousand. LCH. Clearnet Ltd. not included as there is uneven reporting during the period.
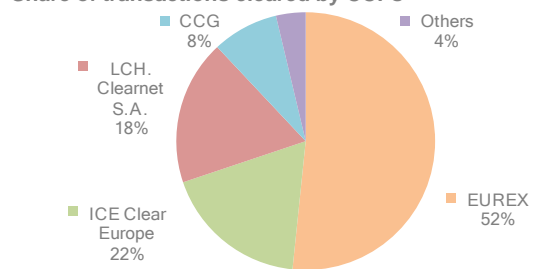Sources: ECB, ESMA.

A.159
IRS CCP clearing

Note: OTC interest rate derivatives cleared by CCPs, in % of total notional amount.
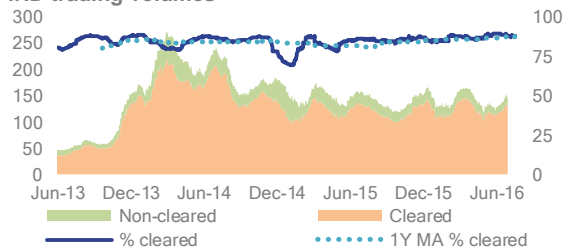Sources: DTCC, ESMA.

A.160
Share of transactions cleared by CCPs

Note: Share of volume of transactions cleared by reporting CCPs for Cash, Repos, non-OTC and OTC derivatives, 2015. LCH. Clearnet Ltd. not included as there is uneven reporting during the period.
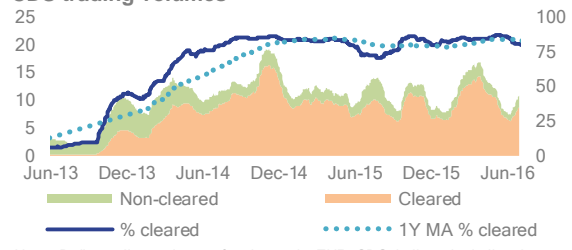Sources: ECB, ESMA.

A.161
IRD trading volumes

Note: Daily trading volumes for EU-currency denominated IRD products (EUR, HUF, PLN, GBP), products include IRS, basis swaps, FRAs, inflation swaps, OIS. 40D MA, in EUR bn. ISDA SwapsInfo data are based on publicly reported data from DTCC Data Repository LLC and Bloomberg Swap Data Repository.
Sources: ISDA Swapsinfo, ESMA.

A.162
CDS trading volumes

Note: Daily trading volumes for the main EUR CDS indices including Itraxx Europe, Itraxx Europe Crossover, Itraxx Europe Sr Financials. 40D MA, EUR bn. ISDA SwapsInfo data are based on publicly reported data from DTCC Data Repository LLC and Bloomberg Swap Data Repository.
Sources: ISDASwaps, ESMA.

Central securities depositories

A.163
Settlement activity
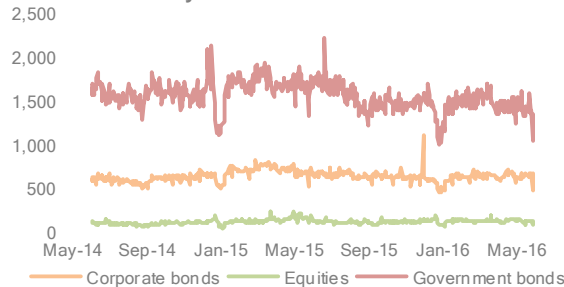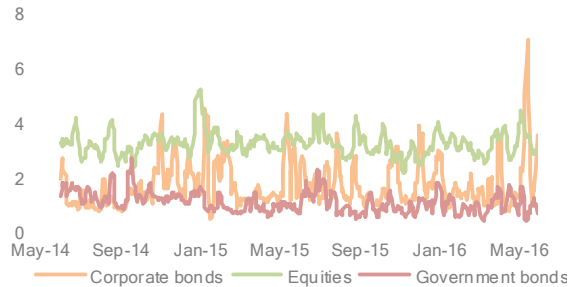

Note: Total value of settled transactions in the EU as reported by NCAs; daily values in EUR bn. Free-of-payment transactions not considered.
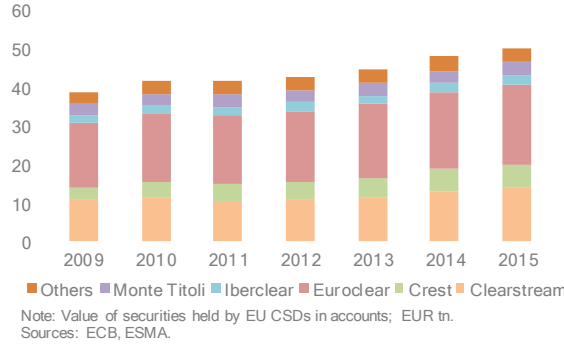Sources: National Competent Authorities, ESMA.
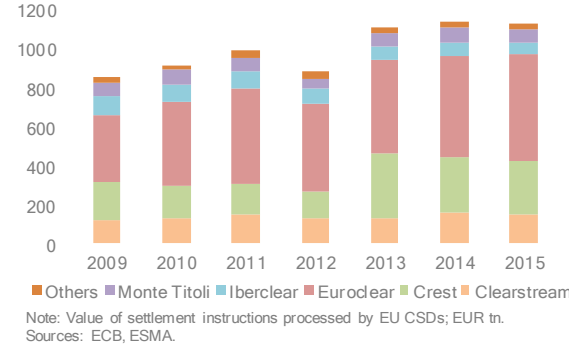
A.164
Settlement fails

Note: Share of failed settlement instructions in EU; % of value, 5D-MA. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.
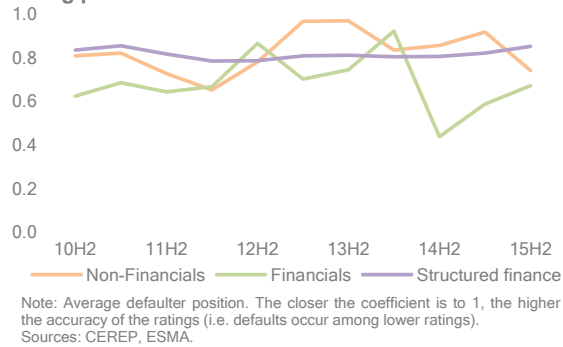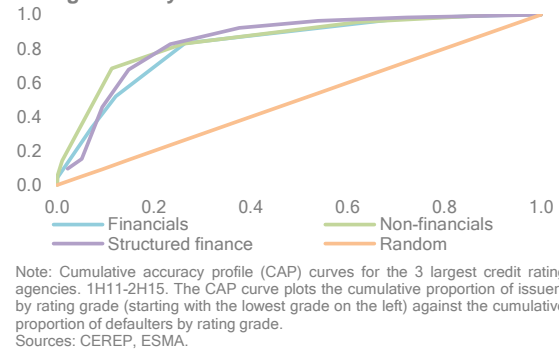
A.165
Securities held in CSD accounts

Others Monte Titoli Iberclear Euroclear Crest Clearstream

Note: Value of securities held by EU CSDs in accounts; EUR tn.
Sources: ECB, ESMA.

A.166
Value of settled transactions

Others Monte Titoli Iberclear Euroclear Crest Clearstream

Note: Value of settlement instructions processed by EU CSDs; EUR tn.
Sources: ECB, ESMA.

Credit rating agencies

A.167
Rating performance

Non-Financials Financials Structured finance

Note: Average defaulter position. The closer the coefficient is to 1, the higher
the accuracy of the ratings (i.e. defaults occur among lower ratings).
Sources: CEREP, ESMA.

A.168
Rating accuracy

Financials Non-financials Structured finance Random

Note: Cumulative accuracy profile (CAP) curves for the 3 largest credit rating
agencies. 1H11-2H15. The CAP curve plots the cumulative proportion of issuers
by rating grade (starting with the lowest grade on the left) against the cumulative
proportion of defaulters by rating grade.
Sources: CEREP, ESMA.

A.169
Change in outstanding SFI ratings

Withdrawn New Net Change

Note: Number of withdrawn and new ratings for structured finance instruments.
Sources: CEREP, ESMA.
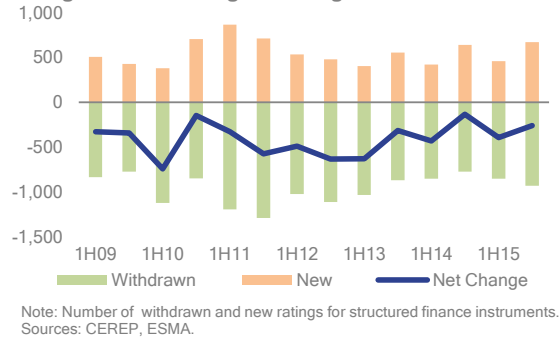
A.170
Change in outstanding covered bond ratings

Withdrawn New Net Change

Note: Number of withdrawn and new ratings for covered bonds.
Sources: CEREP, ESMA.
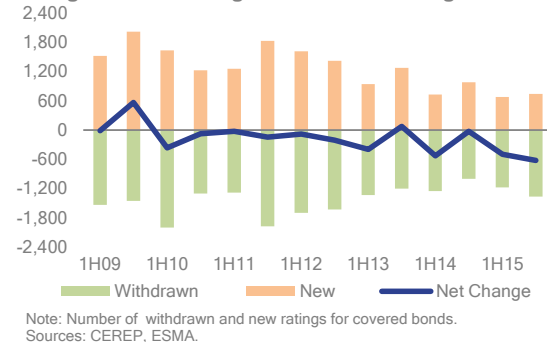
Financial benchmarks

A.171
Number of Euribor panel banks

Note: Number of banks contributing to the Euribor panel; non-viability is
assumed at 12 contributing banks
Sources: European Money Markets Institute, ESMA
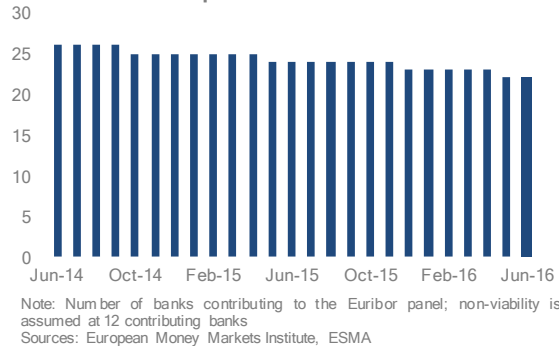
A.172
Dispersion in Euribor contributions

Note: Normalised difference in percentage points between the highest
contribution submitted by panel banks and the corresponding Euribor rate. The
chart shows the maximum difference across the 8 Euribor tenors. The
increase since 2013 is linked to technical factors such as low Euribor rates. The spike in
August 2014 reflects the fact that two panel banks submitted respectively a
quote for the two-week tenor which was 7 times higher than Euribor and a
quote for the 1M tenor which was 10 times higher than Euribor.
Sources: European Money Markets Institute, ESMA.

A.173
Euribor submission dispersion

Top 15%
Bottom 15%
Raw 3M Euribor
Core 70%
3M Euribor
ECB refinancing rate

Note: Dispersion of 3M Euribor submissions, in %. The "Raw 3M Euribor" rate is calculated without trimming the top and bottom submissions of the panel for the 3M Euribor.
Sources: European Money Markets Institute, ESMA.

A.174
Euribor submission variation

Rate increase
Rate reduction
Three-month Euribor (rhs)
Rate unchanged
ECB refinancing rate (rhs)

Note: Number of banks changing their 3M Euribor submission from day to day, in %.
Sources: European Money Markets Institute, ESMA.

List of abbreviations

ABS	Asset-Backed Securities
AuM	Assets under Management
AVG	Average
BF	Bond fund
BPS	Basis points
CAP	Cumulative Accuracy Profile
CCP	Central Counterparty
CDO	Collateralised Debt Obligation
CDS	Credit Default Swap
CRA	Credit Rating Agency
DTCC	Depository Trust & Clearing Corporation
EA	Euro Area
EBA	European Banking Authority
ECB	European Central Bank
EF	Equity fund
EFAMA	European Fund and Asset Management Association
EIOPA	European Insurance and Occupational Pensions Authority
EM	Emerging market
EMIR	European Market Infrastructure Regulation
EOB	Electronic Order Book
EONIA	Euro Overnight Index Average
ESMA	European Securities and Markets Authority
ETF	Exchange Traded Fund
EU	European Union
FRA	Forward Rate Agreement
IMF	International Monetary Fund
IPO	Initial Public Offering
IRS	Interest Rate Swap
LTRO	Long-Term Refinancing Operation
MA	Moving Average
MBS	Mortgage-Backed Securities
MMF	Money Market Funds
MTN	Medium Term Note
NAV	Net Asset Value
NCA	National Competent Authority
OIS	Overnight Index Swap
OMT	Outright Monetary Transactions
OTC	Over the Counter
RMBS	Residential Mortgage-Backed Securities
SCDS	Sovereign Credit Default Swap
SF	Structured Finance
UCITS	Undertaking for Collective Investment in Transferable Securities
YTD	Year to Date

Countries abbreviated according to ISO standards
Currencies abbreviated according to ISO standards