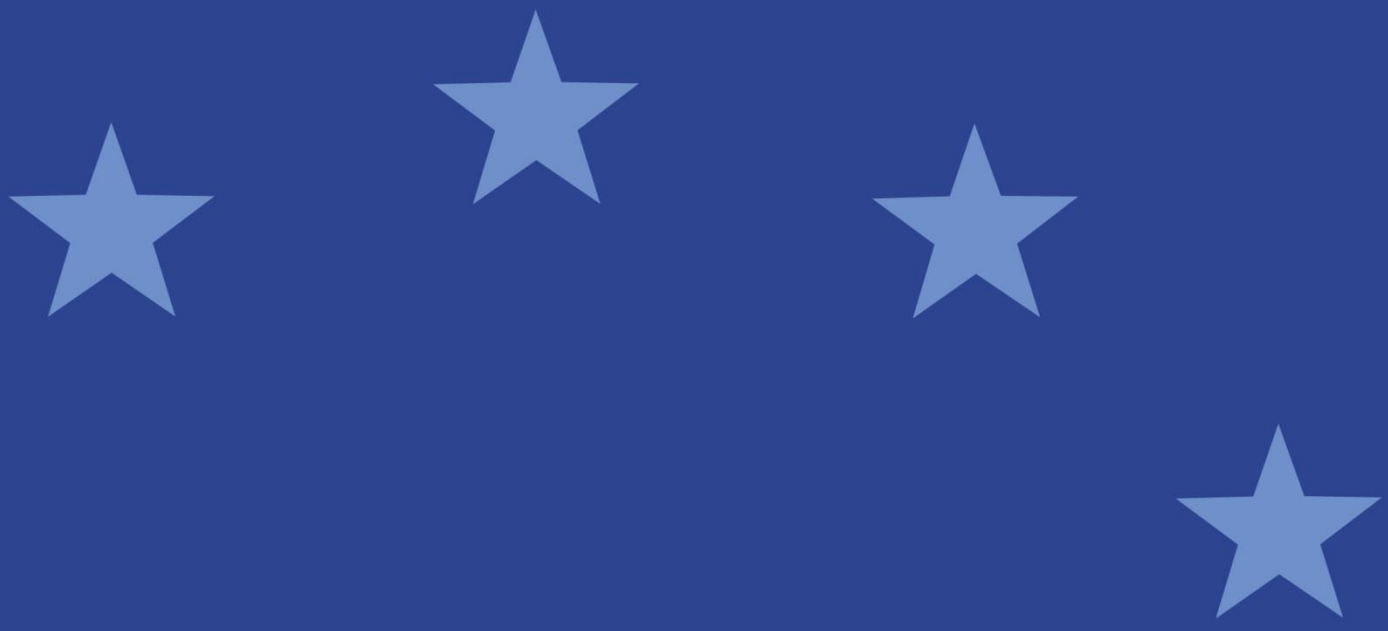
esma European Securities and Markets Authority

# TRV

ESMA Report on Trends, Risks and Vulnerabilities

No. 2, 2017



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 The reporting period of this Report is 1 January 2017 to 30 June 2017, unless indicated otherwise. The reporting quarter of the Risk Dashboard in the Risk Section is 2Q17. Legal reference of this Report: Regulation (EU) No 1095/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Securities and Markets Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/77/EC, Article 32 “Assessment of market developments”, 1. “The Authority shall monitor and assess market developments in the area of its competence and, where necessary, inform the European Supervisory Authority (European Banking Authority), and the European Supervisory Authority (European Insurance and Occupational Pensions Authority), the ESRB and the European Parliament, the Council and the Commission about the relevant micro-prudential trends, potential risks and vulnerabilities. The Authority shall include in its assessments an economic analysis of the markets in which financial market participants operate, and an assessment of the impact of potential market developments on such financial market participants.” The charts and analyses in this report are, fully or in parts, based on data not proprietary to ESMA, including from commercial data providers and public authorities. ESMA uses these data in good faith and does not take responsibility for their accuracy or completeness. ESMA is committed to constantly improving its data sources and reserves the right to alter data sources at any time. The third-party data used in this publication may be subject to provider-specific disclaimers, especially regarding its ownership, its reuse by non-customers and, in particular, the accuracy, completeness or timeliness of the data provided and the provider’s liability related to those. Please consult the websites of the individual data providers, whose names are detailed throughout this report, for more details on these disclaimers.

Please note that for charts related to issuance and outstanding, ESMA has changed the source of commercial data across asset classes. In addition, charts on credit quality and CRAs are now constructed on the basis of more refined ESMA proprietary data based on the RADAR reporting tool. For more detailed information on RADAR please see “ESMA’s supervision of credit rating agencies, trade repositories and monitoring of third country central counterparties. 2016 annual report and 2017 work programme”, published in February 2017. Where data sources have been changed, data differ compared to previous editions of the TRV. These differences generally pertain to the levels of activity, and not to market trends and directions. Our findings and risk analysis are not materially affected by the change in data sources.

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# Executive summary

## Trends and risks

### ESMA risk assessment

| Risk segments | Risk | Outlook | Risk categories | Risk | Outlook | Risk sources | Outlook |
|---|---|---|---|---|---|---|---|
| Overall ESMA remit | orange | → | Liquidity | orange | → | Macroeconomic environment | → |
| Systemic stress | yellow | → | Market | red | → | Low interest rate environment | → |
| Securities markets | red | → | Contagion | orange | → | EU sovereign debt markets | → |
| Investors | yellow | → | Credit | red | → | Market functioning | → |
| Infrastructures and services | yellow | → | Operational | yellow | ↗ | 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: Overall, ESMA's 2Q17 risk assessment remained unchanged from 1Q17. Market and credit risks were very high, while liquidity and contagion risks stayed high. Operational risk remained elevated, but risk is expected to increase, as shown by the risk oulook, reflecting heightened concerns around cyber security. Our outlook for market, liquidity, credit and contagion risks, was stable. Market performance reflected increasing market confidence and improved expectations on the future economic outlook in EU and globally. This is echoed in increased capital flows into strategies yielding higher returns. Substantive risk sources include: economic growth in the EU and elsewhere that needs to prove resilient; structural problems in many EU member states continuing to be addressed; internationally, rising public and private debt levels of increasing concern; persistence of high asset price valuations; and prevailing geo-political and political uncertainties. Brexit-related uncertainties remain among the most important political sources of risk.

Securities markets: In 1H17, equity markets continued to gain across countries, related to the economic recovery in EU and supportive monetary policy, notwithstanding risks at EU and global level. Developments in corporate and sovereign bond yields were mixed, with liquidity measures suggesting a benign trading environment, albeit worsening slightly for sovereigns. Volumes in EA repo transactions grew and net short positions on EA sovereign debt increased in 1Q17. Persisting low spreads in EU corporate and covered bond markets suggest that search-for-yield strategies may be continuing, raising concerns of excessive risk taking. Moreover, securities financing markets have been more volatile since the beginning of the year, reflecting a potential scarcity of high-quality collateral in the EU financial system.

Investors: Mirroring the trend on EU financial markets, notably rising valuations in equity markets, investment fund returns rebounded in 1H17. Investments in bond funds and other fixed income funds constituted the bulk of the inflows, which amounted to EUR 241bn. Investors preferred EM securities and corporate bond funds, documenting the persistent search-for-yield. The EA investment fund sector represented EUR 12tn AuM in the EA, an increase of 6% compared to end-2016. In the reporting period, the funds' cash buffers dropped under 1%, below their four-year average, while fund leverage remained in line with previous quarters. ETF AuM continued to grow in 1H17. Additionally, the development of products such as strategic beta ETFs makes those funds a potential alternative for actively managed funds.

Infrastructures and services: In 1H17, the bulk of trading was executed via electronic order books while the amount conducted via dark pools and off-order books remained limited. With respect to central clearing, ESMA added seven CCPs to its list of third-country central counterparties recognised to offer services and activities in the EU. Moreover, the second delegated regulation requiring mandatory clearing of certain index CDSs took effect for CCP clearing members. Financial benchmarks remained stable in the reporting period, including the Euribor panel with twenty banks as contributors. Finally, ESMA monitors the rapid growth of FinTech and related effects on the financial sector.

## Vulnerabilities

The impact of charges on mutual fund returns: This article provides metrics to analyse the impact of ongoing fees and one-off charges and inflation on mutual fund returns. Preliminary evidence for the EU fund industry suggests that on average ongoing fees and one-off charges and inflation reduced returns available to investors by 29% of gross returns between 2013 and 2015. These reductions apply to all market segments, while varying across jurisdictions, asset classes and client types. Relative return reductions range from 11% for passive equity fund shares to 44% for retail fund shares in bond mutual funds. Relative and absolute return reductions for actively managed and retail fund shares tend to exceed those of passively managed and institutional fund shares. The PRIIPs/MiFID framework will provide for additional cost information, including distribution fees, to be taken into account, especially considering the impact such costs could have on reductions in return. Furthermore, the analysis investigates whether investors take the presence of fund charges and net returns into account when making investment decisions. Despite the impact of fees and charges on the net outcome to investors, these do not seem to be reflected in investor choices, with preliminary results showing that aggregate net flows to EU fund shares react hardly at all to management fees, and even less to cost-adjusted net returns.

DLT key implementation challenges: A common view in the financial industry today is that Distributed Ledger Technology (DLT) has the potential to bring a number of benefits to financial markets, notably more efficient post-trade processes, enhanced transparency, greater resiliency and reduced costs. These benefits, however, will not materialise unless important challenges are addressed. This article first discusses some of the technical aspects of the technology with important implications for its application to financial markets. It then explores three key implementation challenges, namely governance, privacy and interoperability, and some of the solutions that market participants are considering to address these issues. The article does not aim to provide an exhaustive overview of the issues raised by the technology nor to discuss possible legal/regulatory challenges.

EU derivative markets – a first-time overview: The article provides first-time data on the EU interest rate, credit, equity, commodity and foreign exchange derivatives markets in the EU, based on weekly available EMIR data. We present, for the first time, an overview of the size and structure of EU derivatives markets by aggregating data across all six trade repositories authorised in the EU, complementing existing work and taking a broad approach by comprehensively considering the different markets. Trade repositories are an extensive source of information about derivatives, including bank and non-bank entities. Information on the size of the different derivative markets, both in terms of the number of transactions and gross notional amount outstanding, is reported and measures of market concentration by market participants are computed. Finally, this article shows the shares of derivative transactions that occur within the EEA, as opposed to cross-border transactions with non-EEA counterparts, as well as breaking down over-the-counter and exchange-traded derivatives.

# Trends

# Market environment

Market performance reflected increasing market confidence and improved expectations on the economic outlook in the EU and globally. In this context, capital flows in strategies yielding higher returns increased. These market developments, however, have to be seen in a context of lingering structural problems, uncertainties related to developments in the cost of debt, and significant political and event risk. From an EU perspective, Brexit-related risks and uncertainties remain among the most important political risks and are carefully monitored by ESMA. The contribution of capital market financing continued to improve but remained limited. To increase its potential, a series of initiatives have been taken at EU level.

**Global and EU economic growth** continued on an upward path. The European Commission (EC) forecasts GDP to be up by 1.9% in 2017 and 2018, seeing signs of recovery in all EU member states.[1] EA inflation is projected higher than previously expected, at 1.7% in 2017 and 1.6% in 2018.[2] Questions around the resilience of the recent recovery in global growth, and high and, in some cases, rising corporate and public debt levels across the world remain a cause of concern for markets, while fiscal discipline in Europe is starting to bear fruit.[3]

The brighter economic outlook stands in contrast to significant sources of uncertainty in the market environment. In EU, **political and policy risks** remain (T.3), with Brexit among the most important sources of uncertainty. Recently, markets discussed the possibility of cliff effects in the wake of negotiation outcomes. This and other potential Brexit impacts should be carefully monitored. Market participants need to assess potential business implications and prepare accordingly. Globally, geo-political developments and the rise of nationally-oriented policy agendas may affect the commitment to international financial market policy cooperation. Concerning **monetary policy** developments, the consistency of international monetary stances, the timing of monetary decisions, and their possible repercussions on the **cost of debt** are key topics. In the EU, evidence shows how high levels of corporate debt and non-performing bank loans have reduced investment and a balanced capital allocation.[4] Finally, concerns over the profitability of the **EU banking sector** and high non-performing loans in selected member states continued to shape market sentiment.

**EU market performance** echoed the positive news flow. Valuations remained solid and historical volatilities subdued across asset classes (T.1, T.2), as presented in greater detail in the Trend section of this publication. **Market confidence** increased in the financial sector (T.4), sustained by market response to the results of the French presidential and legislative elections, whose outcome was met with benign equity and bond market reaction.

Sustained market confidence has been mirrored in increasing **fund inflows**, focusing on North America and EMs (A.114). Search for higher returns is also revealed in **portfolio investment flows**. There has been rebalancing towards non-EA securities (especially debt) by EA and non-EA area investors, although less so than in 4Q16 (T.5).

Favourable financing conditions prevailed, as shown by the increase in non-financial corporation (NFC) loan and **market financing**: debt securities financing grew by 5% between 1Q16 and 1Q17, against 1% in loan financing (T.8). Nevertheless, capital markets continue to play a limited role compared to loan financing. Against this background the EC has been launching a series of initiatives[5] to increase investment opportunities and accessibility to funding, including the:

- Capital Markets Union aiming at increasing capital market liquidity and diversifying the financing base for the EU economy;[6]
- European Fund for Strategic Investments supporting risk finance for SMEs and mid-cap companies;
- Pan-European Venture Capital Fund aimed at enlarging VC investments.

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1 European Commission, “European Economic Forecast, Spring 2017”.

2 European Central Bank, "March 2017 ECB staff macroeconomic projections for the euro area".

3 International Monetary Fund, "Fiscal Monitor April 2017".

4 IMF, “World Economic Outlook”, April 2017.

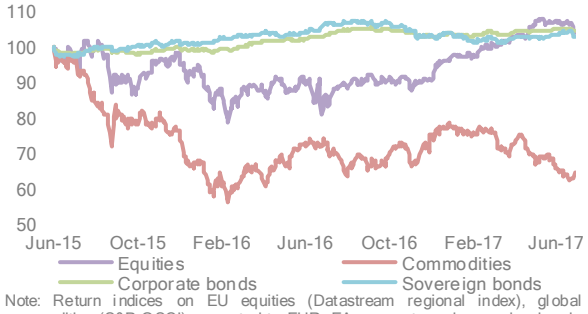
5 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions”, November 2016.

6 European Commission, “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committees and the Committee of the Regions on the Mid-Term Review of the Capital Markets Union Action Plan”, June 2017.

T.1

Market performance

**Equity prices sustained, commodities decreased**



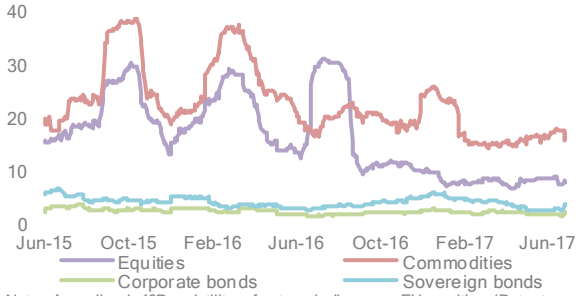

Note: Return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro, all maturities). 01/06/2015=100.

Sources: Thomson Reuters Datastream, ESMA.

T.2

Market volatilities

**Volatility at low levels**



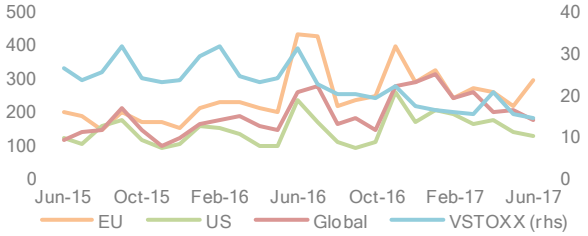

Note: Annualised 40D volatility of return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro all maturities), in %.

Sources: Thomson Reuters Datastream, ESMA.

T.3

Economic policy uncertainty

**Uncertainty in EU**



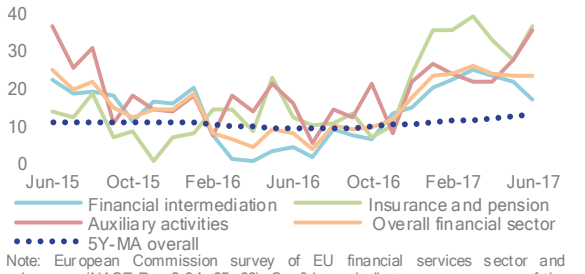

Note: Economic Policy Uncertainty Index (EPU), developed by Baker et al. (www.policyuncertainty.com), based on the frequency of articles in EU newspapers that contain the following triple: "economic" or "economy", "uncertain" or "uncertainty" and one or more policy relevant terms. Global aggregation based on PPP-adjusted GDP weights. Implied volatility of EuroStoxx 50 (VSTOXX), monthly average, on the right-hand side.

Sources: Baker, Bloom, and Davis 2015; Bloomberg, ESMA.

T.4

Market confidence

**Uneven but above 5Y moving average**



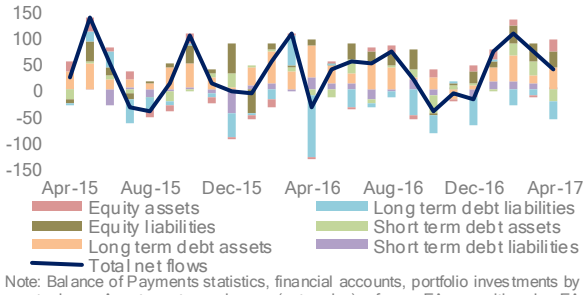

Note: European Commission survey of EU financial services sector and subsectors (NACE Rev.2 64, 65, 66). Confidence indicators are averages of the net balance of responses to questions on development of the business situation over the past three months, evolution of demand over the past three months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

Sources: European Commission, ESMA.

T.5

Portfolio investment flows

**Net outflows**



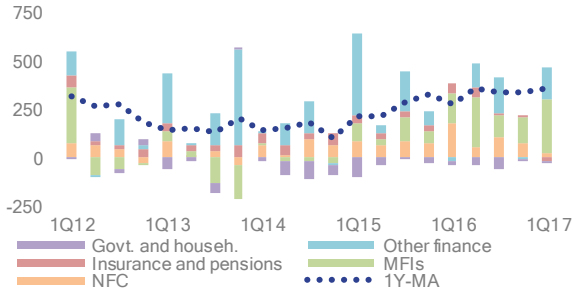

Note: Balance of Payments statistics, financial accounts, portfolio investments by asset class. Assets=net purchases (net sales) of non-EA securities by EA investors. Liabilities=net sales (net purchases) of EA securities by non-EA investors. Total net flows=net outflows (inflows) from (into) the EA. EUR bn.

Sources: ECB, ESMA.

T.6

Equity investment flows

**Increased MFI investment flows**



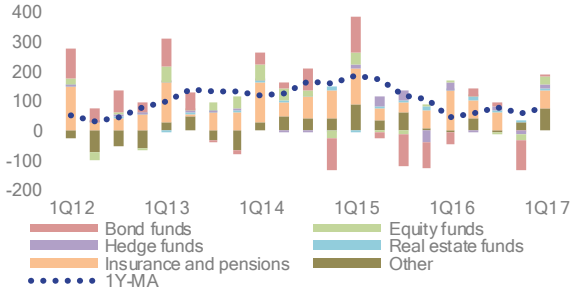

Note: Quarterly Sector Accounts. Investment flows by resident sector in equity (excluding investment fund shares) and debt securities, EUR bn. 1Y-MA=one-year moving average of all investment flows.

Sources: ECB, ESMA.

T.7

Institutional investment flows

**Strong bond fund outflows in 4Q16**



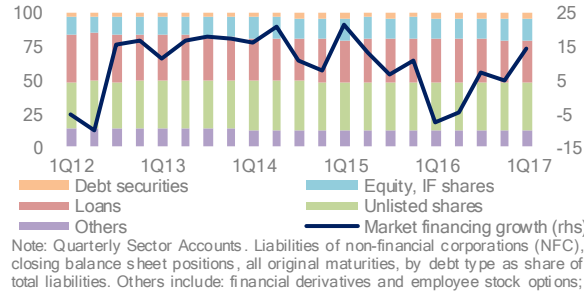

Note: EA institutional investment flows by type of investor, EUR bn. Other=financial vehicle corporations, mixed funds, other funds. 1Y-MA=one-year moving average of all investment flows.

Sources: ECB, ESMA.

T.8

Market financing

**Positive annual growth**




Note: Quarterly Sector Accounts. Liabilities of non-financial corporations (NFC), closing balance sheet positions, all original maturities, by debt type as share of total liabilities. Others include: financial derivatives and employee stock options; insurance, pensions and standardised guarantee schemes; trade credits and advances of NFC; other accounts receivable/payable. Market financing growth: annual growth in debt securities and equity and investment fund (IFs) liabilities.

Sources: ECB, ESMA.

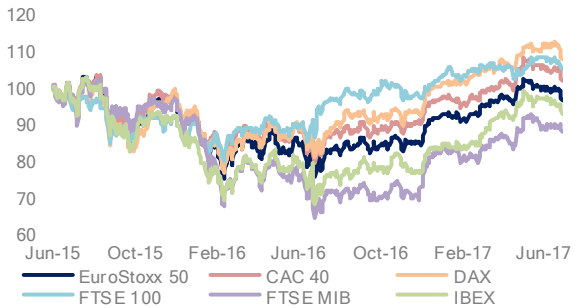
# Securities markets

In 1H17, equity markets continued to gain across member states amid generally subdued volatility. Economic conditions ameliorated in the EU, monetary policy remained supportive, and concerns around the political environment in some EU member states abated, yet remaining prominent. Developments in corporate and sovereign bond yields were mixed, although funding costs remained historically very low. Net short positions on EA sovereign debt increased in 1Q17, which was mirrored by strong growth in EA repo transaction volumes. Liquidity indicators signalled a benign trading environment, despite a slight deterioration in sovereign bond market liquidity conditions. Persistently low spreads in EU corporate and covered bond markets suggest that search-for-yield strategies continue. Conditions on securities financing markets have been volatile since the beginning of the year, reflecting signs of a potential scarcity of high-quality collateral in the EU financial system.

## Equity: positive sentiment prevails

In 1H17 EU **equity prices** continued to increase, rising around 5% from the end of 2016 and taking cumulative gains to 20% since June 2016. Similar developments could be observed across individual EU equity markets (T.9). The improved outlook for economic growth and reduced deflation risk contributed to this trend, together with monetary policy support for asset prices.

T.9
Price performance of national indices
**Broad-based increase**




Note: National equity indices, selected EU members, indexed with 01/06/2015=100.
Sources: Thomson Reuters Datastream, ESMA.

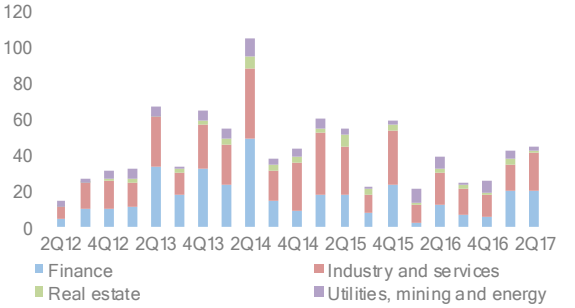
Financial shares performed particularly well, gaining 11%. Within financial shares, financial services equities outperformed other sub-sectors of the system, up 16.5% compared to 11.5% for banks and 6% for insurance companies (A.17).

Equity price volatility remained stable during the analysis period and low by historical standards. In June short-term **implied volatility** in EA equity markets was around 15%, well below its long-term average of 21%, while in the US it stood at 10% (A.2, A.20).

EU **equity market liquidity** also improved, with the composite ESMA equity illiquidity indicator remaining below its long-term average during most of the period (A.23).

In contrast with the decline observed in 2016, the total value of EU **equity issuance** picked up, driven by follow-on issuance rather than IPOs. Issuance in 1H17 amounted to EUR 87bn, compared to EUR 60bn in 1H16 (A.14). Together with improved valuations, this recovery seems to reflect the positive sentiment that has prevailed in EU equity markets so far in 2017. Issuance was particularly strong in the financial sector, which amounted to EUR 40bn in 1H17, up from EUR 14bn in 1H16 (T.10). The industry and services sector also experienced strong growth, with equity issuance increasing by 28%.

T.10
Equity markets
**Rising financial sector issuance in 1H17**




Note: EU equity issuance by sector, EUR bn. Finance includes: Banking and investment services; insurance; investment trusts.
Sources: Thomson Reuters Eikon, ESMA.

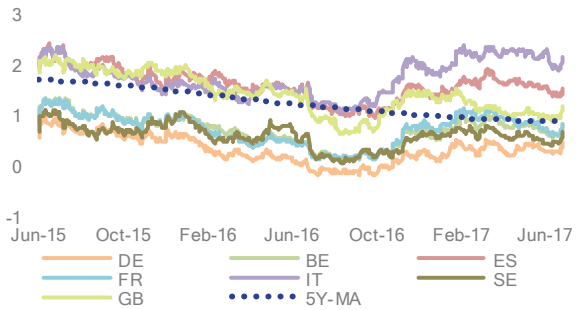
In **securities lending** markets, the average balance of EU equities on loan remained broadly stable in 1H17 compared to 1H16, with EUR 198bn on loan, above the five-year average of EUR 168bn (A.74). Equity lending activity picked up sharply in 2Q17, reflecting seasonal activity around dividend payments and reportedly due to short-selling activities in the French stock market ahead of the presidential elections. However, aggregate net short positions on EU blue chip equities remained broadly stable until the end of 1Q17 (A.83).

## Bonds: yield developments mixed

EU **sovereign bond issuance** declined to EUR 376bn in 1H17, down significantly from EUR 699bn in 1H16. This was driven mainly by a 60% fall in EU issuance during 2Q17 year-on-year (A.25). The average quality of bonds issued remained stable (A.26) and the quality of outstanding bonds ceased deteriorating, with AAA-rated bonds amounting to around 50% of all EU government bonds outstanding (A.27).

Developments in EU **sovereign bond yields** were mixed (T.11). During the first quarter of 2017, 10Y sovereign yields increased across EU markets, by more than 20bps for the largest EA countries. However, bonds traded sideways during the second quarter, with yields up sharply again in DE and NL, but down in FR, IE and PT. As a result, 10Y **sovereign bond spreads** to DE Bund tightened in 2Q17, with PT experiencing the steepest decrease (A.31), and yield dispersion declining (A.32).

T.11
Sovereign bond markets
**Yield increases**




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.

Market **liquidity** conditions in the EA sovereign bond market segment deteriorated in 1H17, reflected in a higher ESMA illiquidity indicator (A.38), slightly higher bid-ask spreads (A.37) and lower turnover ratios.

**Corporate bond issuance** remained strong in 1H17, with EUR 571bn issued, compared to 532bn in 1H16. This was driven almost entirely by a 26% increase in high-yield bond issuance, to EUR 101bn (A.41). By sector, the volume of debt issued by utilities and energy companies saw the steepest increase (+54%) to 47bn, while issuance by industrial and services companies rose 23% to EUR 173bn, signalling robust economic activity in the non-financial sector (A.42). Hybrid capital issuance totalled EUR 50bn, on a par with 1H16 (A.45).

The **credit quality** of corporate bonds outstanding continued to deteriorate, with the share of corporate bonds rated AA or higher slipping to 22% in 2Q17 from 26% in 2Q16, and the share of BBB-rated bonds increasing from 22% to 25% over the same period (A.44).

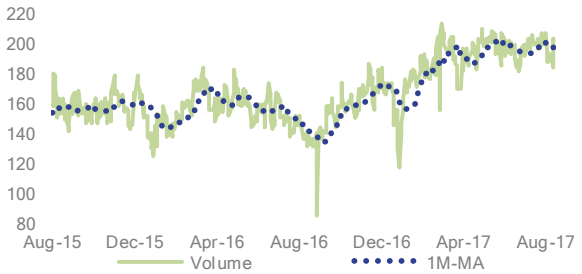
**Yields** in **corporate bond** markets were mixed, with increases in triple to single-A rated bonds ranging from 3 to 18bps (A.47), but tighter credit risk premia on BBB-rated bonds, where yields were down 6bps, suggesting that search-for-yield behaviour may continue to prevail in certain segments of the market (A.48). EU central banks' asset purchases (with EUR 92bn held by the ECB as of June 2017, i.e. around 5% of outstanding EU corporate bonds) continued to shore up corporate bond valuations.

In contrast to sovereign bond markets, EA **corporate bond market liquidity** improved in 1H17, as reflected in narrower bid-ask spreads (below 0.4% in June 2017 compared to 0.5% at the end of 2016) and a low Amihud coefficient (A.49).

## Repo: increased repo market volumes

**Net short positions** on EU sovereign debt reported by market participants (i.e. including positions above certain thresholds) increased sharply (A.85). This mainly reflected a sharp increase in duration-adjusted short positions on Euro Area government debt in the fourth quarter of 2016.

T.12
Euro Area repo markets
**Trading volumes are growing**



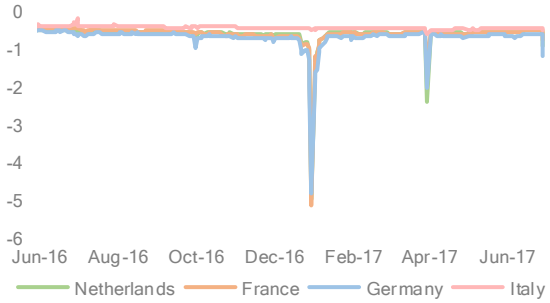

Note: 1M-MA of specific and general collateral transaction volumes executed through CCPs in seven sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), EUR bn. Index volumes filter out atypical transactions.
Sources: RepoFunds Rate, ESMA.

This trend in short positions on sovereign debt markets was also evidenced by strong growth in **repo market** volumes (T.12). Average daily trading volumes in EA centrally-cleared government bond repos rose to EUR 189bn in 1H17, up from EUR 157bn in 2H16, primarily reflecting a 17% increase in the volume of transactions collateralised with French government bonds. This was against the backdrop of volatile repo market activity towards the end of 2016 (A.71 and Box T.13).

T.13
Securities financing markets
**High-quality collateral scarcity**

At the end of 2016, the euro repo market experienced a sharp increase in volatility. The interest rate charged on government bond repo collateral from DE, FR and NL fell sharply to almost -6%, with repo rates on so-called *special* collateral (i.e. securities with specific characteristics that are in high demand) falling as low as -15% on occasion. Euro area repo markets experienced a new bout of volatility at the end of 1Q17, although the price movements were smaller in scale (T.14).

T.14
Euro Area special collateral repo rates
**Strong volatility in euro repo markets**




Note: Special collateral rates on centrally-cleared bilateral repos, collateralised with government bonds from DE, FR, NL and IT, in %.
Sources: RepoFunds Rate , ESMA.

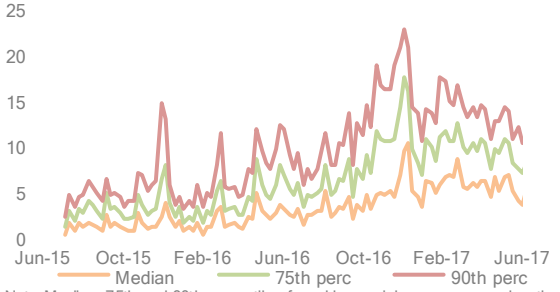
According to market intelligence, the seasonal effect in repo markets at the turn of the year was reinforced by three main factors that combined with thin liquidity from reduced year-end activity:

— a significant increase in dealers' and leveraged funds' short positions;

— a reduced supply of collateral in the market due to ECB government bond purchases;

— banks hoarding high-quality collateral to fulfil their Liquidity Coverage Ratio (LCR) requirements.

T.15
Repo specialness in EA government bonds
**Increase in collateral scarcity premia**



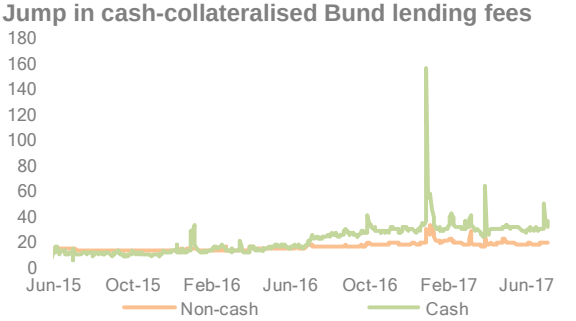

Note: Median, 75th and 90th percentile of weekly specialness, measured as the difference between general collateral and special collateral repo rates on government bonds in selected countries.
Sources: RepoFunds Rate, ESMA.

These events took place in a context of rising Euro Area collateral scarcity premia[7], already flagged by ESMA in recent publications. Indeed, the difference between general collateral and special collateral repo rates increased significantly in 2H16 and remained at comparatively high levels in 1H17, in particular for bonds in very high demand (the highest percentiles of the distribution; T.15).

In addition to the cost they impose on repo market participants, repo market price dislocations of this kind can lead to financial instability as they contribute to liquidity risk (including rollover transactions), volatile funding costs, and reduced market confidence.

While the bilateral repo market is essentially interdealer, the fungibility of collateral securities implies that market participants were also impacted in other securities financing markets. For example, the fees paid for borrowing German government bonds in securities lending markets, where asset managers tend to be much more active, also jumped to unprecedented highs at the end of 2016, and to a lesser extent at the end of 1Q17 (T.16).

T.16
German government bond lending fees
**Jump in cash-collateralised Bund lending fees**




Note: Securities lending fees on German government bond loans, by type of collateral, in basis points.
Sources: Markit Securities Finance, ESMA.

The spike in fees was particularly pronounced for open-term Bund loans collateralised with cash. This may seem surprising, as high-quality liquid assets borrowed against lower-quality securities (so-called "collateral upgrades") can only be eligible under the LCR requirement when borrowed on a fixed-term basis. While this may suggest that the LCR was not the primary driver of the spike, the larger jump in fees for cash collateralised trades can also be explained by the existence of bank or balance-sheet levies on cash holdings in a tight collateral environment.[8]

In contrast to cash sovereign bond markets, EU **sovereign CDS** spreads tightened by 10bps since the beginning of the year, remaining well below their 5Y average (A.35). The decline was particularly pronounced for countries with higher spreads, such as Portugal (-95bps) and Italy (-32bps). The notional value of outstanding CDS on EU sovereigns also fell in 1H17 by around 9% in USD terms (to USD 49bn), partially driven by currency valuation effects (A.36).

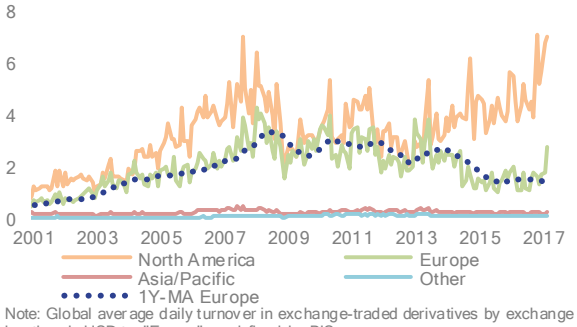
Notwithstanding this decline in one segment of derivatives markets, the global notional amount of **exchange-traded derivatives** (ETDs) outstanding increased to around USD 84tn in 1Q17, up from USD 73tn a year ago (+15%). ETDs mainly comprise short-term interest rate derivatives in the form of options (60% of the total) and futures. Daily average turnover on EU exchanges increased to USD 2.7tn in March

[7] For a detailed analysis of collateral scarcity premia, see ESMA Working Paper No. 1, 2017, "Collateral scarcity premia in Euro Area repo markets".

[8] For more details, see ICMA Quarterly Report, April 2017.

2017, from 1.5tn in March 2016, still significantly below the average USD 7tn traded daily on US exchanges (T.17).

T.17
Quarterly turnover in exchange-traded derivatives
**USD appreciation increases turnover in the US**




Note: Global average daily turnover in exchange-traded derivatives by exchange location, in USD tn. "Europe" as defined by BIS.
Sources: Bank for International Settlements, ESMA.

The volume of **OTC derivatives** outstanding shrank in 2H16, measured either by gross notional or market value, reflecting a fall in the volume of interest rate derivatives (A.95, A.96). This could be related partly to the progressive introduction of mandatory clearing for some of the main IRS products in EU.[9] The BIS estimates that the global share of interest rate derivatives contracts centrally-cleared as of December 2016 stood at 76% of notional outstanding. [10]

**Securitised product** and issuance in 1Q17 remained subdued, with EUR 16bn issued, on a par with 1Q16 and despite a partial recovery in 2H16 (A.81). The share of issuance placed remained high relative to previous years, at around 44%.

**Covered bond issuance** was equally subdued in 1H17, with EUR 128bn issued in total, down from 168bn in 1H16 (A.82). After rising at the end of last year, covered bond spreads declined slightly in 1H17 across rating categories, particularly so for BBB-rated securities (A.54).

In EU **money markets**, the EONIA and the three-month Euribor have remained broadly stable since the beginning of the year while the declining trend in money market activity seemed to stabilise (A.87). The Euribor-OIS spread remained very low, under 3 basis points, reflecting benign conditions and limited EA banking sector counterparty risk perception (A.88).

[9] ESMA, 2017, Infrastructures, TRV No.1 and TRV No.2 2017.

[10] BIS, 2017, OTC Derivatives statistics at end-December 2016.

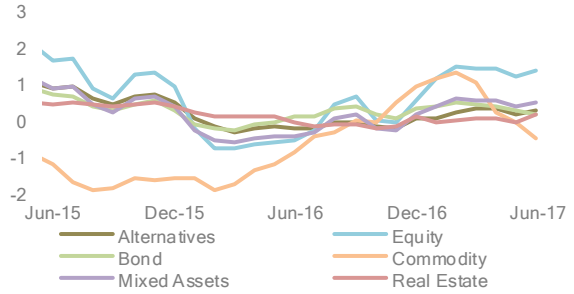
# Investors

Investment fund returns rebounded in 1H17, especially for equity funds, mirroring the development in EU equity markets amid a brightening economic outlook. Investor sentiment improved among both institutional and retail investors. Despite stronger returns for equity funds, investors in general focused their investments on bond funds and other fixed income funds, which attracted the majority of the EUR 241bn of inflows. MMFs also recorded positive flows but faced a seven-year high for outflows in June. Within the bond fund category, search-for-yield behaviour was apparent as funds focusing on EM securities recorded inflows. Overall in 1H17, investment funds had AuM worth EUR 11.8tn, an increase of 6% since December 2016. Corporate bond funds experienced positive flows. However, the percentage of their cash holdings temporarily dropped 0.8 percentage points below their four-year average, subsequently recovering in June. ETF AuM grew again by 13% in 1H17.

## Investment funds: equity funds outperform, flows into FI

Investment **fund returns** rebounded in 1H17, mirroring developments in the underlying asset markets. Equity funds, ETFs and commodity funds were prominent. In 1H17 equity fund returns increased by 0.8 percentage points (pps) to 1.4%, outperforming the rest of the fund industry. Similarly, ETFs' performance rose 0.4 pps to an average monthly return of 0.9% calculated over a one-year period. Commodity funds exhibited a monthly return of -0.5%, receding by 1.4 pps since 4Q16. Oil prices in particular softened at the end of 1Q17 before rebounding amid uncertainty over OPEC production cuts. Other asset classes delivered slightly increasing or stable returns in 2017, e.g. mixed (0.5%), bond (0.2%) alternative (0.3%) and real estate funds (0.2%) (T.18).

T.18
Fund performance
**Equity funds outperform**

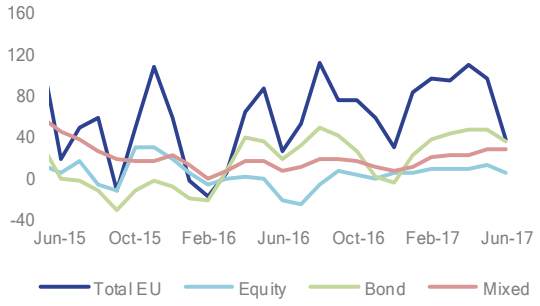



Note: EU-domiciled investment funds' annual average monthly returns, asset weighted, in %.
Sources:Thomson Reuters Lipper, ESMA.

Fund fees and charges play a significant role in determining the net returns to investors, and their levels are a concern to regulators and supervisors. We provide initial evidence from our analyses in this area in the article on investor protection in the Vulnerabilities section of this Report. [11]

**Fund flows** were concentrated into FI funds in 1H17, with bond funds (EUR 118bn) and mixed funds (EUR 68bn) attracting the bulk of the new investment (EUR 241bn in total). Despite their positive performance, investment in equity funds was relatively lower (EUR 39bn of inflows) (T.19). This compares to outflows observed in 2016. Within the bond fund category, investors in search-for-yield focused on EMs (EUR 23.5bn), and to a lesser extent on HY funds (EUR 10bn) (A.114, A.117). In contrast, funds investing mainly in government bonds continued to experience outflows (EUR 7bn).

T.19
Fund flows
**Flows concentrated in FI funds**



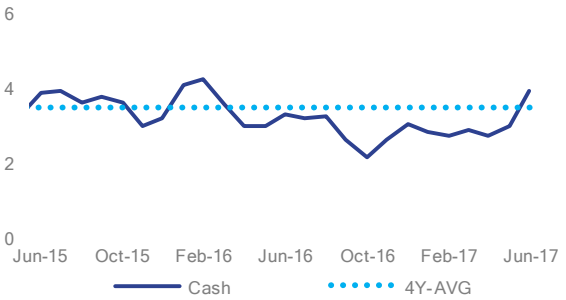

Note: EU-domiciled funds' 2M cumulative net flows, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

Having faced strong outflows at the end of 2016, corporate bond funds experienced positive reversals. However, the proportion of their **cash holdings** temporarily declined in 1Q17 by 0.8 pps, remaining below its four-year average before recovering in June. This trend will need to be monitored, as lower cash holdings potentially reduce the redemption capacity during stress events, especially if faced with a combination of

[11] ESMA, 2017, The impact of charges on mutual fund returns, TRV No. 2 2017, page 38.

high outflows and liquidity dry-up in the corporate bond market (T.20).

T.20
Cash holdings in corporate BF portfolio
**Cash holdings improved end-1H17**

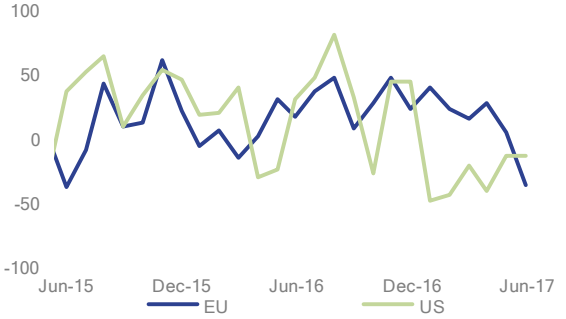



Note: Cash held by EU corporate bond funds, in % of portfolio holdings. Short positions can have a negative value.
Sources: Thomson Reuters Lipper, ESMA.

The sector's **AuM** in the EA stood at EUR 11.8tn in April 2017, increasing by 6% since December 2016. Equity funds (+7% with AuM of EUR 3.2tn) drove this development. The AuM of hedge funds and real estate funds rose by 4%, while mixed and bond funds grew by 5% to EUR 3.0tn and EUR 3.5tn respectively (A.109). The fund sector's NAV increased by 5% in April 2017 from December 2016 to EUR 10.6tn, implying stable leverage (A.111).

## MMFs: regulation expected to strengthen the sector

T.21
MMF flows by domicile
**Outflows at the end of 1H17**




Note: MMF 2M cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

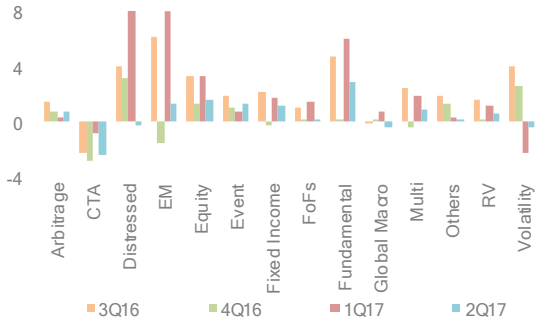
The average return for **EU MMFs** increased temporarily, before receding due to the persistently low interest rate environment. The lowest performing funds posted average monthly returns below -0.4% (A.123). The 0.7 percentage-point improvement was driven in particular by the rebound in returns for MMFs denominated in JPY in 1Q17, which have been volatile during the last year in a context of negative interest rates.

MMFs recorded positive flows in both EU and US funds (EUR 23bn) (T.21) over the reporting period, despite a marked decline in June (EUR 37bn). Of note are the structural developments characterising the MMF segment with the implementation of new regulation.

The EU MMF Regulation was adopted on 14 June 2017.[12] Standard MMFs will continue to use variable net asset value (VNAV), while only short term government funds will be allowed to use a constant net asset value (CNAV). The Regulation also creates a new category called low volatility net asset value (LVNAV) meant to be more resilient to runs by investors. It will make tools such as liquidity fees, gates and suspension of redemption available to the fund manager in order to address liquidity issues and redemption pressures. The Regulation also strengthens the requirements on eligible assets, liquidity, credit assessment and transparency. Finally, MMFs will be obliged to conduct stress tests regularly (at least bi-annually), on the basis of ESMA guidelines. Potential vulnerabilities will be reported to NCAs and ESMA.

## Alternative funds: positive returns

T.22
Hedge funds' performance by strategy
**Positive performance for most strategies**




Note: Quarterly mean sector returns of EU hedge fund by strategy, in %.
Sources: BarclayHedge, Eurekahedge, TASS, HFR, ESMA.

The EU alternative fund industry reported positive **returns** for most strategies in 1Q17 (T.22). Distressed debt (7.4%), EMs (6.3%), fundamental (6.2%) and equity (3.2%) stood out, benefitting from the growth in EU equity markets as well as the improving economic outlook. CTA (-1.4%) and volatility (-0.6%) were the only strategies to post negative returns. CTA funds holding long positions in energy were penalised in 1Q17 by the initial decline in oil prices.

EA hedge funds' AuM augmented 2% to EUR 427bn from December 2016 to March 2017. Their NAV increased by 3%, to EUR 344bn. As a result

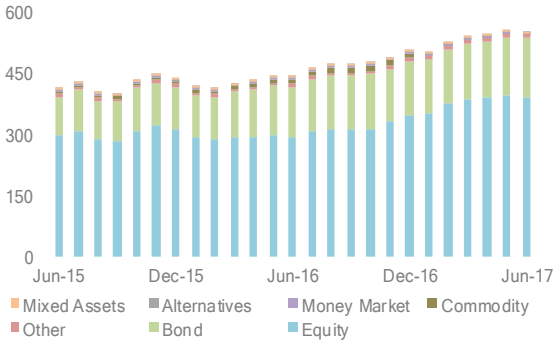
[12] Regulation (EU) 2017/1131 of the European Parliament and of the Council on money market funds.

financial leverage, measured as the AuM/NAV ratio, declined to 1.24 in March 2017 from 1.25 in December 2016 (A.137).

## ETFs: growing competition

In 1H17, EU ETF performance was characterised by positive returns, persistently low volatility (down by 38% year-on-year) and decreasing tracking error. EU ETF NAV stood at EUR 568bn in 1H17, having risen by 13% since December 2016 and 29% year-on-year (T.23).

T.23
NAV by asset type
**ETFs continue to grow rapidly**



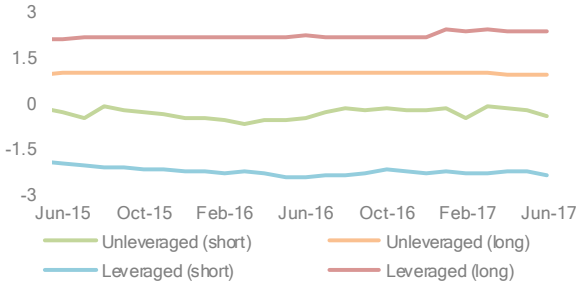

Note: NAV of EU ETFs by asset type, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

This reflects both valuation effects and positive flows: EU ETFs received inflows of EUR 53.5bn in 1H17, the highest half-yearly score since 2010. The EU ETF market is still far smaller than its US counterpart (NAV of EUR 2.6tn). US ETFs received inflows of EUR 226bn during 1H17, up from EUR 56bn during 1H16 (A.141).

Equity funds represent the bulk of the ETF industry with 70% of the assets, followed by bond funds (25%). Commodity ETFs grew by 25% in the first quarter (59% year-on-year) but still represented only 3% of the industry. In general terms, the growth in ETFs whose underlying assets are not very liquid could generate **liquidity mismatches.** ETF shares themselves are deemed liquid, as they are traded on secondary markets. So-called Authorized Participants, as defined by IOSCO[13], ensure that ETF shares are traded close to their NAV price by arbitraging on ETF share prices between the primary and secondary markets. However, this arbitrage mechanism does not increase liquidity in the underlying market, especially not during periods of market stress.[14] In extreme situations, ETF management companies find it impossible to trade the underlying assets and consequently refuse to redeem units, as was the case after the Greek stock exchange closure in July 2015.[15]

Similarly, there are some concerns around Authorized Participants' capacity to absorb excessive liquidity demand during periods of stress. In an extreme situation, the Authorized Participants could withdraw from the market and thus pass on the stress to the underlying assets. The Authorized Participants would then act as the channel through which liquidity risk is transmitted between the ETF and the underlying instruments.

T.24
Average beta values for EU ETFs
**Beta of leveraged ETFs twice unleveraged ETFs**




Note: Leveraged ETFs are self-reported. The annual average monthly beta is measured as the volatility of a fund return in comparison to its benchmark. An unleveraged ETF replicating its benchmark will typically have a beta close to 1.0.
Sources: Thomson Reuters Lipper, ESMA.

Since **leveraged funds** can enhance returns at the cost of potentially higher losses, they can rank among the best or worst-performing funds. This was the case during the reporting period for leveraged funds exposed to commodity markets and leveraged equity funds exposed to energy, with some outperforming the rest of the EU ETF industry, while others underperformed. However, since most ETFs are UCITS, their ability to use leverage is restricted. On average, leveraged ETFs had a beta of 2.3, making them more than twice as volatile as the market (T.24)

There are indications that investors, both institutional and retail, are increasingly focusing on passive managed strategies and ETFs. For retail investors this happens in a context of retail investor fees remaining higher than the charges paid by institutional investors. For details on fund charges and costs, the analysis in the Investor Protection article of the Vulnerabilities section in this Report provides initial quantitative evidence for the EU.[16] The growth of **strategic beta ETFs** (or "smart beta") is contributing to the trend. To some extent, strategic beta ETFs are passive

[13] IOSCO, June 2013, "Principles for the Regulation of Exchange Traded Funds".

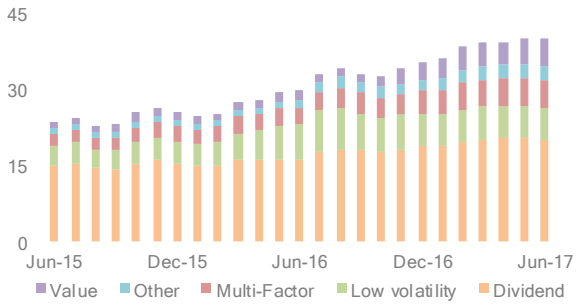
[14] ESMA, 2014, "Performance and risks of exchange-traded funds", TRV No. 2 2014.

[15] AMF, February 2017, "ETFs: characteristics, overview and risk analysis – the case of the French market".

[16] ESMA, 2017, The impact of charges on mutual fund returns, TRV No. 2 2017, page 38.

funds seeking to achieve objectives similar to active management but at a lower cost, thus intensifying competition in the asset management sector. Strategic beta ETFs track a benchmark like most ETFs, the only difference being that the components are weighted by some different criteria. The strategy allows the manager to increase (or reduce) the exposure to various risk factors such as volatility.

T.25
Strategic beta ETFs
**ETFs competing with actively managed funds**

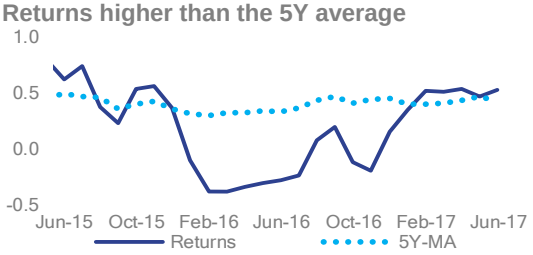



Note: AuM of strategic beta ETFs, EUR bn
Sources: Morningstar, ESMA

EU strategic beta ETFs represented EUR 40bn of AuM in 1H17, up from EUR 29.9bn in 1H16, with 50% following a dividend-screened (or weighted) strategy (T.25). They seek to deliver equity income by weighting stocks based on the characteristics of their dividend payments, for example. Other strategies include value strategies, selecting stocks characterised by some form of undervaluation, and low volatility strategies, selecting and weighting their constituents on the basis of historical volatility.

## Retail investors: improving sentiment

T.26
Retail portfolio returns
**Returns higher than the 5Y average**

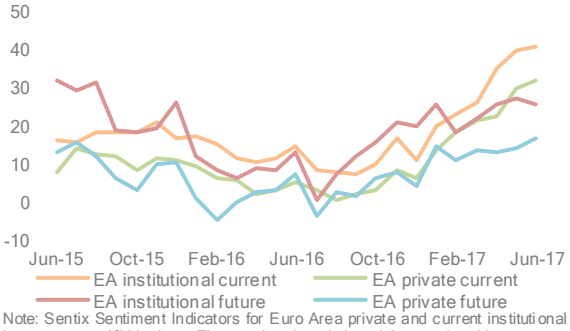



Note: Annual average monthly returns for a representative portfolio for households, in %. Asset weights, computed using ECB Financial Accounts by Institutional Sectors, are 37% for collective investment schemes (of which 12% mutual funds and 25% insurance and pension funds), 31% for deposits, 22% for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

Retail investor **portfolio returns** were at a monthly average rate of 0.4% in 1H17, having been below zero for most of 2016 (T.26). This trend was largely driven by equity performance, with the equity component of collective investment schemes in the representative portfolio growing at 1% per month on average in 1H17.

In 1H17, **investor sentiment** among retail investors improved significantly, with the measure of current sentiment reaching its highest level since 2011 (T.27), consistent with the increase in portfolio returns. Expectations of future performance, even if somewhat lower – in line with perceived political uncertainty in major EA economies – were nonetheless at their highest level since 2015.

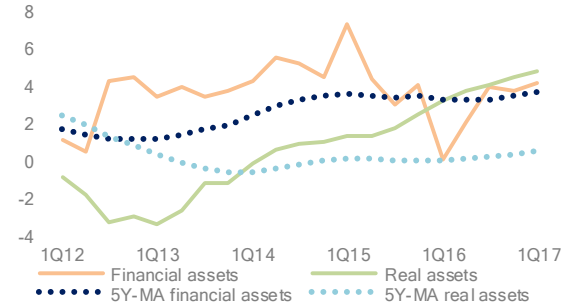
T.27
Investor sentiment
**Continuing rise in confidence**




Note: Sentix Sentiment Indicators for Euro Area private and current institutional investors on a 10Y horizon. The zero benchmark is a risk-neutral position.
Sources: Thomson Reuters Datastream, ESMA.

**Disposable income growth** among EA countries remained solid in 4Q16 at 2.0% on an annualised basis, though falling from 2.6% in 3Q16, a five-year high (A.151). The continued firm growth in household disposable incomes may have supported investor confidence.

T.28
Asset growth
**Growth in real assets higher than in financial**



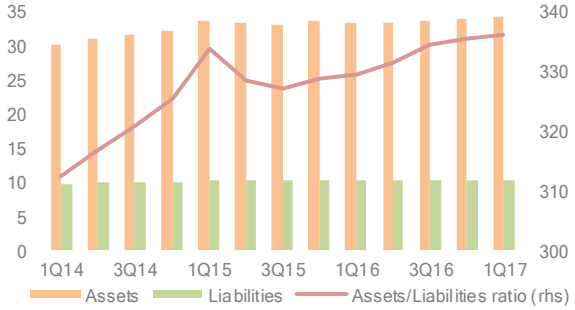

Note: Annualised growth rate of EA-19 households' real and financial assets, in %. 5Y-MA=five-year moving average of the growth rate.
Sources: ECB, ESMA.

For **financial and non-financial assets held by EA households** annualised real asset growth remained robust at a level of 4.4% in 4Q16, comfortably above its near-zero five-year average (T.28). Real assets grew faster than financial assets throughout 2016, with the latter growing at 3% in 4Q16, down from a five-year high of 3.9% in 2Q16 but markedly up from a near-zero level in 1Q16 and beyond its five-year average. In the four years to end-2015, in

contrast, financial asset growth had outstripped that of real assets, though the gap had been narrowing for some time against a backdrop of loosening monetary policy and cheaper mortgages to finance real estate purchases.

Growth rates across asset classes of **household financial assets** ameliorated in 1Q17 compared to 1Q16, especially for shares (+11pps) and debt securities (+5pps). In contrast the growth rate on loans was negative over last year, -18 pps (A.154). This decline is probably also related to investors seeking higher returns.

T.29
Household assets to liabilities ratio
**Increasing since 1H16**




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

EU households held around EUR 34tn of financial assets in 1Q17 versus EUR 10tn of financial liabilities (T.29). The **household asset-to-liability ratio** reached a five-year high, underpinned by asset growth, having previously peaked in 1Q15 following several quarters of roughly constant deleveraging in the sector. The rate of growth in both household financial assets and loans remained fairly flat, however, in the face of low yields and limited availability of credit to households.

The market for **structured retail products**, at around EUR 600bn of AuM, is a relatively small segment of retail investments, representing around 2% of total financial savings in the EU and under a tenth of the AuM in UCITS funds. However, these typically complex products may expose investors to underlying upside and downside risks, and market trends can reveal changes in investor behaviour. [17]

Total outstanding volumes of structured products issued to retail investors in the EU over the five year period from 2011 to 2016 contracted. In 1H17, in terms of volumes, the outstanding was almost at 2016 levels while in terms of numbers of contracts, levels were already higher (A.163).

The decline in volumes over the last five years may be related to the supply side, also in the light of changes in market practices, and the regulatory environment. An increasing number of products have been listed on exchanges. On-exchange products tend to be issued in smaller volumes than OTC products, the latter typically being sold through large distribution networks. Several regulatory changes have characterised this market in recent years, both country-specific and also EU-wide, aimed at enhancing consumer and investor protection.[18]

**Growth products**, which offer a potential capital return, represent more than half of this market, peaking in 2015 with a share of 61% against **income products** and products mixed between growth and income. This suggests that the majority of retail investors who buy structured products do not have pressing liquidity needs. Nevertheless, pure income products gained share in 2016 to 39% of volumes sold, up from 33% in the previous year (A.170).

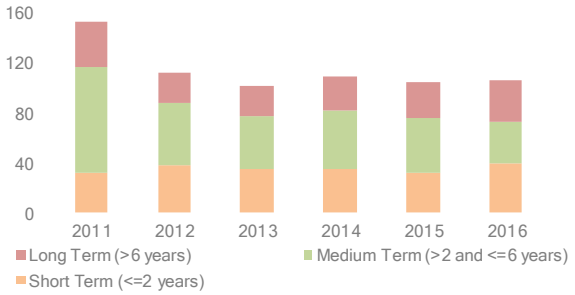
Structured products can be classified by the level of **capital protection** they offer the investor, ranging from products with a capital guarantee of greater than 100% (i.e. a guaranteed return) to those with no capital protection (i.e. the capital is at risk if underlying assets fall in value). In the six years to end-2016, the share of 100% capital-protected products declined whereas that of capital-at-risk products increased (A.168). This trend is likely to be at least in part attributable to the low interest rate environment and the consequent search for yield by investors.

While the vast majority of structured retail products (in terms of the number of products issued) are short-term (i.e. less than two years' duration), as regards volumes there is a more even split between short-term, medium-term (two to five years' duration) and long-term (greater than five years' duration) structured retail products. For the first time in five years, in 2016 short-term products registered higher sales than long- and medium-term. One explanatory factor is that investors appear to be more optimistic about the near-term market outlook than over longer time horizons (T.30). Moreover, the higher returns offered by short-term products have become more attractive for savers and investors in a low-interest-rate environment and may reflect search-for-yield behaviour.

[17] Sources: ECB and Morningstar.

[18] For further details on the evolution of the EU regulatory framework, see ESMA Opinion, 2014, "Structured Retail Products – Good practices for product governance arrangements".

T.30
Investment term
**Shorter-term products in demand**

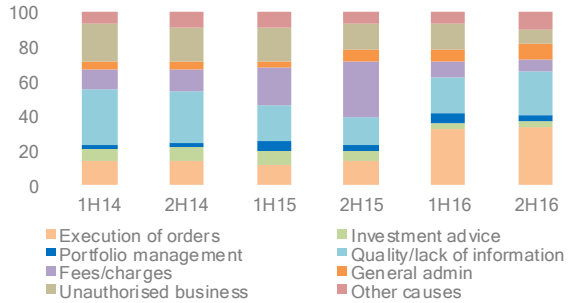



Note: Annual volumes of structured products sold to retail investors by investment term, EURbn.
Sources: Structured Retail Products, ESMA.

The incidence of detrimental outcomes as measured by the overall volume of **consumer complaints** made directly to NCAs fell in 2H16, marking a three-year low, compared with the previous six months (A.159). 1H16 saw a spike in aggregate complaints, attributable to underlying issues in relation to contracts for difference (CFDs) in 2015, complaints being a lagging indicator, and issues around bank resolutions and the provision of CFDs.

The two leading **causes of complaints** filed with NCAs in 2H16 were the execution of orders (34%) and the quality or lack of information (26%) (T.31). The share of complaints relating to the execution of orders was broadly unchanged versus the first half of 2016 and explained chiefly by an ongoing issue in one Member State in relation to resolution measures involving several banks. The share of complaints relating to the quality or lack of information, on the other hand, was up around five percentage points, though this in fact represented a decrease in absolute number (-30% decrease in reported complaints relating to quality or lack of information in 2H16 compared to 1H16).

T.31
Complaints by cause
**Main cause is execution of orders**




Note: Complaints reported directly to NCAs by financial instrument, % of total. Da collected by NCAs.
Sources: ESMA complaints database.

Regarding the **type of financial instrument** cited in complaints filed in 2H16, the share of complaints referring to debt securities rose from around 20% to 26%, its highest proportion since the first half of 2014 (A.162). This trend related to resolution measures in two member states and to company failures.

Finally, compared to 2H15 when the bulk of complaints related to non-bank institutions (mainly issues linked to CFD providers), in 2016 the majority of complaints referred to banks (74%), the largest share in the previous three years (A.160).

# Infrastructures and services

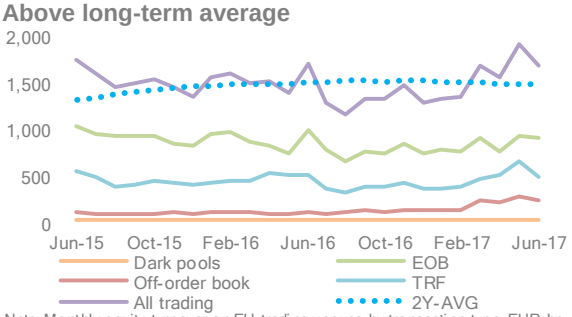
In 1H17, equity trading activity increased slightly, hovering around its long-term average. The composition of trading remained broadly stable, with the majority of transactions occurring via electronic order books and activity conducted through dark pools and off-order books remaining limited. On trading venues, unlike 2H16 no market events led to spikes in circuit breaker occurrences. With respect to central clearing, the rate of centrally cleared products remained broadly stable. In 1H17, ESMA added seven CCPs to its list of third-country central counterparties recognised to offer services and activities in the EU. In addition, the second delegated regulation requiring mandatory clearing of certain index CDSs took effect for CCP clearing members in February 2017. With regard to financial benchmarks, the number of Euribor panel contributors remained stable at 20 banks and no significant irregularities in Euribor quote submission and calculation were observed.

## Trading venues: increased turnover

Equity turnover on EU trading venues increased slightly in 1H17, now being above its long-term average. The turnover conducted via electronic order books (53%) continued to decline, standing at a lower level than end-2016 (58%). The share conducted via trade reporting facilities (TRF) increased slightly, reaching 31% (from 28.9% in December). Off-order book continued to increase their share, climbing to 13.4% from 10.4% at the end of 2016 (T.32).

Even if the majority remains electronic order book, an increasing amount of transactions were conducted via dark pools. Dark pools offer benefits to institutional investors wishing to buy and sell large blocks of instruments while avoiding any significant market impact. However, some other market participants are disadvantaged by the lack of transparency and availability of information. ESMA continues to monitor these dynamics, also with a view to guaranteeing transparency and market efficiency in its role of ensuring orderly markets, investor protection and financial stability.

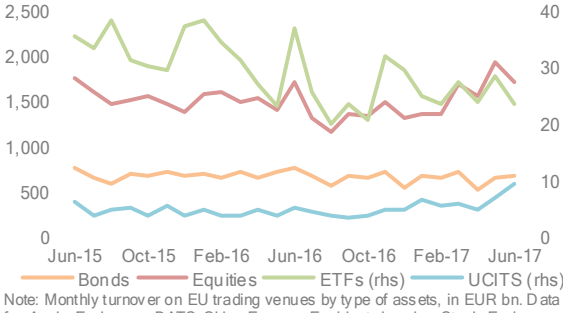
T.32
Equity turnover by transaction type
**Above long-term average**




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.

Meanwhile, the proportion of trading on multilateral trading facilities (MTFs) declined in the reporting period from 7.5% in December 2016 to 6.0% in May 2017. Most of the trading continued to take place on regulated markets (A.175). Trading **turnover** on exchanges remained dominated by equity trading, which accounted for 74% of the total turnover in May 2017. Around 25% of transactions involved bond trading, while ETFs and UCITS amounted to 1% and 0.2% respectively (T.33).

T.33
Equity turnover by type of asset
**Increase in 2Q17**




Note: Monthly turnover on EU trading venues by type of assets, in EUR bn. Data for Aquis Exchange, BATS Chi-x Europe, Equiduct, London Stock Exchange, TOM MTF and Turquoise are not reported for bonds, ETFs and UCITS.
Sources: FESE, ESMA.

Over the reporting period, there were no major market events leading to spikes in **circuit breaker** occurrences, although a significant number of circuit breakers were triggered on EU equity markets on days of high-market activity such as the day following the first round of the French presidential elections. Circuit breakers are trading-venue-based 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 securities affected are put into auction. Based on commercial data on a sample of 10,000 financial instruments traded on EU venues, throughout 1H17 more than 100 circuit breakers were triggered per week on average (A.179).

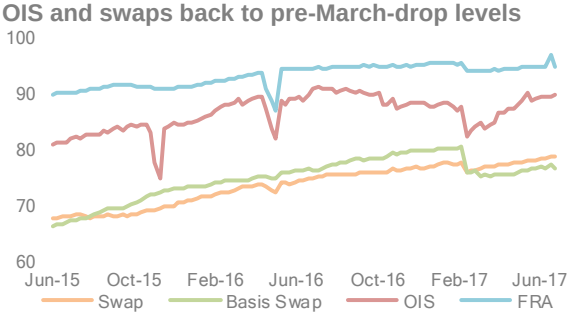
According to ESMA registers on **suspensions** and removals, at the end of 1H17 18 financial instruments were suspended from trading on EEA trading venues. These ongoing suspensions

are mostly due to undisclosed price-sensitive information awaiting public release (A.171). In 1H17 68 financial instruments were removed from trading (A.172).

## CCPs: stable central clearing

In 1Q17, seven CCPs were added to the list of third-country central counterparties recognised to offer services and activities in the EU.[19] This brings the number of third-country **CCPs recognised** in the EU to 29 institutions. In February 2017, the second delegated regulation requiring mandatory clearing of certain index CDS took effect for clearing members.[20] Clearing members are now required to clear two index CDSs (five-year untranched iTraxx Main Index CDS and five-year untranched iTraxx Crossover Index CDS).

T.34
IRS CCP clearing
**OIS and swaps back to pre-March-drop levels**




Note: OTC interest rate derivatives cleared by CCPs captured by Dealer vs. CCP positions, in % of total notional amount. Spikes due to short-term movements in non-cleared positions.
Sources: DTCC, ESMA.

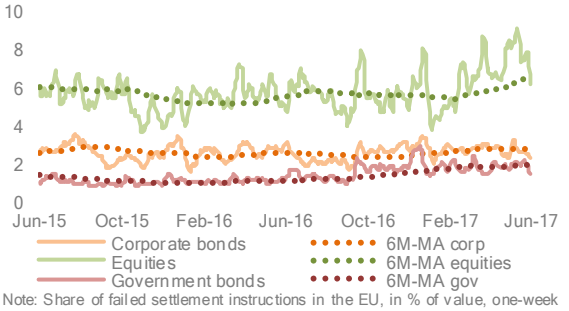
**Central clearing** of IRSs dropped in mid-February for all instrument types but picked up again in May. OIS clearing increased to 90% in June 2017 from 88% at the end of 2016, while the share of cleared basis swaps fell to 77%, from 80% at the end of 2016. The proportion of centrally cleared regular swaps climbed from 77% at the end of 2016 to 79% end-2H17. Levels of central clearing at the end of 1H17 were on a par with 2H16 (95%, see T.34). Movements for FRAs, however, were characterised by a small drop in February, probably also related to concerns over market participants' capacity to meet the 1 March 2017 deadline for posting variation margin on their non-cleared derivatives. While the first phase of the clearing obligation for certain index CDSs entered into force overall CDS central clearing was stable. Based on daily trading volumes, the share of centrally cleared CDSs remained around 80%, only slightly below its one-year moving average (A.188).

## CSDs: increased settlement activity for sovereign bonds

Continuing its regulatory effort, in 1H17 ESMA issued two sets of guidelines on implementation of the **Central Securities Depositories Regulation** (CSDR). These deal with access by a CSD to the transaction feeds of a CCP or trading venue and with the identification of relevant currencies and the substantial importance of a CSD for a host Member State.

**Settlement activity** and settlement fail rates increased following the T2S migration of one large Member State's market in February. However, activity exhibited diverse dynamics. Settlements in government bonds increased strongly in the opening months of 2017, subsequently dropping in April and then increasing again in May and June (A.189).[21] This may be linked to heightened activity on government bond markets in early 2017 related to the EU political calendar. Instead, settlements in equities were broadly stable over 1Q17 but then rose sharply in May due to increased activity by one Member State.

T.35
Settlement fails
**Volatile for equity, increase for government bonds**




Note: Share of failed settlement instructions in the EU, in % of value, one-week moving averages. 6M-MA=six-month moving average. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.

Across markets, the percentage of **settlement fails** was, as usual, higher for equities. The fail rate increased significantly above its average for equities, again driven by one Member State, while remaining around the average for government and corporate bonds (T.35).

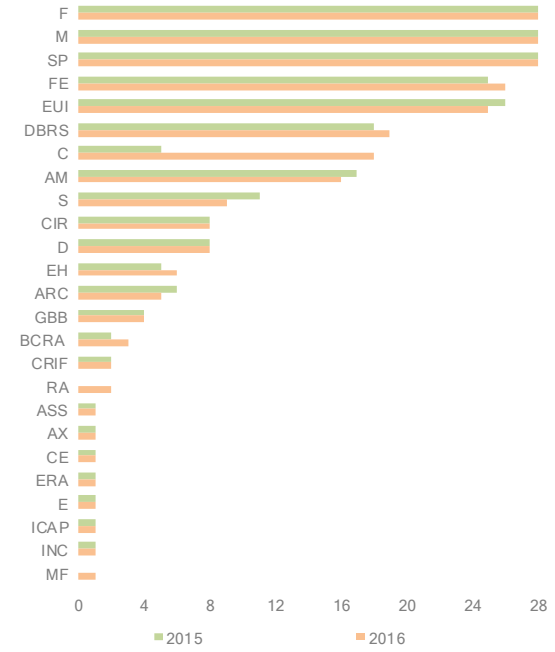
[19] These CCPs are established in The United Arab Emirates, India, Japan, Brazil and in the US.

[20] Commission Delegated Regulation (EU) 2016/592 of 1 March 2016 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on the clearing obligation.

[21] The downward spike at the end of the year for government bonds is seasonal.

## CRAs: increased coverage for smaller players and smooth rating changes

T.36
Number of EU countries in which CRAs operate
**Broad EU coverage for the top three CRAs**

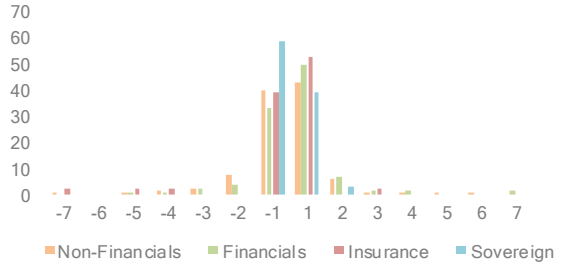



Note: Number of EU countries in or in respect of which EU registered CRAs issued credit ratings. F = Fitch, M = Moody's, SP = Standard and Poor's, FE = Feri Eurorating, EUI = The Economist Intelligence Unit, C = Creditreform, AM = A.M. Best Europe, S = Scope Rating, CIR = Capital Intelligence Ratings, D = Dagong, EH = Euler Hermes, ARC = ARC Ratings, GBB = GBB-Rating, RA = Rating Agentur, ASS = ASSEKURATA Assekuranz Rating, CE = CERVED, ERA = European Rating Agency, E = EuroRating, MF = ModeFinance.
Sources: RADAR, ESMA.

The **CRA industry** in the EU remains concentrated around three large players (S&P, Moody's and Fitch), issuing 80% of all outstanding ratings, while smaller CRAs look to generate more revenue by enlarging their coverage or expanding into new markets.[22] The number of outstanding ratings from the three largest CRAs has been declining on average since 2015 across all rating products. Meanwhile, the number of outstanding ratings issued by the rest of EU-registered CRAs has increased. This trend is particularly pronounced for covered bonds, structured finance and sovereign and sub-sovereign instruments, whose ratings issued by EU CRAs other than the three largest have increased since 1H15 by about 300%, 200% and 37%, respectively (A.193, A.194).

In terms of **geographical coverage**, of 26 EU-registered CRAs only the three largest have EU-wide coverage, issuing ratings for entities located and/or instruments traded in all the 28 EU member states (T.36). Only three other CRAs cover more than 20 member states. At the other end of the spectrum, eight CRAs operated within national borders as of the end of 2016.

T.37
Distribution of issuer credit rating changes
**Concentrated in the range -1/+1 notches**




Note: Distribution of rating changes on issuers (i. e. upgrades and downgrades) in notches. Long-term ratings only. Both foreign currency and local currency. Data for 2017 year-to-date.
Sources: RADAR, ESMA.

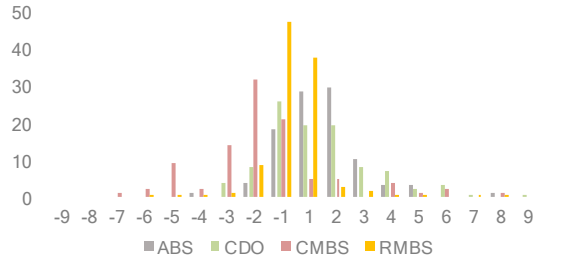
In 1H17, 88% of issuers' **credit rating changes** were in the range of +1/-1 notches and occurred on average across all sectors. However, the frequency distribution is not uniform among different sectors. About 60% of financials' rating changes referred to upgrades, while ratings on sovereign issuers registered slightly more upgrades than downgrades, 58% versus 42%, occurring solely in the range of -1/+1 notches. The frequency distribution of rating changes for non-financials issuers is broadly symmetric, ranging from -6 notches to +5 notches (T.37).

Recent trends in rating changes at asset class level showed **structured finance products** continuing their positive trend in terms of positive rating drift in 2017 (more upgrades than downgrades, see A.63), despite varying significantly between different sub-categories of structured products. 76% of rating changes for asset-backed securities in 2017 were upgrades, while downgrades occurred mainly in commercial and residential-mortgage backed securities, which also registered more frequent multi-notch rating changes (T.38).[23]

[22] ESMA, ESMA's supervision of credit rating agencies, trade repositories and monitoring of third-country central counterparties, 2017.

[23] According to Article 5(2) of the Commission Delegated Regulation (EU) 2015/2 of 30 September 2014 supplementing Regulation (EC) No 1060/2009, an asset-backed security includes auto loans, boat loans, airplane loans, student loans, consumer loans, small and medium-sized enterprise loans, healthcare loans, manufactured housing loans, film loans, utility loans, equipment leases, credit card receivables, tax liens, non-performing loans, recreational vehicle loans, leases to individuals, leases to businesses, and trade receivables.

T.38
Frequency distribution of securitised products
**Mostly upgrades for ABS**




Note: Distribution of rating changes on structured finance products (i.e. upgrades and downgrades) in notches. Long-term ratings only. Asset-backed securities refers to securities backed by assets other than debt obbligations, residential and commercial mortgages. Data for 2017 YTD.
Sources: RADAR, ESMA.

## Financial benchmarks: stable Euribor panel

On 30 June 2016 the **Benchmarks Regulation** (BMR) entered into force to be fully applicable as of January 2018 (for details see T.41).[24] In August 2016 the EC designated Euribor as a critical benchmark,[25] with a total estimated value of instruments referenced on it of at least EUR 500bn on the basis of the full range of maturities and tenors as required by the Regulation. For **critical benchmarks**, the BMR provides for the formation of a college of national supervisors and ESMA to take key decisions. As of June 2017, Euribor and EONIA are the only benchmarks designated as critical by the EC.[26]

The BMR stipulates that input data for the benchmark calculation should be transaction data, if available and appropriate. Strengthening the transactions base of major interbank offered rates in the EU has proved more difficult than anticipated, raising important questions as to the long-term strategy in this market.

The **Euribor panel composition** remained stable in 1H17 at 20 banks (A.195). Our risk indicators do not identify any significant irregularity in submission and calculation during the reporting period.[27] The dispersion of quotes submitted for the Euribor calculation increased slightly in early 1H17 before stabilising and declining in late 1H17, probably related to improved EU economic forecasts. In the reporting period the maximum difference between the quotes submitted and Euribor was observed in the six-month tenor (T.39). Lower dispersion may reflect improved market confidence and reduced divergences in the banks' credit risk assessment.

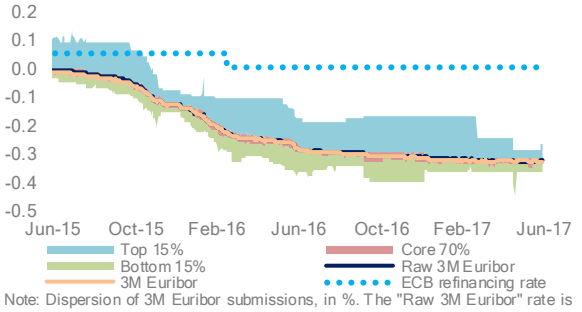
T.39
Euribor contributions
**Decline in 1H17**


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.
Sources: European Money Markets Institute, ESMA.

The **gap** between the actual Euribor[28] and the non-trimmed average for the three-month tenor narrowed end-1H17, as the top 15% of submitted quotes was markedly reduced (T.40).

In 1H17, the **three-month Euribor rate** was broadly stable, with 3% of banks lowering the previous-day submission, 2% raising their quotes and 95% keeping them unchanged (A.198). Finally, in 2017 the three-month Euribor remained below the ECB interest rate for the main refinancing operations.

T.40
Dispersion of submission levels
**Decrease in the top 15%**




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 the UK, the Bank of England (BoE) recently published a feedback consultation paper on the **reform of SONIA**, the widely used sterling unsecured overnight interest rate benchmark.[29] The key change to SONIA is that it will in future

[24] Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016.

[25] On 28 June 2017, EONIA was designated as a critical benchmark by the Commission Implementing Regulation (EU) 2017/1147 of 28 June 2017.

[26] ESMA, 2013, ESMA-EBA Principles for Benchmark-Setting Processes in the EU, ESMA/2013/659. IOSCO, 2013, Principles for Financial Benchmarks, Final Report.

[27] Our risk indicators are based on the data publicly available on the EMMI website.

[28] The current Euribor calculation builds on a quote-based methodology, where the highest and lowest 15% of submitted quotes are eliminated in order to prevent any individual contributors from influencing the rate. The remaining quotes are then averaged.

[29] Bank of England, "The Reform of SONIA", 2017.

capture a broader range of unsecured overnight deposits by including bilaterally negotiated alongside brokered transactions.

T.41
EU financial benchmarks

**EU Benchmarks Regulation**

In September 2013, in the wake of the manipulation of various benchmarks, the European Commission issued a draft Regulation on indices used as benchmarks in financial instruments and financial contracts (Benchmarks Regulation). The Benchmarks Regulation (Regulation (EU) 2016/1011) was published in the Official Journal of the EU on 29 June 2016 and entered into force on 30 June 2016 to apply from 1 January 2018. ESMA is mandated by the European Commission to develop more than 10 regulatory and implementing 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 ESMA Technical advice under the Benchmarks Regulation was delivered on 10 November 2016.

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 29 September 2016, ESMA published a Consultation Paper on the draft technical standards under the Benchmarks Regulation, including that on oversight function, code of conduct for contributors and authorisation/registration of administrators. The consultation period ended on 2 December 2016.

On 30 March 2017 ESMA published its final report containing the draft regulatory and implementing technical standards (RTS/ITS) under the Benchmarks Regulation and submitted them to the European Commission.

On 2 June 2017, ESMA published a methodological framework on the selection of supervised entities for mandatory contribution under Article 23(7) BMR. The aim of the methodological framework is to promote convergence in relation to the supervision of critical benchmarks. ESMA has developed the framework to assist national competent authorities in their selection of supervised entities to be compelled to contribute input data on a critical benchmark, should its representativeness become at risk at some point in the future. The methodological framework applies to all Interbank Offered Rates (IBORs) and to the Euro OverNight Index Average (EONIA).

# Risks

# ESMA Risk Dashboard

R.1
**Main risks**

| Risk segments | Risk | Outlook | Risk categories | Risk | Outlook | Risk sources | Outlook |
|---|---|---|---|---|---|---|---|
| Overall ESMA remit | Orange | → | Liquidity | Orange | → | Macroeconomic environment | → |
| Systemic stress | Yellow | → | Market | Red | → | Low interest rate environment | → |
| Securities markets | Red | → | Contagion | Orange | → | EU sovereign debt markets | → |
| Investors | Yellow | → | Credit | Red | → | Market functioning | → |
| Infrastructures and services | Yellow | → | Operational | Yellow | ↗ | 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.

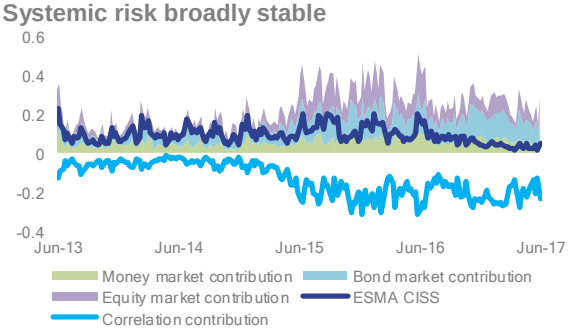
Overall, ESMA's 2Q17 risk assessment remained unchanged from 1Q17. EU financial markets were relatively calm, with stable volatility and increasing equity market prices. EU sovereign bond yields hovered around the higher levels reached in 1Q17. Concerns linked to the potential reactivity to political and geo-political events, excessive risk taking in a low interest rate environment and potential market liquidity shortage linked to event-related risk reversals persisted. Therefore, market and credit risks were kept very high, while liquidity and contagion risks remained high. All previously mentioned risks maintained a stable outlook. Operational risk continued to be elevated, but with an increasing outlook due to Brexit-related operational risk issues and the potential for cyber-attacks. Going forward, we expect the political calendar of the EU including Brexit negotiations, policy developments in the US, and geo-political developments to remain the major risk drivers for 2017.

## Risk summary

Risks in the markets under ESMA remit remained at high levels, reflecting very high risk in securities markets and elevated risk for investors, infrastructures and services. Our assessment of the individual risk categories did not change from 1Q17, with **market and credit risk** very high due to the persistently low interest rate environment, continued weaknesses in the EU banking sector and uncertainty over future geopolitical developments. **Liquidity risk** in 2Q17 held its high level, as liquidity pressures were observed in segments of the fund industry and in repo markets. **Contagion risk** remained high, driven by potential for increasing interconnectedness between different segments of financial markets amplified by the low interest rate environment and associated incentives for high risk-taking. **Operational risk** remained elevated, but with a heightened risk outlook reflecting prominent cyber risks, among others. For all other risk categories the risk outlook remained stable, reflecting both an improved macroeconomic environment and the non-materialisation of risk premia reversals following recent monetary policy actions in the US.

**Systemic stress** eased slightly at the beginning of the reporting period (R.2), with bond markets as the main risk contributor. Risks linked to the macroeconomic environment (GDP, inflation) stabilised, although market uncertainty surrounding potential changes in the European monetary policy stance prevailed. Political events could bring additional uncertainty to financial markets (Brexit negotiations, elections in EU member states, US policy agenda).

R.2
ESMA composite systemic stress indicator
**Systemic risk broadly stable**




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.

## Risk sources

Macroeconomic environment: EU economic recovery continued in 2Q17, with GDP growth expected across all EU member states. Private consumption, the main growth driver in recent years, is nevertheless set to cool as inflation picks up. Inflation in the EA recently increased and will probably hit higher levels in 2017, mainly due to oil price rises. Investment is expected to continue, growing moderately as wages are climbing only gradually and uncertainties around future policies remain elevated. Significant downside risks for the EU economic growth outlook persist. These risks are linked to global geopolitical events, including the future US policy stance and Brexit negotiations.

Low interest rate environment: ECB and BoE monetary policies remained highly accommodative, not least to mitigate the impact of the UK EU referendum on financial markets. In this context, despite the general increase in sovereign yields since 2H16, which continued in 2Q17, the low interest rate environment and related search-for-yield strategies represented a source of concern. The search for higher returns by EU funds is mirrored in increasing inflows into bond funds with a focus on EMs (EUR 23.5bn) as well as North America (EUR 28.4bn) (R.25). On the other hand, funds investing in government bonds registered net outflows in 2Q17 (R.26). Excessive risk taking and capital misallocation thus remain relevant risk sources in the medium-term outlook.

EU sovereign debt markets: In 2Q17 ten-year EU sovereign bond yields floated around the higher levels reached in 1Q17, yet with significant differences across countries. Ten-year sovereign bond spreads versus DE Bund narrowed slightly in 2Q17, with one peripheral country seeing a significant reduction from 3.6% end-1Q17 to 2.5% at the end of the reporting period. Market liquidity improved on 2H16, but signs of uncertainty remained. These were reflected in bid-ask spreads and developments in the ESMA composite liquidity index (R.10, R.11), which were seen to increase a little in May.

Market functioning: No significant disruptions were observed in the functioning of EU markets. Central clearing remained at a high level following entry into force of the first clearing obligation on G4 currency IRS in 2016 and on Index Credit Default Swaps on 9 February 2017. Both settlement activity and settlement fail rates increased following the T2S migration of one big Member State's market in February. The approach to the final migration wave to T2S in September 2017 is related to expectations of an increase in the volumes on this settlement platform, which contributes to the integration of post-trade processes across participating EU markets. Finally, cyber risk is increasingly becoming a key concern for financial markets institutions, both with respect to their business continuity and the integrity of proprietary data, as illustrated by recent global ransomware attacks. Financial market infrastructures (FMIs) such as trading venues, CSDs, TRs and CCPs are becoming ever more central to the financial system. But their size and centrality, as well as their exposure to information technology, render these infrastructures particularly vulnerable to cyber attacks.

Political and event risk: Conclusion of the French presidential elections, a source of significant market nervousness in the run-up, triggered benign equity and bond market reactions. Similarly, immediate market impacts of the British parliamentary elections were limited and concentrated on UK equity markets and the GBP exchange rate. Brexit negotiations are among the most prominent sources of political risk to the EU single market. They create substantial uncertainty over the future economic outlook and EU institutional arrangements, with key aspects to be negotiated over the coming months and possibly years. News flows and announcements may continue to intensify political and event risk, increasing uncertainty and sparking greater asset price volatility in EU markets. This was reinforced by the uncertainty over the US political agenda in key policy areas, including potential fiscal stimuli and financial regulation, and broader geopolitical developments.

## Risk categories

Market risk – very high, outlook stable: In 2Q17 EU equity market prices continued to increase, e.g. for banks (+3.9%), financials excl. banks (+5.6%) and insurance (+2.8%). Nevertheless, these developments were less pronounced than in the US, as mirrored by the dynamics of the P/E ratios (R.5). Implied volatilities remained at a low level. The GBP exchange rate implied volatility decreased throughout 2Q17 following a peak in January, notwithstanding the significant drop in the GBP exchange rate on April 9 (1.5% on average against EUR and USD). In an environment of high political uncertainty, with past elections and their unclear consequences as well as elections in some EU member states in 2017, markets are still prone to strong reactions and are expected to remain so during the coming months.

Liquidity risk – high, outlook stable: Liquidity in equity markets remained around its long-term average levels, with the ESMA composite equity illiquidity indicator deteriorating in May but reverting in June (R.4). On corporate bond markets an improvement in market liquidity was observed as the bid-ask spread and the Amihud indicator[30] edged down slightly compared to end-1Q17 (R.16). The sharp drop in repo rates observed at the end of 2016, documented by ESMA in earlier publications[31], resulted in greater dispersion between the scarcity premia on bonds in very high demand (the highest percentiles of the distribution) and the median premium. This dispersion was then reduced in 2Q17, though remaining at comparatively high levels (R.14). In addition to the cost they impose on repo market participants, repo market price dislocations can also lead to financial instability. They contribute to liquidity risk, volatile funding costs, and reduced market confidence. High dispersion levels reflect potential shortages of high-quality collateral and may endanger financial stability by increasing liquidity risk and volatility in funding costs and reducing overall market confidence.[32] In 2Q17, sovereign bond market liquidity picked up from 4Q16 but was slightly less than 1Q17, as illustrated by the increase in bid-ask spreads (R.10) and in the ESMA composite sovereign bond liquidity index (R.11).

Contagion risk – high, stable outlook: In sovereign bond markets the correlation between German and other EU countries' ten-year bond yields decreased further in 2Q17. Dispersion increased across member states versus end-1Q17 levels, with uneven behaviour within the same group, namely core and peripheral countries. One peripheral country's sovereign bond market drove the bottom 25% dispersion (R.19). Intra-sectoral fund interconnectedness for MMFs and HFs decreased in 1Q17 (R.29, R.32). However, concerns over banking sector balance sheet issues and their potential contagion for other sectors, such as insurances and pensions or funds, are still present.

Credit risk – very high, outlook stable: In 2Q17, EU corporate bond spreads remained around their 4Q16 levels. Covered bond spreads, having also ticked up at the end of 2016, reversed slowly toward lower levels and remained stable throughout the reporting period (R.18). The significant net inflows for EU bond funds whose assets concentrate on emerging, corporate, high-yields or mixed strategies seemed to confirm search for higher returns within the persistently low interest rate environment. Flows into funds focusing on emerging economies approximated EUR 24bn while HY funds' flows stood at around EUR 10bn (R.26). In contrast, flows into funds focusing mainly on government bonds continued to decline. The credit quality of outstanding corporate bond debt deteriorated, with the share of corporate bonds rated AA or higher declined to 22%, in 2Q17, while the share of BBB-rated bonds increased from 22% to 25% (R.17). Refinancing requirements for financials over the medium to long run (from 3Q17 to 3Q18) were lower than last year (R.23). Concerns remain at a more global level, also in relation to high corporate and public debt levels.[33]

Operational risk – elevated, negative outlook: Technology and conduct risks remained a key concern both within and outside the EU. No major trading disruptions were observed on EU financial markets in 2017, though a significant number of circuit breakers were triggered on EU equity markets on days of high market activity, such as the day following the first round of the French elections. The absence of spikes in quotes submission confirms the improved reliability and quality of Euribor, underlining the importance of sound and well-managed financial benchmarks (R.39). Even though the operational risk assessment remained unchanged, the risk outlook is negative. Concerns are deepening against the background of rising cyber-risk, uncertainty related to Brexit negotiations and unexpected difficulties in strengthening the transactions base of major interbank offered rates. Moreover, the rapid growth of FinTech and related effects on the financial sector are monitored by regulators.[34] In effect, FinTech influences changes in business models and opens new business opportunities, yet it may also raise concerns related to data privacy issues, vulnerability to cyber-crime and associated legal issues.

[30] The Amihud illiquidity ratio is a widely used measure of stock market illiquidity and evaluates the price impact of trading. It is calculated as the daily ratio of absolute stock returns to its volume, averaged over the chosen period. A smaller value of the coefficient means lower price impact and thus higher liquidity.

[31] For example see ESMA TRV No. 1 2017.

[32] For more details on high-quality collateral scarcity, see Box 12 in ESMA TRV No. 2 2017, Securities.

[33] International Monetary Fund, "Fiscal Monitor April 2017".

[34] ESMA response to Commission Consultation on Fintech", June 2017.

# Securities markets

R.3

## Risk summary

Risk level

Risk change from 1Q17

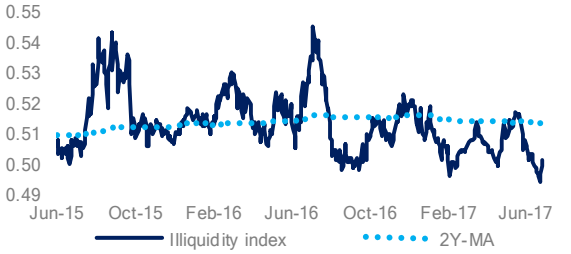
Outlook for 3Q17

## Risk drivers

- Asset re-valuation and risk re-assessment
- Low interest rate environment and excessive risk taking
- Geo-political and event risks
- Potential scarcity of collateral

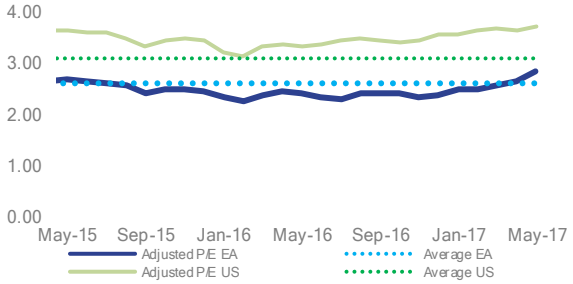
Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for forthcoming quarter. Systemic risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high 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
ESMA composite liquidity index
**Increased liquidity in June**



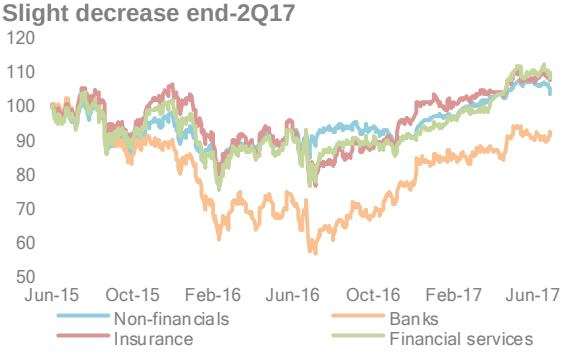

Note: Composite indicator of illiquidity in the equity market for the current Eurostoxx 200 constituents, computed by applying the principal component methodology to six input liquidity measures (Amihud illiquidity coefficient, bid-ask spread, Hui-Heubel ratio, turnover value, inverse turnover ratio,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

R.5
Equity valuation
**Long-term average in the EA reached**



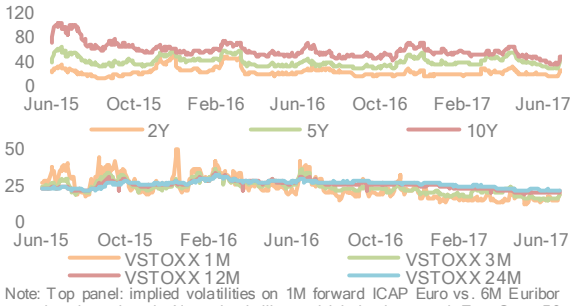

Note: Monthly earnings adjusted for trends and cyclical factors via Kalman filter methodology based on OECD leading indicators; units of standard deviation; averages computed from 8Y. Data available until the end of May 2017.
Sources: Thomson Reuters Datastream, ESMA.

R.6
Equity prices
**Slight decrease end-2Q17**



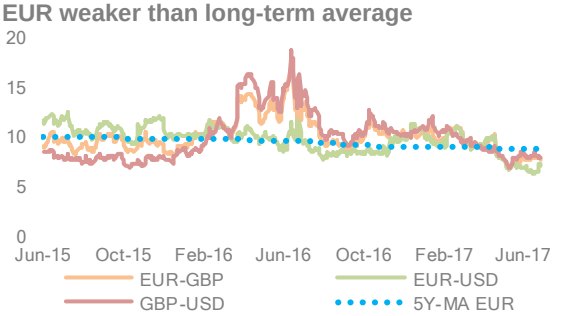

Note: STOXX Europe 600 equity total return indices. 01/06/2015=100.
Sources: Thomson Reuters Datastream, ESMA.

R.7
Financial instruments volatilities
**Stable volatility**



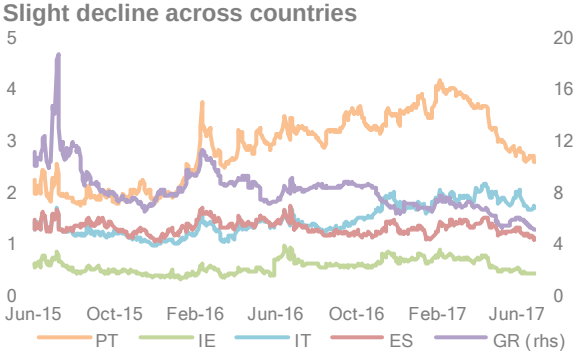

Note: Top panel: implied volatilities on 1M forward ICAP Euro vs. 6M Euribor swaptions based on the Normal volatility model, in bp; low panel: Euro Stoxx 50 implied volatilities, measured as price indices, in %.
Sources: Bloomberg, Thomson Reuters Datastream, ESMA.

R.8
Exchange rate volatilities
**EUR weaker than long-term average**



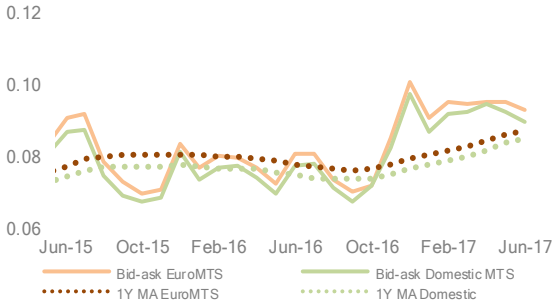

Note: Implied volatilities for 3M options on exchange rates. 5Y-MA EUR is the five-year moving average of the implied volatility for 3M options on EUR-USD exchange rate.
Sources: Bloomberg, ESMA.

R.9
Sovereign risk premia
**Slight decline across countries**



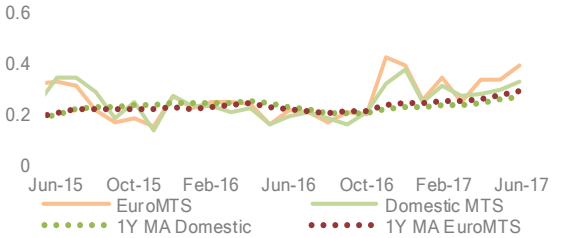

Note: Selected 10Y EA sovereign bond risk premia (vs. DE Bunds), in %.
Sources: Thomson Reuters Datastream, ESMA.

R.10
Sovereign bond liquidity – bid-ask spreads
**Better since end-2016**



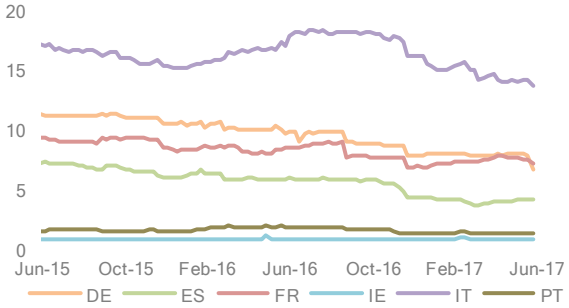

Note: Bid-ask spread as average bid-ask spread over one month across ten EU markets, Domestic and Euro MTS, in %. 1Y MA = one-year moving average.
Sources: MTS, ESMA.

R.11
ESMA composite sovereign bond liquidity index
**Improved for domestic MTS**



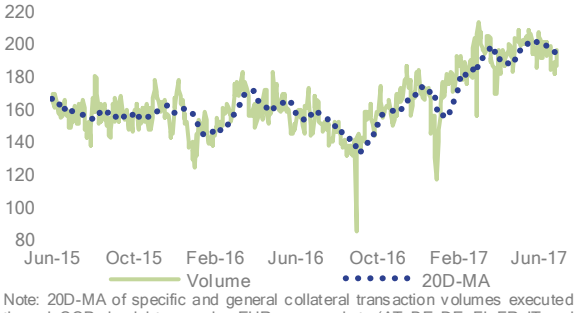

Note:Composite indicator of market liquidity in the sovereign bond market for the domestic and Euro MTS platforms, computed by applying the principal component methodology to four input liquidity measures (Amihud illiquidity coefficient, Bid-ask spread, Roll illiquidity measure and Turnover). 1Y MA = one-year moving average. The indicator range is between 0 (higher liquidity) and 1 (lower liquidity).
Sources: MTS, ESMA.

R.12
Sovereign CDS volumes
**Stable or decreasing**



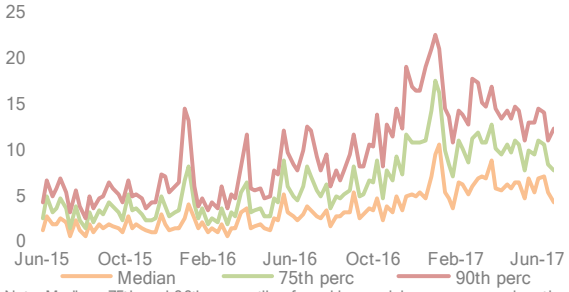

Note: Value of outstanding net notional sovereign CDS for selected countries; USD bn.
Sources: DTCC, ESMA.

R.13
Sovereign repo volumes
**Elevated volumes**



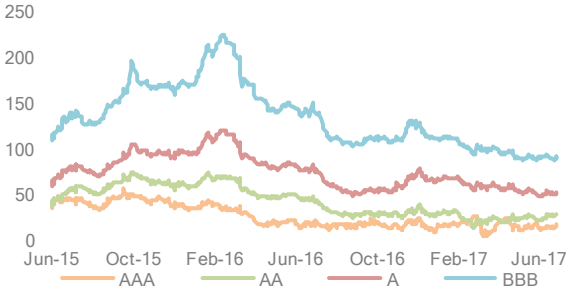

Note: 20D-MA of specific and general collateral transaction volumes executed through CCPs in eight sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), EUR bn. Index volumes filter out atypical transactions.
Sources: RepoFunds Rate, ESMA.

R.14
Repo markets specialness
**Reduced dispersion, though still at high levels**



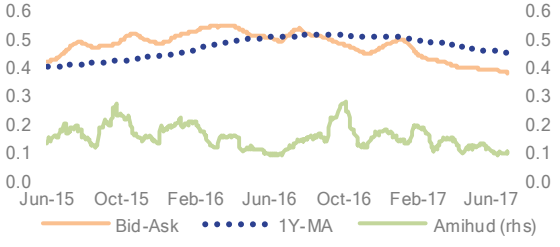

Note: Median, 75th and 90th percentile of weekly specialness, measured as the difference between general collateral and special collateral repo rates on government bonds in selected countries.
Sources: RepoFunds Rate (BrokerTec, MTS, ICAP), ESMA.

R.15
Corporate bond spreads
**Broadly stable in 2Q17**



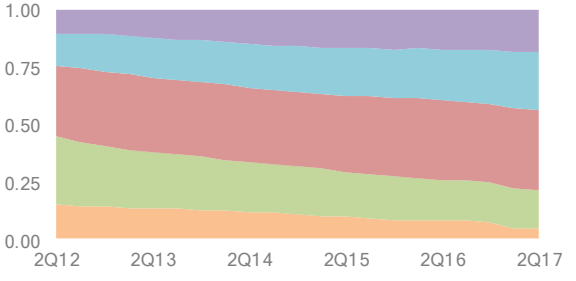

Note: EA non-financial corporate bond spreads by rating between iBoxx non-financial corporate yields and ICAP Euro Euribor swap rates for maturities from 5 to 7 years, basis points.
Sources: Thomson Reuters Datastream, ESMA.

R.16
Corporate bond bid-ask spreads and Amihud indicator
**Enhanced corporate bond liquidity**



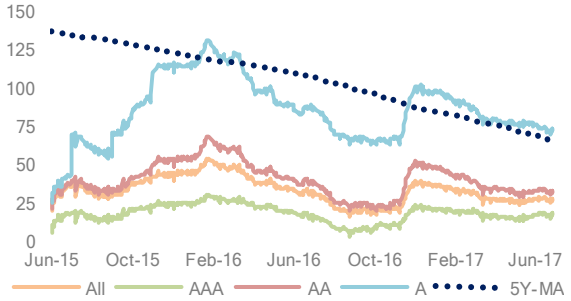

Note: EUR Markit iBoxx corporate bond index bid-ask spread, in %, computed as a one-month moving average of the iBoxx components in the current composition. 1Y-MA=one-year moving average of the bid-ask spread. Amihud liquidity coefficient index between 0 and 1. Highest value indicates less liquidity.
Sources: IHS Markit, ESMA.

R.17
Outstanding long term corporate debt
**Increased share of BBB and lower**



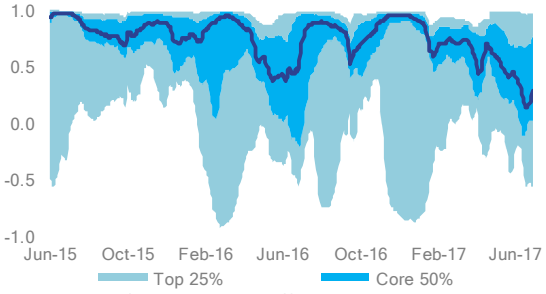

Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
Sources: Thomson Reuters Eikon, ESMA.

R.18
Covered bond spreads
**Decrease in 2017**



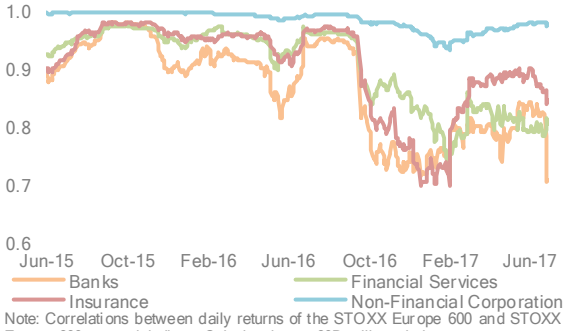

Note: Asset swap spreads based on iBoxx covered bond indices, basis points. 5Y-MA=five-year moving average of all bonds.
Sources: Thomson Reuters Datastream, ESMA.

R.19
Dispersion in sovereign yield correlation
**Increased dispersion, lower correlation**



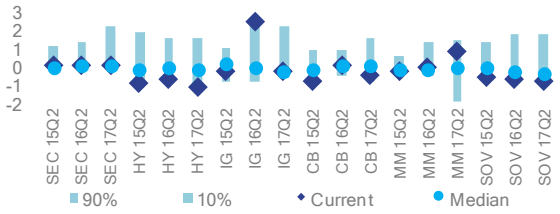

Note: Dispersion of correlations between 10Y DE Bunds and other EU countries' sovereign bond redemption yields over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

R.20
Sectoral equity indices correlation
**Lower correlation for banking sector**



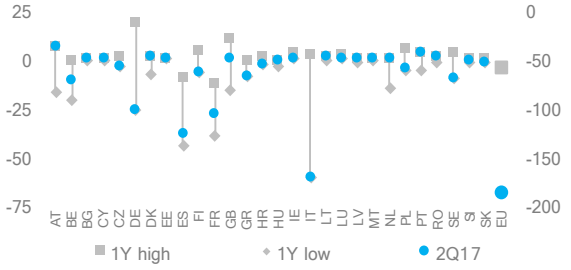

Note: Correlations between daily returns of the STOXX Europe 600 and STOXX Europe 600 sectoral indices. Calculated over 60D rolling windows
Sources: Thomson Reuters Datastream, ESMA.

R.21
Debt issuance growth
**Issuance growth negative for sovereigns**



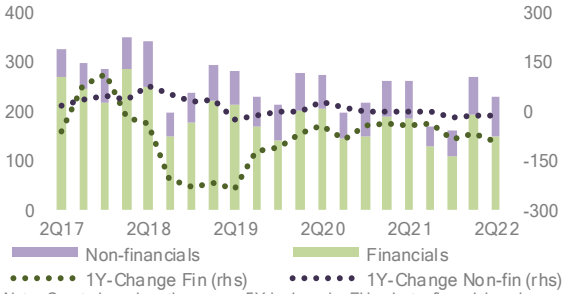

Note: Growth rates of issuance volume, in %, normalised by standard deviation for the following bond classes, following Eikon classification: securitised (SEC); high-yield (HY); investment grade (IG); covered bonds (CB); money market (MM); sovereign (SOV). Percentiles computed from 12Q rolling window. All data include securities with a maturity higher than 18M, except for MM (maturity less than 12M). Bars denote the range of values between the 10th and 90th percentiles. Missing diamond indicates no issuance for previous quarter.
Sources: Thomsons Reuters Eikon, ESMA.

R.22
Net sovereign debt issuance
**Negative net issuance in the EU**




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: Thomson Reuters Eikon, ESMA.

R.23
Debt redemption profile
**Lower short-term financing needs for financials**




Note: Quarterly redemptions over 5Y-horizon by EU private financial and non-financials corporates, EUR bn. 1Y-Change=difference between the sum of this year's (four last quarters) and last year's (8th to 5th last quarters) redemptions.
Sources: Thomson Reuters EIKON, ESMA.

# Investors

R.24

## Risk summary

Risk level

Risk change from 1Q17

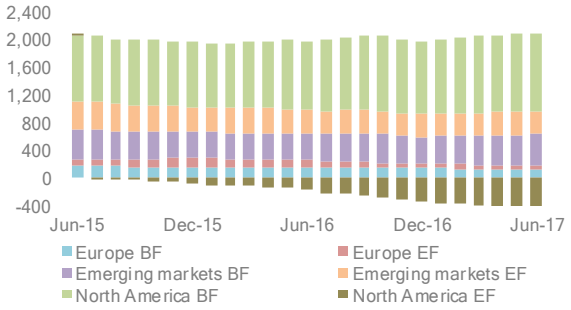
Outlook for 3Q17

## Risk drivers

- Sustained search-for-yield
- Asset re-valuation and risk re-assessment
- Correlation in asset prices
- Continued inflow into EU fund industry and potential event-related reversals

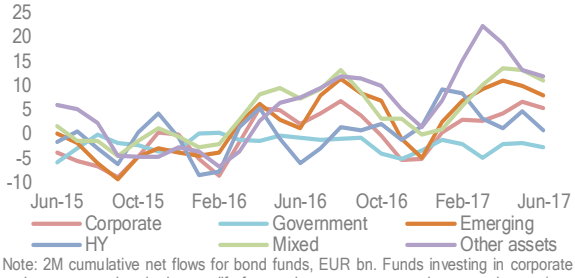
Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for forthcoming quarter. Systemic risk assessment based on categorisation of the ESA Joint Committee. Colours indicate current risk intensity. Coding: green=potential risk, yellow=elevated risk, orange=high 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 global investment fund flows
**Inflows for funds focusing on bonds and EMs**



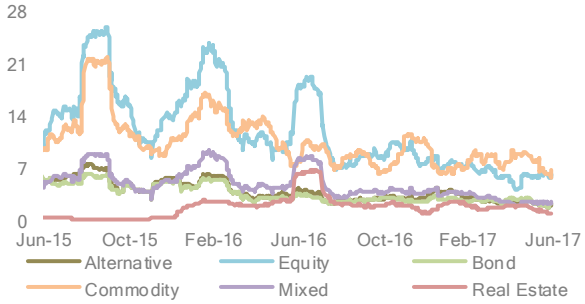

Note: Cumulative net flows into bond and equity funds (BF and EF) over time since 2004 by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

R.26
EU bond fund net flows
**High for funds with emerging and mixed focus**



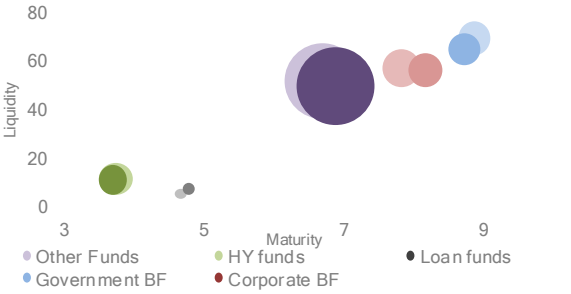

Note: 2M cumulative net flows for bond funds, EUR bn. Funds investing in corporate and government bonds that qualify for another category are only reported once (e.g. funds investing in emerging government bonds will be reported as emerging; funds investing in HY corporate bonds will be reported as HY).
Sources: Thomson Reuters Lipper, ESMA.

R.27
RoR volatilities by fund type
**Broadly stable volatilities**



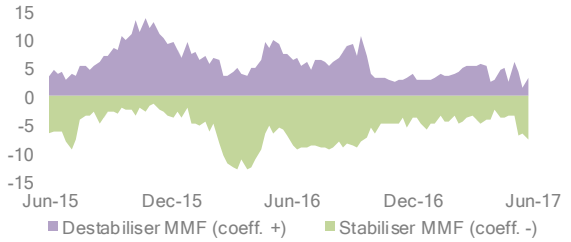

Note: Annualised 40D historical return volatility of EU domiciled mutual funds, in %.
Sources: Thomson Reuters Lipper, ESMA.

R.28
Liquidity risk profile of EU bond funds
**Stable liquidity and mixed maturity changes**



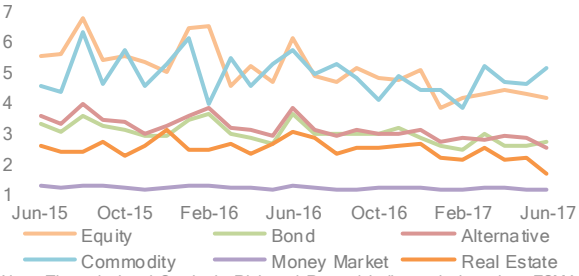

Note: Fund type reported according to the average liquidity ratio, in % (Y-axis), the effective average maturity of assets (X-axis) and size. Each series is reported for 2 years, i.e. 2016 (bright colours) and 2017 (dark colours).
Sources: Thomson Reuters Lipper, ESMA.

R.29
Money market fund interconnectedness
**Stabiliser MMFs have slightly stronger impact**



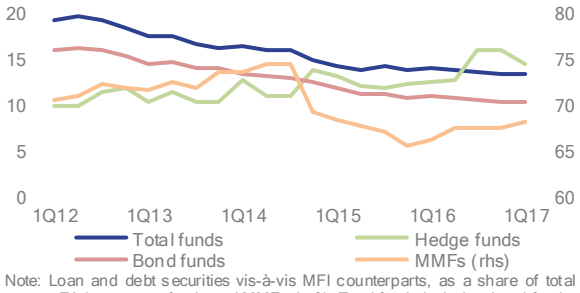

Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coefficients for individual fund returns' impact on the mean sector return and respective estimators. Coefficients stem from VEC models regressing individual fund returns and moments of the entire industry's return distribution on lags and general financial market indices. Measures aggregated across individual regressions.
Sources: Thomson Reuters Lipper, Thomson Reuter Datastream, ECB, ESMA.

R.30
Retail fund synthetic risk and reward indicator
**Decreasing for all but bond and commodity funds**



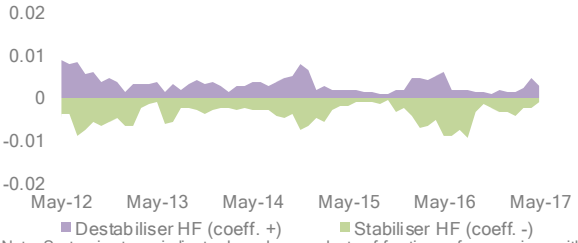

Note: The calculated Synthetic Risk and Reward Indicator is based on ESMA SRRI guidelines. It is computed via a simple 5-year annualised volatility measure which is then translated into categories 1-7 (with 7 representing higher levels of volatility).
Sources: Thomson Reuters Lipper, ESMA.

R.31
Financial market interconnectedness
**Increase for MMFs**




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
**Low intra-sector interconnectedness**




Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coefficients for individual fund returns' 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.
Sources: Barclayhedge, Eurekahedge, TASS, HFR, ESMA.

# Infrastructures and services

R.33

## Risk summary

Risk level

Risk change from 1Q17

Outlook for 3Q17

## Risk drivers

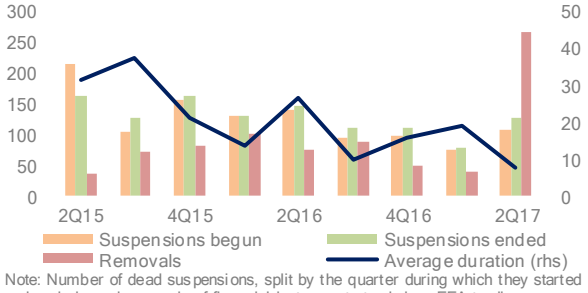
- Operational risks, including cyber risks
- Conduct risk, including intentional or accidental behaviour by individuals, market abuse
- Systemic relevance, interconnectedness between infrastructures or financial activities, system substitutability

Note: Assessment of main risk categories for markets under ESMA remit since past quarter, and outlook for forthcoming 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

Trading suspensions – lifecycle and removals

**Longer suspensions on average in 2Q17**

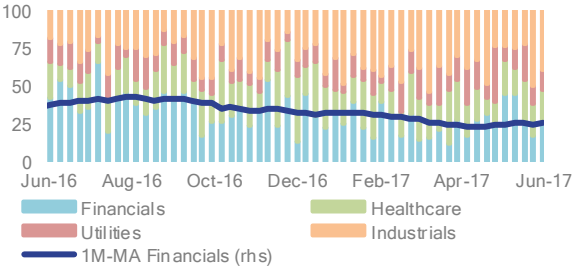



Note: Number of dead suspensions, split by the quarter during which they started and ended, and removals of financial instruments traded on EEA trading venues. Average duration of dead suspensions, in days, computed as the mean of the difference between the end-of-quarter date and the start date.
Sources: ESMA Registers.

R.35

Circuit breaker trigger events by sector

**No major market events**

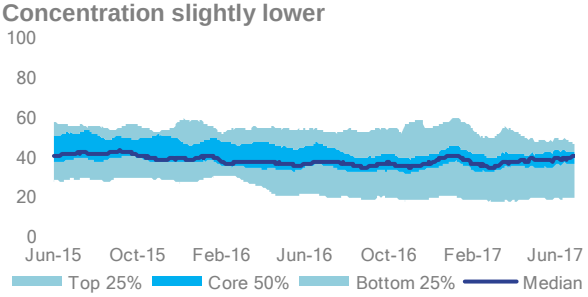



Note: Percentage of circuit breaker trigger events by economic sector. Results displayed as weekly aggregates.The analysis is based on a sample of 10,000 securities, including all constituents of the STOXX Europe 200 Large/Mid/Small caps and a large sample of ETFs tracking the STOXX index or sub-index.
Sources: Morningstar Real-Time Data, ESMA.

R.36

Equity market concentration

**Concentration slightly lower**

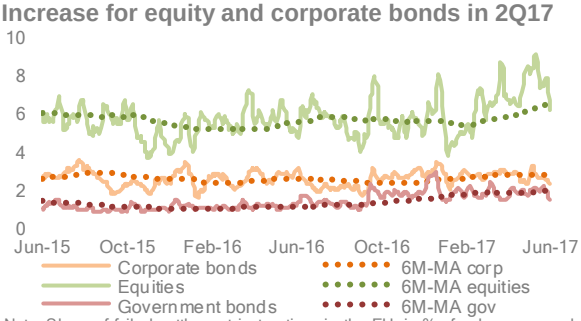



Note: Concentration of notional value of equity trading by national indices computed as a 1M-MA of the Herfindahl-Hirschman Index, in %. Indices included are FTSE100, CAC40, DAX, FTSE MIB, IBEX35, AEX, OMXS30, BEL20, OMXC20, OMXH25, PSI20, ATX.
Sources: BATS, ESMA.

R.37

Settlement fails

**Increase for equity and corporate bonds in 2Q17**

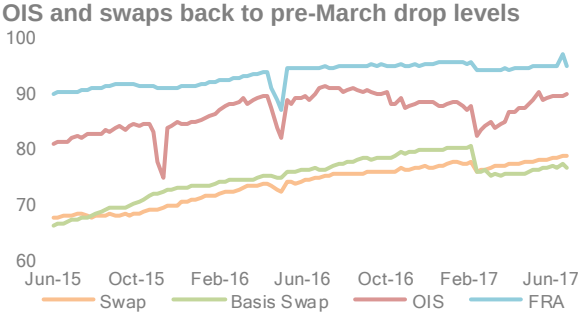



Note: Share of failed settlement instructions in the EU, in % of value, one-week moving averages. 6M-MA=six-month moving average. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.

R.38

IRS CCP clearing

**OIS and swaps back to pre-March drop levels**




Note: OTC interest rate derivatives cleared by CCPs captured by Dealer vs. CCP positions, in % of total notional amount. Spikes due to short-term movements in non-cleared positions.
Sources: DTCC, ESMA.

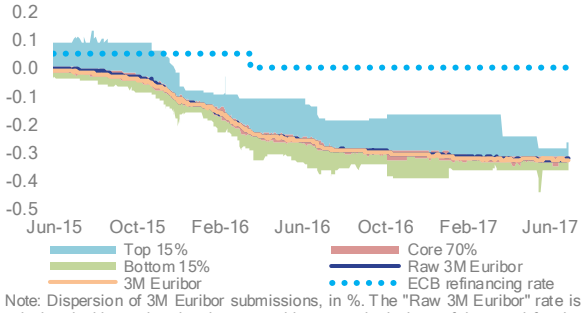
R.39

Euribor – Dispersion in contributions

**Decline in 2Q17**

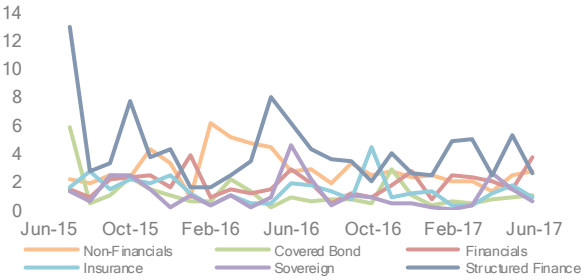

Note: Normalised difference in percentage points between the highest contribution submitted by panel banks and the corresponding Euribor rate. The chart shows the maximum difference across the 8 Euribor tenors.
Sources: European Money Markets Institute, ESMA.

R.40
Euribor – Dispersion of submission levels
**Decrease in the top 15%**




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.41
Rating changes
**Increasing volatility for financials**




Note: Volatility of ratings by all credit rating agencies, excluding CERVED and ICAP, by asset class computed as number of rating changes over number of outstanding ratings.
Sources: RADAR, ESMA.

# Vulnerabilities

## Investor protection

# The impact of charges on mutual fund returns

Contact: frank.hespeler@esma.europa.eu[1]

This article provides metrics to analyse the impact of ongoing fees, one-off charges and inflation on the returns of mutual funds. Preliminary evidence for the EU fund industry suggests that over the three–year horizon, from 2013 to 2015, ongoing fees, one-off charges and inflation reduced the returns available to investors by 29% of gross returns on average or, in absolute terms, 252bps. While reductions vary across jurisdictions, asset classes and client types, they apply to all market segments: Relative return reductions range from 11% for passive equity fund shares to 44% for retail fund shares in bond mutual funds. Absolute reductions vary from 74 to 398bps, respectively. Relative and absolute return reductions for actively managed and retail fund shares tend to exceed those of passively managed and institutional fund shares. In general, these reductions are driven mainly by total expenses, while sales fees act as a further driver. Investors' real returns are further reduced by inflation. The PRIIPs/MiFID framework will provide additional cost information, including distribution fees, to be taken into account, with particular consideration of the impact such costs could have on return reductions. In addition, we evaluate whether investors do indeed take fund charges and net returns into account when making investment decisions. Despite the impact of fees and charges on the net outcome to investors, these costs do not seem to be reflected in investor choices, given that aggregate net flows to EU fund shares evidently react hardly at all to management fees, and even less so to cost-adjusted net returns.

## Introduction

This article proposes a methodology to measure aggregate cost-adjusted returns on mutual funds. First, the impact of fees and load charges on investor returns is analysed. Preliminary results support the notion that management fees and subscriptions, as well as redemption charges, and also inflation, substantially reduce returns on fund shares. A second, ancillary step analyses the impact of charges on fund flows. Aggregate investments in mutual funds are, at best, weakly price- and cost-sensitive.

## Data and methodology

We employ a number of measures to analyse the impact of charges on returns on investments in mutual funds (RoI). These include:

- gross returns on the underlying portfolios;
- returns net of a fund share's total expenses, but including distributed income and
- returns net of expenses and charges, i.e. the second measure reduced by charges levied by fund managers on the acquisition and disposition of fund shares;[2]
- real returns net of all expenses and charges, i.e. the third measure reduced by inflation costs.

These metrics are constructed using data obtained from the Thomson Reuters Lipper database covering the EU mutual fund universe for the period January 2013 to December 2015. To avoid biases due to recent low interest rates, we complement these metrics with equivalents for the period from January 2005 to December 2015. As variables, we use entity-specific share-class data on total net assets (TNA), annual returns (gross, $r^{G}$, net of expenses, $r^{nE}$, net of expenses/charges, $r^{nEC}$, and real returns net of expenses/charges, $\bar{r}^{nEC}$), and annual net flows (flow). EU inflation figures are sourced from Eurostat. All these data are quarterly. In addition, we employ static information on asset

[1] This article was authored by Giacomo Massa, Julia Loder and Frank Hespeler.

[2] These measures exclude cost components borne by investors but not charged by fund managers, such as brokerage costs, account costs, charges by financial advisors, transaction costs levied by brokers, dealers and others, and finally also taxes. Inclusion of these cost components is left to future analysis. Therefore, they may conceptually deviate from the new rules specified in PRIIPs/MiFID II to be put in place from 01/01/2018.

types, domiciles, client types, fund strategies, and fees and charges levied by funds.

Total expenses and returns net of total expenses are directly available from our data sources.[3] To incorporate one-time load charges, such as sales (FL) or redemption fees (BL),[4] we weigh respective one-off charges with the absolute value of asset-weighted net flows.[5] Hence, our net returns decompose as:

$$r_j^{net} = r^G - exp - charges_j \quad j \in (FL, FL+BL),$$

with respective reductions in returns through expenses and charges computed as:

$$exp = (r^G - r^{nE})$$

$$charges_j = \left|\frac{net\ flows}{TNA}\right|\left(r^{nE} - r_j^{nEC}\right) \quad j \in (FL, FL+BL).$$[6] [7]

This approach assumes for each fund share that net flows correlate perfectly with gross flows, and accepts the resulting downward cost bias as inevitable, since gross flows are not available.[8] On the other hand, the partial employment of maximum load fees, whenever actual loads are not available, creates an upward bias, which tends partially to offset the first bias.[9] This effect is substantiated by our ignoring possible discretionary load fee reductions granted to attract clients.

Real returns net of charges, expenses and inflation (IC) are computed as:

$$\bar{r}_j^{net} = r^G - exp - charges_j - IC \quad j \in (FL, FL+BL).$$

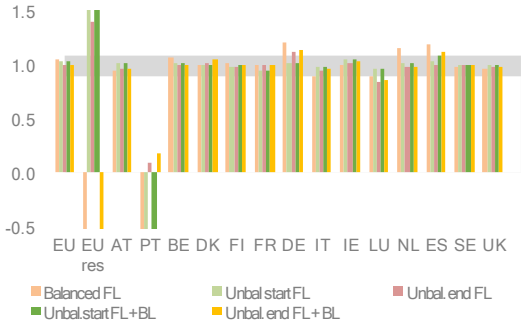
We report TNA-weighted averages across the EU mutual fund industry and its various segments, using two approaches:

- a balanced panel requiring full data for all relevant variables for the entire observation horizon, and
- an unbalanced panel simultaneously requiring full data for all relevant variables in at least one period.

All figures presented use the entire data available for all funds matching the respective panel. Hence, our sampling encompasses the full data universe. With regard to sample sizes, the unbalanced panel presents data on 20,731 EU funds in 1Q13 and on 40,133 in 4Q15. The balanced approach reports data for 18,623 EU funds.

## Sample representativeness

V.1
Relative sample deviations in rates of return
**Samples representative up to +/- 10%**




Note: Relative deviations of sample from population in the average rate of gross returns. Balanced, unbal. start and unbal. end denote the balanced panel, the beginning of the unbalanced panel and its end respectively. FL and BL denote sales and redemption fees. Grey area marks the region between 0.9 and 1.1, that is the region where sample fund return do not differ from population return more than 10%
Sources: Thomson Reuters Lipper, ESMA.

We illustrate the representativeness of our sample for the two different sampling approaches by analysing deviations in samples from respective populations on fund returns (V.1) and industry size (V.2).

3 Total expenses include all fund expenses as reported by funds, including performance fees. Potential differences in national interpretations of related EU legal concepts for individual expense categories are not necessarily factored in. For details on expense categories please refer to Lipper, 2011.

4 Sales (redemption) fees are defined as one-off fees expressed in percent of share prices and charged when the share is sold (redeemed) by the fund. See Thomson Reuters Lipper, 2011.

5 We follow a different approach from e.g. Davydoff and Klages, 2014, who assume a holding period of 5 years for factoring in the effect of load charges. We argue that a data-driven measure should adequately reflect the aggregate impact of load charges.

6 *TNA*-weighted net flows are computed as a piecewise function. The denominator of the weight in a given period is the start value in the case of negative net flows and the end value in the case of positive net flows. In addition, we use a threshold value of 1.5 for the absolute value of this variable, dropping all fund shares with a higher value from the analysis.

7 Our method does not explicitly account for discounts received by investors. Such discounts would be more likely for large (institutional) investors and could therefore bias the respective figures upward. In terms of the computation of sales fees, we recalculated from fee-adjusted returns provided in the data source, while redemption fees were used directly, not recomputed from respectively adjusted returns, as the data available for the latter appeared to be of low quality.

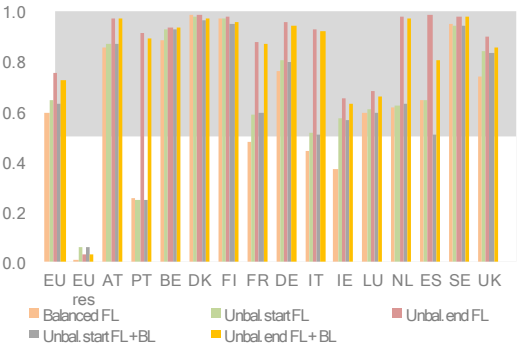
8 We acknowledge the restrictive nature of this assumption and the resulting potential underestimation of the impact of fees and charges, as net flows need not necessarily correlate perfectly with gross flows.

9 Our data source, Thomson Reuters Lipper, offers a combination of actual and maximum load fees reported, using maximum loads to substitute for actual ones if the latter data field is empty. It draws on prospectuses and KID documents usually stating maximum amounts of entry charges. These maximum charges may not always reflect the level of actual charges applied. Maximum redemption fees are used for roughly 20% of the fund shares included and remain below 3.5% in 85% of these cases.

Regarding fund returns, on average EU funds reporting data on charges adequately represent the respective return metrics of related universes. Average returns in samples for the EU as a whole, as well as for the majority of individual countries, are within a bound of +/- 10% around respective values for corresponding subgroups of the entire fund population.

Regarding the size of the fund industry, in most instances the samples represent the majority of respective industry segments of the entire fund population in terms of the number of funds (more than 50%) and in respect of the total assets they manage (more than 60%, not explicitly reported). Exceptions are samples for PT and residual EU countries, for which we do not claim representativeness. Minor deviations in single criteria for other countries are offset by the remaining criteria for these countries.

V.2
Relative sample deviations in fund numbers
**Most sample segments cover more than 50%**




Note: Relative deviations of sample from population, number of funds. Balanced, unbal. start and unbal. end denote the balanced panel, the beginning of the unbalanced panel and its end respectively. FL and BL denote sales and redemption fees. Grey area marks the region when the ratio sample over population is between 0.5 and 1.
Sources: Thomson Reuters Lipper, ESMA.

By the same criteria, our results are representative for most fund types, except for alternative mutual funds (Alt) and real estate (RE), for which all our samples show strong deviations from the respective EU mutual fund populations (up to 80% deviations in average returns and coverage).

Breaking down samples further reduces their representativeness, as fund numbers for individual sample segments decline, except for major geographic market segments. For asset class breakdowns and for institutional and passive market segments in particular, representative preliminary results are only available for a minority of markets.

We present results exclusively for the unbalanced sample, as all results are qualitatively robust to a switch to a balanced panel. In addition, an unbalanced panel has the advantage of including more data in the analysis.

## Cost-adjusted fund returns in the EU

As a first step, we analyse the impact of fees included in the total expense ratio (TER), i.e. fund charges designed to cover the costs of administrating and managing funds,[10] on fund returns. Averaged across mutual fund shares and the observation period from 13 January 2016 to 15 December 2016, the TER reduced returns on EU fund shares by 13%. Depending on the market segment considered, returns net of total expense fees are 5 to 25% lower than gross portfolio returns. Expressed in absolute terms, absolute average return reductions vary between 16 and 188bps across countries and asset classes.

As a second step, we factor in the impact of loads. For sales fees, the average relative reductions in fund returns vary across different countries, asset classes and investor types between 7 and 34%. This adds a further absolute reduction in fund returns of between 1 and 77bps to the profit reductions caused by the TER. The respective EU average for the relative reduction of returns through TER and sales fees stands at 19%. Next, we factor in redemption fees, which trim another 0 to 86bps from gross returns. On average, TER and all load fees thus reduce the returns on an EU mutual fund share by 20%.[11]

Finally, inflation cuts the returns available to investors by an additional 26 to 149bps, equivalent to 0.4 to 8.5 percentage points (ppt) of gross returns, bringing the average real net return on an EU fund share to 6.32ppt, 29% less than its respective nominal gross return.

Reductions in fund returns show considerable geographic heterogeneity across the EU. The lowest relative reductions due to TER are

[10] We employ the TER definition by Thomson Reuters Lipper, which conceptually resembles the TER definition of UCITS as opposed to the ongoing charges to be included in the UCITS IV KIID. One of the main differences between the two concepts is the inclusion of performance fees in the TER.

[11] Our load reduction of 55bps for the average EU fund share is of the same order as the respective 31bps reported in Investor Economics (2012) for a sample of Canadian funds and quite close to the estimate of 50bps in Bogle, 2014. Similarly, our average TER reduction of 119bps is of roughly the same size as the average 100bps reported for European funds in Holdt, 2016.

observed in NL and SE, where additional losses generated by load fees are also close to zero (in absolute terms 2-6 bps), as funds frequently do not charge such fees. On average, the most pronounced reductions materialise in AT, IT and LU, with relative reductions due to TER and loads reaching up to 28% of respective gross portfolio returns. Substantial contributions by loads to average relative RoI reductions are observed for LU and BE, where loads add up to 16 ppt of the overall shrinkage in RoI. While in most cases the major part of this additional reduction is generated by sales fees, redemption fees tend to exceed sales fees in BE.

V.3
**Reduction in fund returns – TER and load charges[12]**

Average rate of, and relative reductions in Return on Investment

| | Absolute returns | | | | | Relative return reductions | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Gross | Net of expenses | Net of expenses and sales charges | Net of expenses, sales and redemption fees | Net of expenses, sales and redemption fees, and inflation | Net of expenses | Net of expenses and sales charges | Net of expenses, sales and redemption fees | Net of expenses, sales and redemption fees, and inflation |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | $r^G$ | $r^{nE}$ | $r^{net}_{FL}$ | $r^{net}_{FL+BL}$ | $\bar{r}^{net}_{FL+BL}$ | $(r^G-r^{nE})/r^G$ | $(r^G-r^{net}_{FL})/r^G$ | $(r^G-r^{net}_{FL+BL})/r^G$ | $(r^G-\bar{r}^{net}_{FL+BL})/r^G$ |
| **Geographical heterogeneity** | | | | | | | | | |
| EU | 8.84 | 7.65 | 7.13 | 7.11 | 6.32 | 13.4% | 19.3% | 19.8% | 28.7% |
| AT | 6.50 | 5.24 | 4.66 | 4.66 | 3.16 | 19.4% | 28.4% | 28.4% | 51.4% |
| BE | 10.25 | 8.70 | 7.93 | 7.07 | 6.27 | 15.1% | 22.6% | 31.0% | 38.8% |
| DE | 9.15 | 7.82 | 7.37 | 7.37 | 6.54 | 14.6% | 19.4% | 19.5% | 28.6% |
| DK | 9.06 | 7.85 | 7.71 | 7.83 | 7.42 | 13.4% | 14.9% | 15.2% | 19.6% |
| ES | 6.21 | 4.99 | 4.77 | 4.63 | 4.37 | 19.5% | 23.1% | 26.7% | 30.8% |
| FI | 8.58 | 7.45 | 7.33 | 7.35 | 6.18 | 13.2% | 14.6% | 16.0% | 29.3% |
| FR | 5.83 | 4.92 | 4.56 | 4.54 | 3.96 | 15.6% | 21.7% | 22.0% | 31.9% |
| IE | 7.83 | 7.05 | 6.54 | 6.44 | 6.15 | 10.0% | 16.5% | 17.0% | 20.8% |
| IT | 6.54 | 5.06 | 4.85 | 4.80 | 4.22 | 22.6% | 25.9% | 27.7% | 36.4% |
| LU | 7.62 | 6.35 | 5.61 | 5.56 | 4.77 | 16.6% | 26.3% | 27.2% | 37.5% |
| NL | 11.68 | 10.67 | 10.64 | 10.61 | 9.52 | 8.6% | 8.9% | 9.2% | 18.5% |
| SE | 11.65 | 10.54 | 10.52 | 10.52 | 10.07 | 9.6% | 9.7% | 9.7% | 13.6% |
| UK | 13.84 | 12.37 | 11.82 | 11.80 | 10.39 | 10.6% | 14.6% | 14.7% | 24.9% |
| **Asset classes/Investor type** | | | | | | | | | |
| Equity Ret | 15.54 | 13.82 | 13.18 | 13.15 | 12.21 | 11.1% | 15.2% | 15.4% | 21.5% |
| Equity Inst | 14.62 | 13.67 | 13.18 | 13.07 | 12.43 | 6.5% | 9.8% | 10.6% | 15.0% |
| Bond Ret | 5.96 | 4.83 | 4.12 | 4.07 | 3.33 | 18.8% | 30.8% | 31.9% | 44.3% |
| Bond Inst | 6.12 | 5.52 | 5.17 | 5.08 | 4.25 | 9.8% | 15.6% | 16.6% | 30.2% |
| Mixed Ret | 9.39 | 7.68 | 7.15 | 7.13 | 6.24 | 18.2% | 23.9% | 24.5% | 33.9% |
| Mixed Inst | 9.26 | 8.13 | 7.58 | 7.50 | 6.74 | 12.2% | 18.2% | 19.1% | 27.3% |
| MMF Ret | 1.42 | 1.15 | 0.94 | 0.92 | 0.34 | 19.0% | 33.6% | 34.8% | 75.7% |
| MMF Inst | 2.89 | 2.73 | 2.69 | 2.68 | 2.15 | 5.4% | 7.0% | 7.3% | 25.6% |
| ETF | 11.69 | 11.31 | 10.76 | 10.36 | 9.84 | 3.2% | 7.9% | 11.3% | 15.8% |
| **Management type** | | | | | | | | | |
| Active | 8.67 | 7.46 | 6.92 | 6.90 | 6.12 | 14.0% | 20.2% | 20.7% | 29.7% |
| Passive | 13.12 | 12.65 | 12.49 | 12.44 | 11.55 | 3.6% | 4.8% | 5.2% | 11.9% |
| Active Equity | 15.49 | 13.76 | 13.09 | 13.04 | 12.14 | 11.2% | 15.5% | 15.9% | 21.7% |
| Passive Equity | 14.82 | 14.32 | 14.20 | 14.16 | 13.25 | 3.4% | 4.2% | 4.4% | 10.6% |

Note: The first five columns report sample averages of gross returns, returns net of charges, returns net of charges and front load fees, returns net of charges and all load fees and returns net of charges, all loads and inflation. The last four columns report the relative reductions in gross returns generated by charges, the total of charges and front loads, the total of charges and all load fees and, finally the total of charges, load fees and inflation. Formal definitions for the individual reductions are provided in the "Data and methodology" section in the article. Ret = Retail; Inst = Institutions; all data as of December 2015, in percentage points. The results presented are derived from unbalanced panels, taking into account all available data. Equivalent results using a balanced panel approach, i.e. requiring full data for all variables, do not significantly differ in most cases. Columns 1-3 and 6-8 are based on the sample for which front load data are available. Columns 4-5 and 8-9 build on the samples for which front and back load data are available.
Source: Thomson Reuters Lipper, Eurostat, ESMA.

Heterogeneity in the impact of expenses on returns and fees is considerably lower across the locations in which funds are marketed: Absolute (relative) reductions due to TER vary between 118 and 196bps (19 and 27%). Focusing on the same EU markets as above,[13] load charges increase these losses within a range of 202 to 293bps (31 to 41%), with UK, DK and IE at the lower end of the relative reduction spectrum.

The impact of charges on fund returns varies for different segments of the fund industry. Relative reductions in returns due to fees and loads are moderate for equity funds. Retail (institutional) equity funds experience reductions of 239bps/15% (155bps/11%) on average. Despite lower absolute reductions, bond fund investors lose on average a higher share of the available gross profits (32% in retail and 17% in institutional funds). Across all asset classes, the highest relative return reductions are experienced by retail investors (35%/48bps) in MMFs and the lowest by institutional investors in MMFs (7%/20bps).

These EU-wide results are matched by most individual country results, with equity funds generally experiencing lower reductions than bond and mixed funds. With the latter two, major national markets separate into two groups: In FR, IE and UK returns on bond funds are reduced less than on mixed funds, while in BE, DK, IT, LU, ES and SE the opposite holds true. In general, reductions range between 8% (SE equity funds) and 42% (bond funds in BE) of available gross returns. The exceptions are Swedish bond funds, which experience a 78% reduction in their returns, with particularly low gross returns on Swedish bond funds as the main driver. The returns on MMFs are massively reduced by fees and loads in FI, FR, DE and IT: by between 62 to 93% in relative terms, with loads acting as the major driver in FR and TER in FI, DE and IT.

On average EU-wide, annual expenses and one-time load fees reduce returns more markedly for retail clients (21%) than for institutional investors (13%). This holds across all asset classes, with the lowest relative differences observed for mutual funds following alternative and mixed investment strategies. Institutional and retail clients of MMFs on the other hand, face massive fee differences. Factoring in inflation costs as well, this pattern still holds across all major EU markets, with the exception of FI, FR and DE, where the impact of total reductions on fund returns is higher for institutional clients (V.4).[14] In contrast, IE, LU and DK show particularly elevated relative return reductions for retail investors.[15]

The results in Table V.3 illustrate that the average share in a passive EU fund outperformed its active peer not only in absolute gross returns, but also in terms of their reduction through fees and charges. This is partly because the passive fund industry is predominantly invested in equity markets, which on average offer higher risk premia. In detail, for active fund shares the reduction in returns due to fees, charges and inflation averaged 255bps of their annual performance, or 30% of gross returns. The respective reductions for passive funds amounted to 157bps or 12% of gross returns.[16] Active equity funds, however, do outperform their passive peers in terms of gross returns (15.49% vs. 14.82%). Expenses, charges and inflation still reduce returns substantially more for active equity funds (335bps or 22%) than for passive ones (157bps or 11%), leaving active equity funds with inferior net returns.[17] ETF shares

[12] Due to a printing error in the first published version of this document, the values in the last four rows of column five have been corrected in this version.

[13] The set of countries is adjusted to achieve comparability with the results for domiciles. For the entire set of markets, which includes the EU and some neighbouring markets, absolute reductions due to all fees reduce returns by 202 to 385bps, or in relative terms by 31 to 57%. The larger set of markets is due to the fact that the same fund can be marketed in several jurisdictions.

[14] Despite methodological differences and correction for the inclusion of inflation costs, our results fall within the intervals of cost reductions reported by Davydoff and Klages, 2014. The smaller size of our average effects is due to actual net flows below their implicit assumption of net flows of 20% of the investment per year.

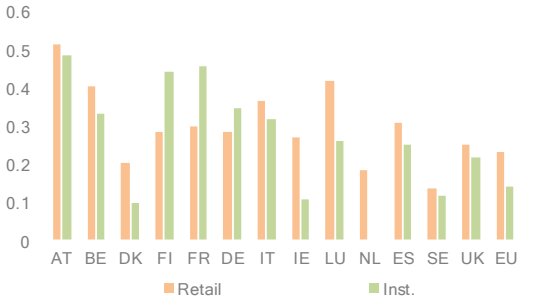
[15] If inflation is not factored in, the order of cost sizes reverses for FI and FR, while for DE costs for retail and institutional clients are of a similar size. This may be due to the change in the composition of subsamples over time, which also affects client-type-specific gross returns.

[16] Bogle's 2014 estimate of 257bps for the difference between the absolute reduction experienced by an active and a passive fund exceeds our equivalent excluding inflation, but includes additional cost components such as the drag of cash positions, etc. Holdt's 2016 estimate of 107bps difference between ongoing costs (net of taxes) for active and passive European funds exceeds our equivalent of 74bps for TER as well. The FCA's 2016 difference of 75bps for UK equity funds, closely matches our result for the average EU fund.

[17] Hence the differences in portfolio structures of actively and passively managed funds. In particular, the high proportion of funds with equity-focused portfolios in the

performed slightly less well than passive funds[18]: on average for the EU, they suffered an absolute reduction in their returns through fees, load charges and inflation by 185bps, equivalent to a relative reduction of 16%.

V.4
Relative return reductions through TER, loads and inflation
**Return reductions more severe for retail clients**




Note: Relative reductions in RoI generated by TER, front and back-load charges and inflation. Time averages across sample horizon, in ppt.
Sources: Thomson Reuters Lipper, ESMA.

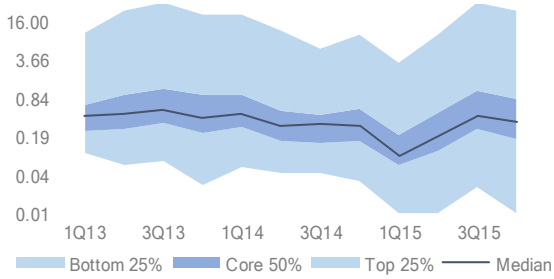
In terms of relative relevance, total expense fees dominate all other components, generating almost half of the overall reductions in returns suffered by EU fund clients. Sales fees make up a further 20%, leaving redemption fees with a mere contribution of around 2% and inflation with another 31%. IE and LU depart from this pattern, as sales fees account for up to 30% of the reduction in clients' returns. On the other hand, sales and redemption fees represent 10% maximum of the overall return reduction in DK, FI, SE and NL. Load fees are particularly important for ETFs, weighing in with almost 50% of their respective overall reduction in clients' returns, while for retail equity and mixed funds they shave off a mere fifth.

Results for the period from 1Q06 to 4Q15, both unweighted and asset-weighted time averages, confirm the robustness of our findings: relative reductions in gross returns generated by expenses, load charges and inflation consistently exceed respective values for the three-year horizon. This corroborates the relevance of costs for investors. Lower fees and higher gross returns, however, appear to have improved the situation for investors in recent years.

Looking at share classes, relative return reductions are generally quite heterogeneous. Around 10% of fund shares display very high relative reductions in their respective RoI (V.5).

Such massive reductions stem mainly from combinations of low gross returns on underlying portfolios, i.e. close to zero, and the presence of considerable load. In a situation where a fund client is confronted with an investment yielding gross returns close to zero the presence of discretionary load charges can therefore render investment and disinvestment extremely costly. These situations are more likely to occur in the current low interest rate environment, reinforcing the vulnerability of investors to low performance by their investments in the fund industry.

V.5
Dispersion of relative return reductions
**Substantial heterogeneity**




Note: Dispersion of relative reductions in ROI. Y-axis logarithmic scale using base of 4. Values of 0.01 indicate negative values in the original data. Negative values of this kind can be generated by deflation.
Sources: Thomson Reuters Lipper, Eurostat, ESMA.

## Aggregate net fund flows hardly cost- or return-sensitive

This section complements the results derived above by analysing whether net fund flows are sensitive to cost-adjusted fund returns and respective fees and charges. To estimate this, we employ the cross-sectional simultaneous equation model

$$\begin{pmatrix} r^{nEC} \\ flow \\ ter \end{pmatrix} = \beta_1 \begin{pmatrix} r^{nEC} \\ flow \\ ter \end{pmatrix} + \beta_2 D \begin{pmatrix} r^{nEC} \\ flow \\ ter \end{pmatrix} + \gamma X + \varepsilon$$

This comprises optimality conditions for 1) fund managers who maximise profits by adjusting the TER; 2) clients maximising returns on their investments by choosing their optimal net investment flow; and 3) the balance between the volume of fund shares offered and the demand by fund clients ensured by adjustments in the fund's net return. D represents the impact of various dummies on interaction variables used to distinguish contemporaneous effects of varying fund groups. Interaction groups include domiciles, asset types and retail/institutional

passive fund segment appears to contribute to results aggregated across all asset types.

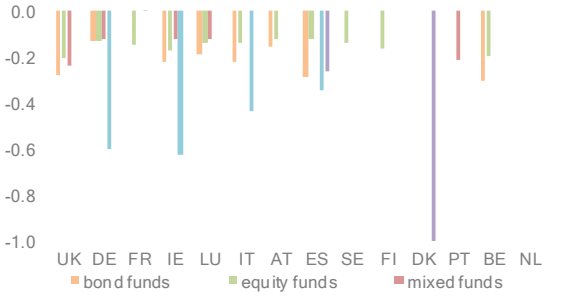
[18] ETFs differ substantially from other investment funds in terms of their issuance process and portfolio composition. For instance, fund shares of ETFs can be acquired or sold on primary or secondary markets. Hence, cost and return data on this fund type are not perfectly comparable with the data for other fund types.

share classes. X denotes the set of exogenous variables, which varies across model specifications and includes lags of endogenous variables, their squares, fund sizes and fund cost data. To cope with contemporaneously interdependent endogenous variables, the system is estimated using three-stage least squares estimation (TSLS).[19] Family averages or aggregates of the three endogenous variables across funds associated with the same investment portfolio serve as instrumental variables.

Results demonstrate the relevance of family returns, flows and TER: respective estimators are significant, positive and sizeable. Fund shares' net returns, flows and TER depend positively on their lags, with such effects more pronounced for TER than for fund flows and net returns. Fund share size weakly affects returns, with positive elasticity and a very small negative estimator for its square implying small and diminishing scale effects. Annual charges covering management costs, but not distribution costs, impact positively, but less than one-to-one, on TER[20] and have a tendency to be higher for more profitable fund shares. A positive alpha for active funds tends to be present as well, but significance is dependent on the model version employed.

Contemporaneous effects between endogenous variables remain weak and ambivalent, with results showing limited robustness across differing model versions. When lag structures are symmetric, flows react negatively to TER, significantly more so for share classes of retail investors. Their reaction to net returns is ambivalent: coefficients are positive for institutional share classes and negative for retail fund shares. These results are not persistent, as lagged TER influence flows positively[21], if at all, and lagged net returns display negative estimators of negligible sizes, which are not robust across all model versions.[22] When using asymmetric lag structures in order to remove potential multicollinearity of current and lagged TER, contemporaneous sensitivities disappear for institutional fund shares or, in the case of retail shares, are positive for TER and negative for cost-adjusted returns. Sensitivities to lagged net returns switch signs between the first and second lag and are of negligible size.[23] OLS estimators for the flow equation used to evaluate robustness lend some qualitative support to these results, while displaying less pronounced sizes.

V.6
Estimates for sensitivity of flows to TER
**Flows in some countries react negatively to TER**




Note: Impact of TER on flows, significant at 90%. Derived from benchmark model.
Sources: Thomson Reuters Lipper, ESMA.

In models with symmetric lag structures, net flows to bond funds appear more sensitive to TER than net flows to mixed or equity funds, with only moderate heterogeneity across countries. MMFs and commodity fund flows exhibit higher sensitivity to TER (V.6). Differences between retail and institutional share classes are less clear-cut: substantial differences exist only for commodity funds and MMFs, with retail clients appearing as the more sensitive customer group (V.7).[24]

[19] Details of this method are available in Zellner and Theil, 1962. Reported results were, according to Hansen-Sargan statistics, not exposed to overidentification issues.

[20] Econometric results reported thus far are significant on a 99% level and hold across all model versions employed.

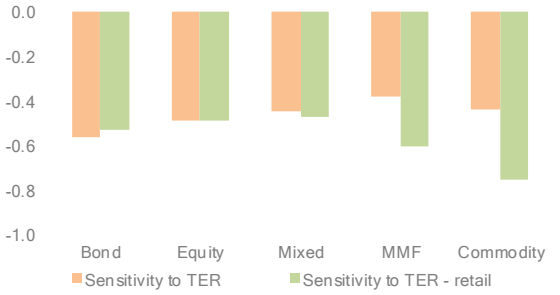
[21] Barber et al., 2005, report similar positive effects for operating expenses. In addition, our unreported result of weak evidence for a negative dependence of TER on lagged net flows similarly matches their respective results.

[22] These results contradict the findings of Barber et al., 2005.

[23] Our results, reported at 99% level, broadly fit with those of Bergstresser et al., 2009. They report relative flows reacting slightly negatively to expense ratios and unanimously positively to excess returns relative to benchmarks. As we employ returns instead of excess returns, the higher statistical strength of the respective estimators in Bergstresser et al., 2009, may be due to investors' orientation towards relative returns. In line with our results, their estimates for the effects of loads and sizes (cumulated from their fund and complex sizes) suggest ambivalent and only borderline significant results for respective flow sensitivities. Our positive flow sensitivity to contemporaneous returns for institutional share classes matches respective results for US equity funds in Edelen and Warner, 2001, which they explain through reversed causality.

[24] In models with asymmetric lag structures results are even more ambiguous. Significant TER coefficients found for individual countries are positive as often as negative and of negligible size.

V.7
Estimates for sensitivity of flows to TER
**Retail investors in MMFs and commodity funds sensitive to TER**




Note: Impact of TER on flows, significant at 90%. Derived from benchmark model.
Sources: Thomson Reuters Lipper, ESMA.

Negative coefficients appear only for retail fund shares in bond, money market and commodity funds and range between one-third and one-fifth of the sizes of their respective equivalents for symmetric models.[25] The sensitivity of net flows to cost-adjusted returns results shows no perceptible pattern across domiciles or asset classes. Again, OLS estimators support these results.

With regard to the convexity of flows in returns,[26] our results add yet more ambiguity. Splitting funds into performance quintiles, net flows to institutional fund share classes that outperform the industry appear to react negatively to returns and more sensitively than worse-performing funds. Estimates for flows' sensitiveness to TER appear positive and much stronger for institutional clients than retail clients

We interpret this evidence as reconfirmation of at best weakly cost-sensitive and even less return-sensitive aggregate investor demand functions. This impression tallies with market intelligence reported in Andersen et al., 2016. However, it does not necessarily imply that individual investors are cost- or return-insensitive. Aggregate demand for fund shares insensitive to costs and returns can also result from individual effects offsetting each other. Similarly, both sales and redemptions could be characterised by similar sensitivities, again cancelling each other out through netting.

## Conclusion

This article provides metrics to analyse the impact of ongoing fees and one-off charges on mutual fund returns. Our preliminary evidence delivers two key results:

— a substantial reduction in net returns available to investors, especially retail investors; and

— only weakly cost- or price-sensitive investment decisions by retail investors.[27]

Methodological limitations in our proposed metrics described in this article are linked chiefly to data availability. Transaction-level data on individual clients' transactions in fund shares could e.g. serve as a first step to the correction of biases in the calculation of cost-adjusted returns, which are generated by the use of aggregate net flow data or by assumptions about clients' average holding periods.

Similarly, such data would contribute to a more disaggregated analysis of the determinants of individual investors' demand for fund shares. In addition, data on fees and charges levied not by funds, but by brokers and investment advisers are currently not available on a consistent basis but would be necessary to provide a complete picture of the charges investors face. Finally, there may be merit in assessing at a later stage whether the results presented in this paper are confirmed when the fresh information on costs taken from the new PRIIPs/MiFID framework to be put in place in 2018 is available.

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[25] Effects discussed here are significant at the 90% level.

[26] This issue is actively discussed, e.g. Keswani et al., 2010, with the consensus that flows are convex in returns, i.e. the flows of higher-performing funds react more sensitively to returns.

[27] Similar results are reported in FCA, 2016, for the UK.

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## Orderly markets

# DLT – key implementation challenges

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A common view in the financial industry today is that Distributed Ledger Technology (DLT) has the potential to bring a number of benefits to financial markets, notably more efficient post-trade processes, enhanced transparency, greater resiliency and reduced costs. However, these benefits will not materialise unless important challenges are addressed. This article first discusses some of the technical aspects of the technology that have important implications for its applications to financial markets. It then explores three key implementation challenges: governance, privacy and interoperability, and some of the solutions that market participants are considering to address them. This article does not aim to provide an exhaustive overview of the issues raised by the technology. In particular, it does not discuss possible legal/regulatory challenges, which we analysed in the recent ESMA DLT Report.[2]

## Introduction

In February 2017, ESMA published a DLT Report[3], setting out its view on the technology when applied to financial markets. The Report highlights the potential risks and benefits that DLT may bring, as well as the interactions with existing EU rules. The Report draws on previous work, including a Discussion Paper[4] launched in June 2016 to collect feedback from stakeholders on DLT.

ESMA believes that DLT could bring a number of benefits to financial markets. These include faster and more efficient back office processes, especially in those segments of the markets where these processes are most cumbersome today, e.g. for OTC derivatives or unlisted securities. Potential benefits also include enhanced reporting and oversight capabilities at firms and regulators, greater security and reduced costs.

The extent of the benefits, but also the risks that DLT may bring, will depend on how the challenges posed by the technology are addressed. This article discusses three main challenges: governance, privacy and interoperability issues, and some of the solutions that market participants are exploring. Other possible challenges, including technical and legal/regulatory aspects, are not discussed in this article. More information on those challenges is available in ESMA's DLT Report.

Even if there may be a need to update our analysis in the near term as the technology is evolving quickly, ESMA's position is that regulatory action would be premature at present, considering that the technology is still at an early stage. In line with its mandate, ESMA is committed to monitoring market developments closely with a view to identifying potential gaps and issues in current EU financial regulation and to assessing whether there is any need for regulatory action to address such shortcomings, e.g. in cases where they would prevent the technology from achieving its potential or leave certain risks unaddressed. This work includes better understanding the solutions that market participants are developing to address the challenges posed by the technology.

## DLT in a nutshell

Distributed ledgers ─ also known as 'blockchains' ─ trace their roots to the peer-to-peer network first described by Satoshi Nakomoto in November 2008.[5] They are essentially records, or ledgers, of electronic transactions, very similar to accounting ledgers, with two distinguishing features: namely the fact that they are maintained

1 This article has been authored by Anne Chone.

2 ESMA, DLT Report, February 2017.

3 Idem.

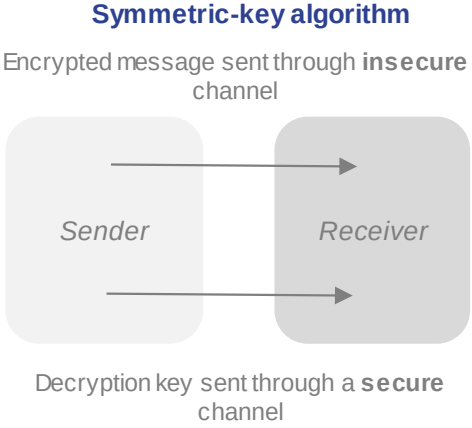
4 ESMA DLT Discussion Paper, June 2016.

5 Satoshi Nakamoto, Bitcoin: "A Peer-to-Peer Electronic Cash System", October 2008. Satoshi Nakamoto, a pseudonym for one or several individuals, was the first to provide a description of a peer-to-peer network that would be used to timestamp and validate transactions. Although Nakamoto did not use the term 'distributed ledger' at the time, he referred to the same concept, i.e. a system where trust would rest on a network of peers and not a centralised third party.

by a network of peers rather than a central authority, and the use of sophisticated encryption techniques to store and transfer assets. Distributed Ledger Technology (DLT) is a broad term that refers to the technologies used to implement distributed ledgers.[6] One early and well-publicised example of DLT is the Bitcoin Blockchain.

### Asymmetric key cryptography

V.8
Symmetric vs asymmetric key cryptography
**Public/private keys provide enhanced security**




Public/private keys are effectively comparable to a situation where the receiver of a given message sends an open box with an open lock (its public key) to the sender. The sender puts the message into the box, secures it with the lock and sends it back to the receiver. Only the receiver may open the box with the corresponding (private) key.

Source: ESMA

The use of computer-based encryption techniques is common for information protection. New, however, is their application to distributed ledgers. Cryptography is essential to distributed ledgers as, in the absence of a central trusted party, it serves to authenticate and secure the data stored and processed on the ledgers. Encryption techniques provide the digital signatures to claim and move assets and support the consensus mechanism used to validate transactions. Indeed, distributed ledgers rely on cryptographic proof instead of trust.

Modern encryption techniques fall into two broad categories: symmetric and asymmetric (also called 'public') key cryptography. Symmetric cryptography uses the same key for encryption and decryption. The sender delivers the encrypted message to the intended recipient and sends the key to decrypt it through a separate secure channel. The main drawback is that the separate channel is rarely entirely secure. Asymmetric key cryptography, which was conceptualised in the mid-1970s, uses two distinct keys, a public and a private key. The public key, as its name suggests, is public. It is comparable to a public address. The private key is known only to its beneficiary. Losing its private key is equivalent to losing the right to dispose of its assets, hence the importance of protecting and safeguarding private keys. Only the private key can decrypt the information encrypted with the corresponding public key, and vice versa.

Depending on the sequence in which they are used, public/private keys may serve different purposes. As an example, using a public key to encrypt a message will ensure that only the owner of the corresponding private key has the ability to read the message (restricted access). Signing a message with a private key will provide certainty as to the identity of the sender (digital signature). DLTs effectively use these two features in combination, as we discuss below.

### Hash functions

Another important element of DLT are hash functions. Hash functions map input data of arbitrary size into output data of predefined size. Cryptographic hash functions are commonly used to obfuscate data and thereby enhance data security because of their non-invertible and collision-resistant features. Hash functions are said to be one-way or non-invertible functions because it is excessively difficult, if not impossible, to infer $x$ from its hash value $h(x)$ (it would indeed involve an inordinately large amount of computing power). This feature is also known as 'pre-image resistance'. Meanwhile, it is

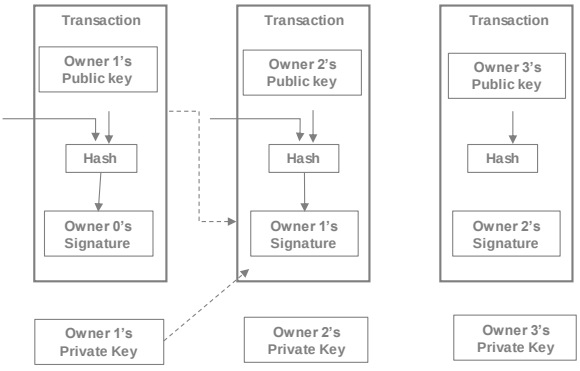
[6] See for example IOSCO definition in IOSCO Research report on Financial Technologies, February 2017.

very easy to compute the hash *h(x)* of a given *x*. In addition, cryptographic hash functions are collision-resistant, meaning that having two pieces of data that generate exactly the same hash value is extremely unlikely, i.e., for every x and x', h(x) ≠ h (x'). A classic example of hash functions are those used by websites to store the passwords of their users.[7]

### DLT protocols

A series of DLT protocols, like the Ethereum, Ripple or Hyperledger protocols to name but a few, have been developed over the last few years. Abstracting from the technical details, as this is not the purpose of this paper, these protocols intertwingly use public/private keys and hash functions with a view to achieving a high level of security, although with some variations. In the Bitcoin protocol, for example, the procedure to generate public/private keys includes use of the Elliptic Curve Digital Signature Algorithm (ECDSA) and two hash functions (SHA-256 and RIPEMD-160). ECSDA is a widely accepted cryptographic standard since the late 1990s. It relies on Elliptic Curve Cryptography. SHA-256 as its name suggests produces standard 256-bit strings of code. In comparison, RIPEMD produces a shorter hash of 160 bits, which enables faster transactions.

V.9
The Bitcoin Blockchain
**A chain of signatures and hashes**




Source: Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto.

Asset transfers involve intertwined use of the public/private keys generated as per the process described above and the SHA-256 and RIPEMD-160 hash functions. The following chart provides an overview of the use of public/private key and hash functions to sign asset transfers in the Bitcoin Blockchain.

## Key challenges

### Governance of DLTs

A network of peers, rather than a central trusted party, underpin DLT, as discussed above. This decentralised framework has the potential to provide a series of benefits. It could reduce the number of intermediaries involved and ultimately remove the need for trusted third parties. It could also enhance cyber security thanks to replicated shared records. Yet, it raises a number of issues when applied to financial markets.

First, there is the question of who would have access to a given DLT network and act as a validating node. There seems to be agreement in the industry that permissioned DLT networks would make the most sense for financial markets.[8] Under this framework, participation would be restricted to authorised parties only. This is a marked departure from the original Bitcoin Blockchain, which was meant to be open to all. Two main reasons support the case for restricted access in financial market applications: (i) the need to interact with known and reliable parties to mitigate risks, e.g., the risk of money laundering or other illicit activities, and (ii) scale, as the capacity to handle large volumes decreases as the number of nodes in the network increases.

Permissioned networks require criteria to grant access to the network. Ideally, those criteria should provide some form of protection against unwanted risks, e.g. the risk of the network going bankrupt or engaging in illicit activities. Likely components would include minimum capital requirements, conduct of business rules and risk mitigation techniques. The criteria applied should be sufficiently strict to provide for the necessary safeguards. At the same time, they should not represent undue barriers to entry, meaning that they should be fair, transparent and commensurate to the risks involved.

There also needs to be rules to govern the day-to-day interactions between network participants. In particular, there should be clarity on the liabilities of the respective parties, including in case of error, breach of compliance or fraud, and

[7] Only the hashes of the passwords are recorded on the website. Someone breaking into the system would not therefore be able to infer the passwords from the hashes, which prevents their illicit use. Meanwhile, it is easy for the website to run the passwords through the hash to authenticate its users. Also, two similar passwords will generate materially different hashes.

[8] This does not prejudge other DLT applications.

the penalties that could apply.[9] There should also be some form of oversight mechanism to maintain the framework and update the protocol or source code if and when needed, as evidenced by the DAO case.[10]

Based on the above, it appears that the governance framework that would apply to DLT networks would bear resemblance to the rules governing the existing market infrastructure and central authorities, such as Central Counterparties (CCPs) or Central Securities Depositories (CSDs) today. Indeed, depending on the services that they intend to provide, DLT networks may fall under the scope of EMIR, MiFIR, SFD[11] and CSDR and the existence of a CCP or CSD may be mandatory, as highlighted in our recent report.

Yet several aspects would require specific consideration in a DLT environment. One aspect has to do with the transactions validation process. In its original design, DLT provides that several parties, instead of one as is the case with centralised records, validate transactions through a consensus mechanism. Another aspect has to do with the shared and distributed nature of the ledgers, meaning that DLT records may not be formally stored in one place but potentially across several participants and locations. Establishing the exact liability of each party and the territoriality of the applicable law might therefore prove challenging with DLT, unless these issues are carefully considered and resolved prior to implementation.

Potential governance issues would be mitigated in the scenario where DLT would aim to upgrade existing processes within the current market infrastructure. Meanwhile, they would be heightened in a more disruptive scenario, where DLT would aim to change or replace the current role of central trusted parties, such as CCPs or CSDs. Our understanding is that most DLT applications being developed for financial markets aim to enhance current processes at this stage. Although these applications may change the role of certain market participants over time or introduce new functions, e.g. the management and safekeeping of private keys, ESMA does not see a possibility for DLT to eliminate the need for central trusted parties, at least in the short term.

### Privacy

In its original design, DLT provides for the records on the ledgers, encompassing both state and transaction data, to be viewable by all network participants (both in permissionless and permissioned networks, although in the latter case the participants are authorised). This publicity serves two purposes. First, it supports trust in the system by allowing participants to verify and validate transactions in order to prevent 'double spending' in the absence of a central trusted party. Second, it provides access to a single and shared 'golden record', which eliminates duplicate records and the need for multiple reconciliations. Indeed, sharing identical information in almost real time is one of the main benefits expected of DLT.

The public aspect of the technology is mitigated by the fact that public/private keys cannot easily be connected to their owners. Thus the identity of the participants in the network and those that are party to a transaction remain hidden. Yet, when applied to financial markets, publicity may raise issues. Indeed, while the identity of the parties is private, all participants are aware of transactions and their details, e.g., the quantity of assets involved. There is therefore a risk of participants inferring the trading book and activity of others from the history of the transactions. They could in turn unduly use this information, e.g. to front-run competitors or manipulate prices.

V.10
Enhanced Encryption Techniques
**Overview**

Homomorphic encryption
Computations are executed on encrypted data, without requiring access to a decryption key.

Zero knowledge proof
One party is able to prove to another party that a given statement is true, without conveying any other information than the fact that the statement is true.

Secure multi-party computation
N parties are able to share a computation, each learning only what can be inferred from their own inputs and the output of the computation

Source: ESMA

[9] Legal liability does not disappear with DLT, see 'The Distributed Liability of Distributed Ledgers : Legal Risks of Blockchain', Dirk A. Zezsche, Ross P. Buckley and Douglas W. Arner, 2017.

[10] The Decentralized Autonomous Organisation (DAO) is a leaderless organisation comprised of smart contracts. In June 2016, an attacker exploited a flaw in the code to drain money out of the DAO. To fix the problem, developers created a fork, i.e., a new branch, in the chain. This raised a number of legal issues, as the DAO's original design did not provide for such changes. For more details, see Understanding The DAO Attack, CoinDesk, June 2016.

[11] The SFD refers to the Settlement Finality Directive, Directive No 98/26/EC.

Another risk is that the identity of a given participant is revealed at some point in the future, e.g. due to advances in quantum computing, at which point their entire history of transactions could be traced back. Publicity may also contravene applicable laws that treat transactions as confidential information.

Market participants are considering several solutions to address privacy issues in a DLT context. Some solutions are looking at enhancing privacy through advanced obfuscation/encryption techniques, such as homomorphic encryption, zero-knowledge proof or secure multi-party computation. Advanced obfuscation/encryption techniques enable participants to perform specific computations and prove their accuracy publicly without revealing the inputs and outputs of the computations. With homomorphic encryption, for example, asset quantities for a transaction may be hidden to all but the sender and recipient of that transaction, while the participants would still be able to verify the validity of the transaction.

Other solutions focus on some form of ledger segregation. Digital Asset Platform[12] for example is built around a 'Distributed Ledger Layer', which comprises two subcomponents: the 'Private Contract Store' (PCS) and the 'Global Synchronisation Log' (GLS). The PCS contains only those contractual agreements that the participant is entitled to store and view. The GSL is a communication layer. With this framework, Digital Asset aims to segregate confidential information physically and store it locally, while sharing a global replicated log of hashes of the sensitive data and execution commitments. In a somewhat similar design, the Quorum[13] platform developed by JPMorgan uses a new 'private' transaction identifier to prevent all participants except those party to the transaction from seeing sensitive data. Transactions are fully replicated across all nodes but the state database is split into a private state database and a public state database. All the nodes concur on the public state database but their private state databases differ. Corda[14] from R3 restricts publicity on the details of a transaction to the parties to that transaction and what they call an 'authoritative cluster'. Our understanding is that authorised participants would operate those clusters. There would be different clusters for different types of assets and market segments.

Enhanced encryption techniques are conceptually interesting. Indeed, cryptography could go a long way towards protecting privacy. However, these techniques are not without their challenges. They may not be legally sound, e.g. some participants not entitled to certain data may hold that data in encrypted or obfuscated form. Also, they remain untested in production environments.

The segregation of ledgers presents other challenges. In particular, it would require 'bridges' between the different clusters of ledgers and/or the private and public components. Our understanding is that some market participants are working on innovative solutions to address this issue, with a view to avoiding reconciliation issues similar to those that exist today. However, it is unclear what these solutions might look like and how effective they would be in achieving both the confidentiality needed in financial markets and the data integrity expected from DLT.

All these solutions, whether based on enhanced encryption techniques or some form of ledger segregation will also require effective control mechanisms, e.g. to manage and protect private/public keys and link them to 'actual' identities.

### Interoperability

It seems very unlikely that DLT will be deployed at once across the entire trade lifecycle and all financial assets. In a more likely scenario, and provided a number of conditions are met, DLT would co-exist with the current systems and market infrastructure. It is also likely that there will be competing DLT networks across different market segments. DLT networks would therefore need to interoperate with the existing systems and between themselves. Common technical standards and business rules will be essential to meet interoperability requirements.

In addition, many of the perceived benefits of the technology, e.g. the elimination of duplicate records and the need for multiple reconciliations, are conditional on use of the same 'libraries' of smart contracts and reference data. Failing that, and unless common rules and standards are agreed, the deployment of DLT could lead to

[12] The Digital Asset Platform, Non-technical White Paper, Digital Asset, December 2016.

[13] See https://github.com/jpmorganchase/quorum/wiki and Quorum, White Paper, November 2016.

[14] See https://www.corda.net/ and Corda Technical White Paper, November 2016.

more market fragmentation than is currently the case.

The industry is aware of the challenge, and a number of market-driven initiatives are geared to fostering common DLT protocols and standards or collaborative efforts in general. Some of the most publicised initiatives for financial markets include the HyperLedger Linux Foundation, the R3 Consortium and the Post-Trade Distributed Ledger group.

V.11
Key market initiatives
**Collaborative efforts are needed**

| | Key objectives | Members |
|---|---|---|
| HyperLedger Linux Foundation Project | Create an enterprise grade, open source distributed ledger framework and code base | Leaders in: Finance, Banking, Internet of Things, Supply Chains, Manufacturing and Technology |
| Post-Trade Distributed Ledger group | Provide a trusted environment for key post-trade participants to collaborate and share information | Nearly 40 financial institutions and prominent market infrastructures players from all regions of the globe |
| R3 Consortium | Develop the base layer reference architecture to underpin a global financial-grade layer<br>Deploy secure collaborative lab to test blockchain technologies | 80 leading financial institutions |

Source: ESMA

Experience with similar initiatives in the past, e.g. the introduction of ISDA agreements for swaps, shows that achieving consensus takes time. Besides potential disagreements on technical aspects, some market participants may support a status quo situation for various reasons, including the need to protect a competitive advantage or simply resistance to change. ESMA will monitor closely the progress being made in fostering reference standards and common business rules across the industry. DLT supporters' ability to put forward compelling business cases and to identify tangible benefits for market participants will be a key element in that journey.

## Conclusion

DLT is an evolving technology which needs to address important challenges before it can be widely deployed in financial markets. There is an inherent tension between the shared and distributed features of DLT and the governance framework and level of privacy required in financial markets. Interoperability with existing systems and across DLTs is also crucial for its wide adoption. A number of FinTech firms and financial intermediaries are working on innovative solutions to address these governance, privacy and interoperability issues. Our understanding is that most DLT applications being developed today for financial markets focus on enhancing existing processes within the current market structure, which would reduce potential governance issues. Solutions to address privacy issues, such as enhanced encryption techniques or some form of ledger segregation, as well as market initiatives to promote interoperability, are at early stages of development. Importantly, the extent of the benefits and risks which DLT may entail will depend on the way the challenges described in this article are addressed.

## Financial stability

# EU derivatives markets — a first-time overview

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This article provides first-time data on the EU interest rate, credit, equity, commodity and foreign exchange derivatives markets, based on weekly available EMIR data. The study provides for the first time an overview of the size and structure of EU derivatives markets by aggregating data across all six trade repositories authorised in the EU, complementing existing work and taking a broad approach by comprehensively considering the different markets. Trade repositories are an extensive source of information on derivatives including bank and non-bank entities. Information on the size of the different derivative markets, both in terms of number of transactions and gross notional amount outstanding, is reported and measures of market participants' market concentration are computed. Finally, this article shows the shares of derivative transactions that occur within the EEA, as opposed to cross-border transactions with non-EEA counterparts, as well as the breakdown between over-the-counter and exchange-traded derivatives.

## Introduction

In 2009, G20 leaders committed to increase transparency on derivatives markets by prescribing mandatory reporting of derivatives contracts. This took place against the background of the role played by credit derivatives in particular in the financial crisis and the transparency related to these instruments.

In the EU, the G20 commitment translated into the EMIR Regulation, Article 9 of which states that in the EU "Counterparties and CCPs shall ensure that the details of any derivative contract they have concluded and of any modification or termination of the contract are reported to a trade repository".[2]

EMIR reporting requirements came into force in February 2014, and given the complexity of derivatives products it took a great deal of work to put the requirements into practice and ongoing effort to improve data quality by the industry and regulators.

This article now provides for the first time an overview of the size and structure of EU derivatives markets based on a complete set of EMIR data, i.e. by aggregating data across all six trade repositories authorised in the EU, and adds to the already existing work both at EU level[3] and globally[4]. In line with the BIS approach, the article is not limited to one specific class of derivatives, but takes a broad approach by investigating - in addition to credit derivatives - interest rate, equity, foreign exchange and commodity products as well.

By combining data from all six trade repositories authorised in the EU,[5] the data provides uniquely comprehensive coverage for the EU and complements existing market statistics, such as the BIS Semi-annual and Triennial derivatives statistics, which are based on surveys of members or derivatives dealers[6]. The data reported by ISDA is another source of information on global interest rate and credit derivative markets.[7]

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1 This article was authored by Yanis El Omari, Martin Haferkorn and Carsten Nommels.

2 Regulation (EU) No 648/2012 of the European Parliament and the Council of 4 July 2012 on OTC derivatives central counterparties and trade repositories.

3 ESRB, 2016, Occasional Paper Series, No. 11.

4 Global guidance on the harmonisation of data elements reported to trade repositories has been developed by the Committee on Payments and Market Infrastructures (CPMI) and International Organisation of Securities Commissions (IOSCO). Similarly, in 2016, the Financial Stability Board published two reports on the implementation of key aspects of reforms to the over-the-counter (OTC) derivatives market.

5 The authorised trade repositories are: DTCC Derivatives Repository Ltd. (DTRL), Krajowy Depozyt Papierow Wartosciowych S.A. (KDPW), Regis_TR S.A. (REGIS), Unavista Limited (Unavista), CME Trade Repository Ltd. (CME TR), ICE Trade Vault Europe Ltd. (ICE TVEL). In July 2017 Bloomberg Trade Repository Limited was authorised. See ESMA List of registered trade repositories.

6 The BIS publishes a set of statistics on ETD and two sets on OTC derivatives markets. For more information: http://www.bis.org/statistics/about_derivatives_stats.htm. See also Abad et al. (2016) for a description of the BIS data and its comparison to data collected under EMIR.

7 http://www.swapsinfo.org/charts/derivatives/notional-outstanding.

Trade repositories are an extensive source of information on derivatives and a means of increasing completeness, as their data is very detailed and coverage comprises all types of counterparties to a derivative contract, including bank and non-bank entities. This article offers high-level indications of market size and composition across derivatives markets in the EU. Differently, previous literature used EU TR trade state data from a single TR and/or focusing on a specific derivatives market, such as the interest rate derivatives or CDS markets. Abad et al. (2016) looked at the interest rate swap, credit default swap and foreign exchange markets in the EU using DTCC data. Ali et al. (2016), Brunnermeier et al. (2015), D'Errico et al. (2016) used DTCC data to analyse the EU CDS market, and D'Errico and Roukny (2017) studied compression mechanisms on the EU CDS market, while Kenny et al. (2016) analysed the role of special purpose vehicles (SPV) in the Irish CDS market using EMIR data across all six trade repositories authorised in the EU.

A different strand of literature uses transaction reports (trade activity reports): Benos et al. (2013) analyse CDS transactions using DTCC data; Benos et al. (2016) use transactional data from the USD and EUR segments of the plain vanilla interest rate swap market, while Cielinski et al. (2017) analyse the effects of the Swiss-Franc depegging using OTC FX data provided by DTCC.

This article begins by describing the data available and the necessary steps to obtain an EU-wide picture of derivatives markets. It goes on to provide some basic descriptive statistics on the size of and participants in interest rate, credit, equity, commodity and foreign exchange derivatives markets.

## Data description

The subsequent analysis is based on trade state reports on 24 February 2017 from the six trade repositories authorised in the EU (DDRL, KDPW, REGIS, UnaVista, CME TR and ICE TVEL). Trade state data refer to the most updated values of all the derivative contracts with open interest at the end of a given day. The raw data represent a snapshot of all derivative contracts open at the end of the day in the EU. [8]

Following pre-processing of the data, cleaning procedures were applied with respect to transactions and the counterparties involved. Regarding transactions, the double reporting regime for intra-EU derivatives transactions under EMIR (i.e. both buyer and seller have to report the transaction) requires as a first step the identification and subsequent removal of duplicate records. This was carried out as follows:

— If only one of the counterparties involved is an EEA entity, no double reporting obligation exists. Consequently, these records did not require deduplication.

— By contrast, only one of the records was used for each pair, as identified by matching reports for both the trade ID and the respective counterparty IDs.

— Lastly, wherever no matching second record existed but there was a double reporting obligation, the notional amount was halved.

Second, the reported notional amounts were checked for validity. Records with values that could not be converted to a numeric value were excluded. The notional amounts of the remaining records were converted to EUR using ECB exchange rates on 24 February 2017. Following this conversion, outliers were removed as follows:

— transactions with a notional value equal to zero (entries displaying negative notional values are considered in absolute terms);

— entries with log notional value four standard deviation above the mean.[9] This accounts for the different characteristics of each asset class and its usage form.

Entities were identified at the Counterparty ID[10] level and not aggregated at the group level. In doing so, we introduce a small inaccuracy for concentration measures, as each subsidiary of a financial cooperation has its own Counterparty ID (e.g. in each jurisdiction or city). Aggregated measures such as notional amounts outstanding are not impacted, but concentration measures such as network degree centrality and the

[8] Trade state reports for one day were made up of 15 different raw files amounting to 26 GB of data with different types of files (csv, excel files, text files) and different reporting formats. Files with various numbers of columns and different field names had to be standardised before they could be merged and analysed.

[9] Mean is calculated by asset class distinguishing between compression (Y/N) and clearing status (Y/N).

[10] European Commission Delegated Regulation (EU) No 148/2013.

Herfindahl-Hirschman Index (HHI) are slightly underestimated.

Moreover, the asset classes studied here are identified either by the TRs themselves, as some of them provide reports by asset class, or according to the Product ID 1 and Product ID 2 fields, using CFI codes when necessary.[11] In the absence of a unique product identifier in Europe, however, this classification can lead to the misallocation of a specific product to the wrong asset class both from the point of view of the reporting entity or the data end-user. The derivative class "Other" has not been incorporated in the analysis below either. Another caveat lies in the fact that trade identifiers are not generated centrally or uniquely, with the same identifiers potentially used for more than one transaction. However, this can be mitigated by relying on information on other transaction characteristics. In addition to the trade ID, for example, the counterparty IDs and notional amounts could also be used to identify transactions . There may still be some unidentified duplicated transactions or different transactions erroneously considered as single ones. Any form of aggregation at the counterparty identifier level has been left for future examination. This is of no consequence for the aggregated notional figures but inevitably leads to overestimation of the market size in terms of the number of participants or underestimation of the concentration measures.

These procedures are a pre-condition for carrying out analysis using trade state data aggregated across the six authorised TRs. They have now been implemented in an automated manner and will allow monitoring of derivatives markets based on time-series data going forward.

## Indicators

The indicators developed describe market size in terms of number of transactions and gross notional amounts outstanding as well as concentration indicators. For concentration indicators, the analysis uses participants' market share as measured by the sum of all their gross notional positions in euro. To evaluate the degree of concentration for a specific asset class, this study makes use of the HHI, which reflects the concentration of a given market and is normalised between zero and one. To provide indications of the degree of concentration, the analysis takes as a reference the HHI levels defined in the EC Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (Section III). Concentration levels with a HHI below 0.10 are unlikely to raise competition concerns.[12] As an additional measure of concentration, we use network degree centrality for each asset class. This measure builds a network level centrality score based on the individual degrees or number of distinct bilateral relationships between the individual counterparties in the network. It varies between zero and one, with one representing the highest possible concentration level for a network, i.e. a network where one big participant would be the unique counterparty to all the other counterparties.

## Interest rate derivatives

### Participants

For interest rate derivatives, 251,916 different counterparty identifiers were reported. Among these, nine were CCPs authorised to offer services and activities in the EU. 11 were CCPs established in a third country, and an additional 339 were clearing members of either of these CCPs. The more than 250,000 remaining counterparties reflect the widespread use of interest rate derivatives; they include financial and non-financial counterparties, clients to a clearing member in the case of a cleared trade, or non-clearing-member brokers and their clients.

### Size of the market

The trade state reports record a total of 5.4mn open transactions amounting to a total notional value of around EUR 282tn, making interest rate derivatives the largest derivatives asset class in

[11] Product ID 1/ID 2 are two mandatory fields used for identification of the asset classes. Product ID 1 can be an ISIN or Alternative Instrument Identifier (AII) code or one of the following: CO for commodity, CR for credit, CU for currency (foreign exchange in our analysis), EQ for equity, IR for interest rate, OT for others. Product ID 2 can be either blank, a CFI code (ISO 10962 Classification of Financial Instruments Code) or one of the following: CD for contract for difference, FR for forward rate agreements, FU for futures, FW for forwards, OP for options, SW for swaps, OT for others. We used the product ID 1 as the asset class when it was one of the following five: CO, CR, CU, EQ, and IR. For the rest we used the CFI code when provided in Product ID 2 to allocate the record to one of the five asset classes.

[12] Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings. Art 19 and Art 20 of the EC Guidelines refer to both levels and changes in the HHI following a merger. In this analysis, we consider levels only, as changes would not be applicable in the specific case.

terms of gross notional amounts outstanding. As previously mentioned, this dataset complements other existing statistics. For example, in the case of interest rate derivatives ISDA reports USD 543.3tn globally on 24 February 2017. In its latest semi-annual survey, the BIS reports gross notional outstanding of USD 368tn for OTC interest rate derivatives at a global level for the end of 2016.[13] The differences with our dataset might also be due to the nature of the data, BIS and ISDA survey-based data collection. Differences in reported numbers can also be observed for the other asset classes.

6% and 94% of transactions were exchange-traded derivatives (ETD) and OTC derivatives transactions respectively. This compares to 14% ETD and 86% OTC in terms of notional, indicating a larger volume of standardised ETD transactions. It is worth noting that the average notional amount per transaction is much higher than for the other derivative categories. This is due to the character of IRDs, where a typical IRD used to hedge an interest rate risk with payments expressed in basis points will have a very high notional amount (V.12).

V.12
Interest rate derivatives
**Mostly OTC transactions**

| | Number of transactions | % of total | Notional value | % of total |
|---|---|---|---|---|
| ETD | 0.30 | 6 | 41 | 14 |
| Trade with EEA | 0.24 | 4 | 20 | 7 |
| Trade with non-EEA | 0.06 | 1 | 21 | 7 |
| OTC | 5.05 | 94 | 239.8 | 85 |
| Trade with EEA | 3.46 | 64 | 137 | 49 |
| Trade with non-EEA | 1.52 | 28 | 100 | 35 |
| Total | 5.36 | 100 | 283 | 100 |

Note: Number of transactions in millions of records. Notional value in EUR tn. Transactions for which the trading venues were not reported and transactions for which the "trade with non-EEA" field was not reported are only included in total numbers.
Source: ESMA

In both ETD and OTC markets, approximately half of the transactions measured by notionals take place between two EEA-based counterparties, while the remainder involve a counterparty based in another jurisdiction. This is in line with expectations, as interest rate derivatives often serve as a means of hedging interest rate payments across jurisdictions.

In terms of concentration, both the HHI and the network concentration measures indicate a relatively decentralised market. As interest rate derivatives cover a wide variety of needs for a broad set of economic actors/agents, this result is in line with expectations. Moreover, the often bilateral and bespoke nature of these agreements is reflected in the predominance of the OTC market segment. These numbers are in line with the HHI provided by the BIS which, although not directly comparable (HHI for interest rate swaps separated by currency for the BIS figures), are in the same order of magnitude (V.13).[14]

V.13
Interest rate derivatives
**Relatively decentralised**

| | OTC | ETD | Overall |
|---|---|---|---|
| HHI | | | 0.05 |
| Degree centrality | 0.07 | 0.16 | 0.07 |

Note: Market share of participants as measured by the sum of their gross notional positions in euro.
Source: ESMA.

## Credit derivatives

### Participants

Compared to interest rate derivatives, the number of participants in the credit derivative segment is much smaller, with only 9,829 unique counterparty identifiers reported. In total, six CCPs are active in the market – two of which are authorised in the EU, while the other four are established in third countries. In addition, 76 clearing members are active in this market segment. It is the smallest derivatives market in terms of the number of counterparties, as firms entering into credit derivative contracts are typically those with substantial financial hedging needs. This is reflected in the lower number of small non-financial counterparties compared to other markets.

### Size of the market

The vast majority of trades were OTC (97% or 1.2mn transactions) whereas only 3% or 30,000 transactions were ETDs. In terms of notional value, the credit derivative markets totalled EUR 13.8tn. BIS reports USD 9.9tn of CDS contracts outstanding globally between dealers as at end-2016, and ISDA reports USD 10.5tn as at 24

[13] The BIS compiles and publishes one set of statistics on ETD and two sets on OTC derivatives markets. For more information: http://www.bis.org/statistics/about_derivatives_stats.htm
See also Abad et al. (2016) for a description of the BIS data and how it compares to data collected under EMIR.

[14] http://stats.bis.org/statx/srs/table/d7.

February 2017. With regard to the EUR 13.8tn notional value in our data, 96%, or EUR 13.3tn, were attributable to the OTC segment, where CDS for instance are primarily traded. On the OTC side, more than 60% of transactions occur between an EEA and a non-EEA counterparty (in terms of both the number of transactions and notionals) (V.14).

V.14
Credit derivatives
**Mostly OTC transactions**

| | Number of transactions | % of total | Notional value | % of total |
|---|---|---|---|---|
| ETD | 0.03 | 3 | 0.5 | 4 |
| Trade with EEA | 0.003 | 0 | 0.3 | 2 |
| Trade with non-EEA | 0.03 | 2 | 0.2 | 1 |
| OTC | 1.18 | 97 | 13.3 | 96 |
| Trade with EEA | 0.41 | 34 | 4.5 | 32 |
| Trade with non-EEA | 0.77 | 63 | 8.8 | 64 |
| Total | 1.21 | 100 | 13.8 | 100 |

Note: Number of transactions in millions of records. Notional value in EUR tn. Transactions for which the trading venues were not reported and transactions for which the "trade with non-EEA" field was not reported are only included in total numbers.
Source: ESMA.

Based on the network centrality indicator, markets for credit derivatives are more concentrated than for interest rate derivatives. This is even more pronounced for OTC derivatives, which consist mainly of CDS contracts. These are characterised by a high degree of concentration at the counterparty level, which is in line with existing literature (Brunnermeier et al., 2015). The HHI is, however, only marginally higher than for interest rate derivatives despite a smaller number of counterparties (V.15).

V.15
Credit derivatives
**High level of network centrality**

| | OTC | ETD | Overall |
|---|---|---|---|
| HHI | | | 0.07 |
| Degree centrality | 0.44 | 0.24 | 0.43 |

Note: Market share of participants as measured by the sum of their gross notional positions in euro.
Source: ESMA.

## Equity derivatives

### Participants

For equity derivatives, 220,256 different counterparties were reported. Among market participants, 13 EU-based CCPs were present, as well as 13 third-country CCPs and 193 of their clearing members.

### Size of the market

In terms of the number of transactions, equity derivatives are the largest derivatives asset class with 16.8mn open transactions. Of these transactions, 12.5mn were OTC (80%) and 3.1mn were ETDs (20%). However, the order is different when considering notional amounts: EUR 15.3tn are OTC derivatives (43%), while EUR 20.2tn are ETDs (57%), again indicating the larger share of standardised transactions.

V.16
Equity derivatives
**Mostly OTC transactions, larger amounts for ETD**

| | Number of transactions | % of total | Notional value | % of total |
|---|---|---|---|---|
| ETD | 3.12 | 20 | 20 | 57 |
| Trade with EEA | 1.64 | 10 | 13 | 36 |
| Trade with non-EEA | 1.48 | 10 | 7 | 21 |
| OTC | 12.50 | 80 | 15 | 43 |
| Trade with EEA | 5.54 | 35 | 6 | 17 |
| Trade with non-EEA | 6.94 | 45 | 9 | 26 |
| Total | 15.62 | 100 | 35 | 100 |

Note: Number of transactions in millions of records. Notional value in EUR tn. Transactions for which the trading venues were not reported and transactions for which the "trade with non-EEA" field was not reported are only included in total numbers.
Source: ESMA.

Concentration levels are relatively low overall: between the levels observed in the rather concentrated credit derivative segment and the interest rate segment. This is in line with the BIS concentration index for equity-linked options (V.16).[15]

V.17
Equity derivatives
**High-level concentration**

| | OTC | ETD | Overall |
|---|---|---|---|
| HHI | | | 0.06 |
| Degree centrality | 0.28 | 0.20 | 0.22 |

Note: Market share of participants as measured by the sum of their gross notional positions in euro.
Source: ESMA.

Concentration levels and the relatively similar importance of OTC vs. ETD transactions are consistent with the very diverse nature of equity

[15] http://stats.bis.org/statx/srs/table/d8.

derivatives covering both standardised products such as exchange-traded futures or plain vanilla options as well as bespoke, bilaterally traded forwards and exotic options (V.17).

## Commodity derivatives

### Participants

305,685 different counterparty IDs were reported for the commodity asset class, which makes this category the largest in terms of market participants. That is not surprising given the widespread use of these contracts across industries and types of counterparties, notably non-financials. Overall, 10 EU CCPs and 11 third countries' CCPs were present in this market, as well as 149 clearing members (V.18).

V.18
Commodity derivatives
**Majority of ETD transactions**

| | Number of transactions | % of total | Notional value | % of total |
|---|---|---|---|---|
| ETD | 2.65 | 54 | 5 | 60 |
| Trade with EEA | 0.89 | 18 | 2 | 16 |
| Trade with non-EEA | 1.76 | 35 | 4 | 43 |
| OTC | 2.34 | 46 | 4 | 40 |
| Trade with EEA | 1.05 | 21 | 2 | 21 |
| Trade with non-EEA | 1.29 | 26 | 2 | 18 |
| Total | 5.03 | 100 | 9 | 100 |

Note: Number of transactions in millions of records. Notional value in EUR tn. Transactions for which the trading venues were not reported and transactions for which the "trade with non-EEA" field was not reported are only included in total numbers.
Source: ESMA.

### Size of the market

Around five million open commodity derivatives transactions were reported, 54% of them ETD derivatives. Similarly, in terms of notional amounts ETDs account for EUR 5.4tn (60%) of notional values compared to EUR 3.6tn (40%) for OTC. Once again, most of these transactions involve a non-EEA counterparty. The average notional transaction amount is lower than for the other asset classes, reflecting the wide use of commodity derivatives by small non-financial firms such as commodity producers managing their commodity price risk (V.19)

Comparatively high levels of concentration can be observed on the commodity derivatives market. Values for the HHI (0.16) and degree centrality – in particular for OTC derivatives – are the highest among all asset classes. This illustrates the nature of the commodity derivative markets, where many counterparties, including many non-financial corporations, interact with a few large brokers.

V.19
Commodity derivatives
**Comparatively high level of concentration**

| | OTC | ETD | Overall |
|---|---|---|---|
| HHI | | | 0.16 |
| Degree centrality | 0.46 | 0.16 | 0.44 |

Note: Market share of participants as measured by the sum of their gross notional positions in euro.
Source: ESMA.

## Foreign exchange derivatives

### Participants

Nine EU and seven third-country CCPs, and 41 clearing members were among the 162,698 different counterparty IDs reported for foreign exchange derivatives.

### Size of the market

V.20
Foreign exchange derivatives
**Primarily OTC transactions**

| | Number of transactions | % of total | Notional value | % of total |
|---|---|---|---|---|
| ETD | 0.05 | 1 | 0.5 | 0 |
| Trade with EEA | 0.03 | 1 | 0.2 | 0 |
| Trade with non-EEA | 0.01 | 0 | 0.2 | 0 |
| OTC | 6.46 | 99 | 111.7 | 99 |
| Trade with EEA | 3.42 | 52 | 18.2 | 16 |
| Trade with non-EEA | 3.02 | 46 | 93.3 | 83 |
| Total | 6.52 | 100 | 112.3 | 100 |

Note: Number of transactions in millions of records. Notional value in EUR tn. Transactions for which the trading venues were not reported and transactions for which the "trade with non-EEA" field was not reported are only included in total numbers.
Source: ESMA.

6.5mn transactions were open at the time of the analysis, almost all of them OTC. They totalled EUR 112tn, only EUR 475bn of which were exchange traded (V.20).

V.21
Foreign exchange derivatives
**Comparatively low levels of concentration**

| | OTC | ETD | Overall |
|---|---|---|---|
| HHI | | | 0.05 |
| Degree centrality | 0.11 | 0.22 | 0.11 |

Note: Market share of participants as measured by the sum of their gross notional positions in euro.
Source: ESMA.

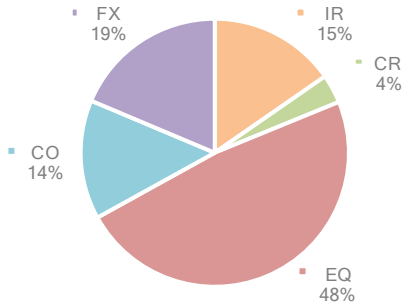
As regards concentration, we do not observe any significant level. Values for both the HHI (0.05) and degree-centrality are low overall, in line with the BIS figures. Interestingly, however unlike most other asset classes, degree-centrality is higher for EC than for OTC positions (V.21).

## Conclusion

This article provides descriptive statistics from EU EMIR data for the first time, including an initial overview of the EU interest rate, credit, equity, commodity and foreign exchange derivatives markets. Data are based on mandatory reporting under EMIR and aggregated across all six trade repositories authorised in the EU. The data provide very comprehensive coverage of the EU derivatives markets, complementing other existing market statistics.

In terms of number of transactions, the equity derivatives market is the largest (48% of the total number of transactions reported), followed by foreign exchange products (19%), interest rate derivatives (15%), commodity derivatives (14%) and credit derivatives (4%) (V.22).

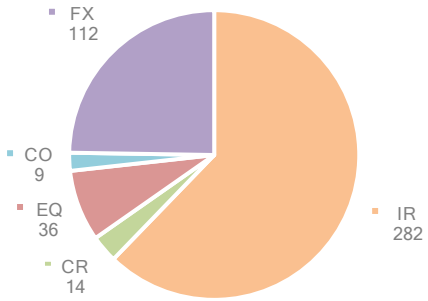
V.22
Number of transactions by asset class
**EQ predominant**




Note: share of the total number of transactions by asset class.
Source: ESMA.

However, in terms of market size as measured by the value of gross notional amount outstanding, the picture looks different. Interest rate derivatives constitute the largest market (EUR 282tn), followed by foreign exchange derivatives (EUR 112tn). Equity, credit and commodity derivatives markets are much smaller (EUR 36tn, EUR 13.8tn and EUR 9.1tn respectively). Different average transaction sizes reflect the different uses made of the various types of derivatives. The typical IRD used to hedge an interest rate risk, with payments expressed in basis points, will thus have a very high notional, while equity or commodity derivatives linked to stocks or physical commodities will have smaller notionals on average (V.23).

V.23
Gross notional amounts outstanding by asset class
**IR predominant**




Note: Gross notional amount outstanding by asset class. in Eur tn.
Source: ESMA.

In terms of market size, it is worth noting that the coverage of the EMIR dataset used here is based on mandatory regulatory reporting and is more comprehensive than coverage of the data reported by the BIS. The BIS Semiannual and Triennial derivatives statistics are based on surveys of members or derivatives dealers.[16] For example, the gross notional amounts outstanding in the EU total EUR 13.8tn (of which EUR 13.3tn are OTC) for credit derivatives. This compares with USD 11.8tn of OTC derivatives outstanding globally as reported by big dealers to the BIS.

Derivatives markets also have very different market structures with, for example, more concentrated markets such as the commodity and credit derivatives markets. These tend to exhibit a core of central counterparties with large exposures and a periphery of smaller ones. Other markets are less concentrated, with a larger number of small counterparties. We also observe an important part of EU derivatives trading activity occurring with non-EEA counterparts.

Finally, the type of transaction varies significantly across asset classes, reflecting different degrees of contract standardisation. OTC transactions are predominant on FX, credit and interest rate derivatives markets, whereas there is a slight majority of ETD transactions on equity and commodity derivatives markets (V.24).

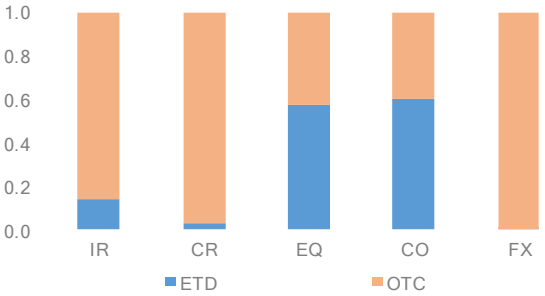
ESMA is thus taking advantage of newly available data in this area to complement existing literature and study focusing on the EU derivatives markets. However, this article is but a starting point, with substantial work yet to be

[16] The BIS compiles and publishes one set of statistics on ETD and two sets on OTC derivatives markets. For more information: http://www.bis.org/statistics/about_derivatives_stats.htm

See also Abad et al. (2016) for a description of the BIS data and how it compares to data collected under EMIR.

carried out on enhancing data quality and on further market and statistical analysis. The above aspects are key priorities for ESMA in the coming years

V.24
ETD vs OTC
**Heterogeneous across asset classes**




Note: Execution type by asset class. Transactions for which the trading venue was not reported are not included. % of total.
Source: ESMA.

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# Annexes

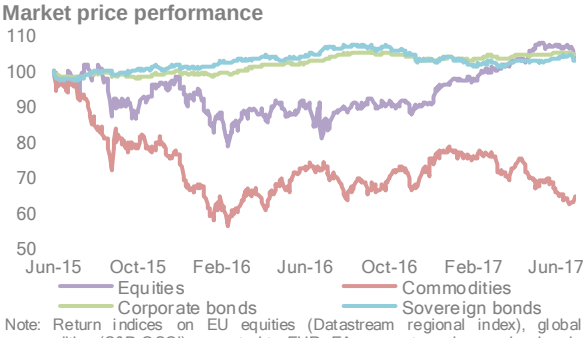
# Statistics

## Securities markets

Please note that for charts related to issuance and outstanding, ESMA has changed the source of commercial data across asset classes. In addition, charts on credit quality and CRAs are now constructed on the basis of more refined ESMA proprietary data based on the RADAR reporting tool. For more detailed information on RADAR kindly refer to "ESMA's supervision of credit rating agencies, trade repositories and monitoring of third country central counterparties. 2016 annual report and 2017 work programme", published in February 2017. Where data sources have been changed, data differ compared to previous editions of the TRV. These differences generally pertain to the levels of activity, and not to market trends and directions. Our findings and risk analysis are not materially affected by the change in data sources.

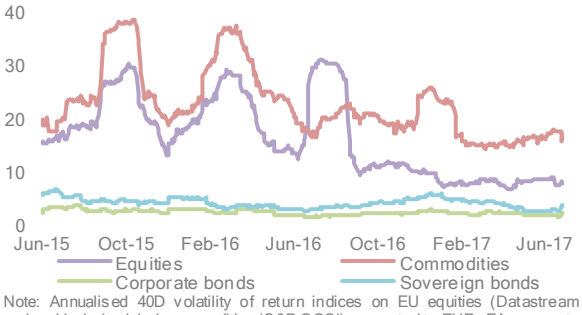
### Market environment

A.1
**Market price performance**



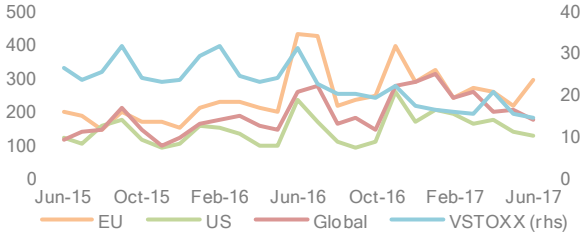

Note: Return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro, all maturities). 01/06/2015=100.
Sources: Thomson Reuters Datastream, ESMA.

A.2
**Market volatilities**



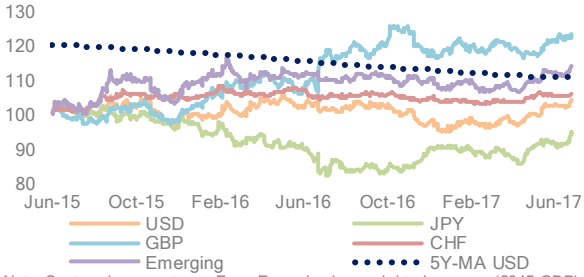

Note: Annualised 40D volatility of return indices on EU equities (Datastream regional index), global commodities (S&P GSCI) converted to EUR, EA corporate and sovereign bonds (Iboxx Euro all maturities), in %.
Sources: Thomson Reuters Datastream, ESMA.

A.3
**Economic policy uncertainty**



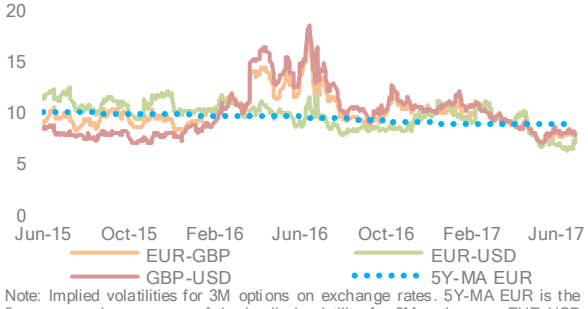

Note: Economic Policy Uncertainty Index (EPU), developed by Baker et al. (www.policyuncertainty.com), based on the frequency of articles in EU newspapers that contain the following triple: "economic" or "economy", "uncertain" or "uncertainty" and one or more policy relevant terms. Global aggregation based on PPP-adjusted GDP weights. Implied volatility of EuroStoxx 50 (VSTOXX), monthly average, on the right-hand side.
Sources: Baker, Bloom, and Davis 2015; Bloomberg, ESMA.

A.4
**EUR exchange rates**



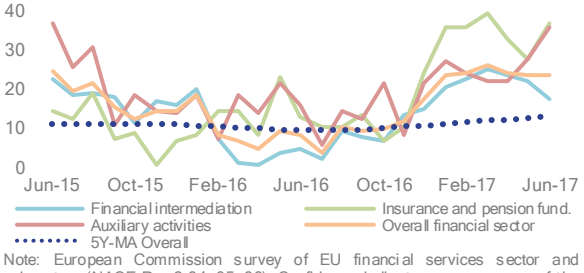

Note: Spot exchange rates to Euro. Emerging is a weighted average (2015 GDP) of spot exchange rates for CNY, BRL, RUB, INR, MXN, IDR and TRY. 01/06/2015=100. Increases in value represent an appreciation of EUR. 5Y-MA USD=five-year moving average of the USD exchange rate.
Sources: ECB, IMF, ESMA.

A.5
**Exchange rate implied volatility**



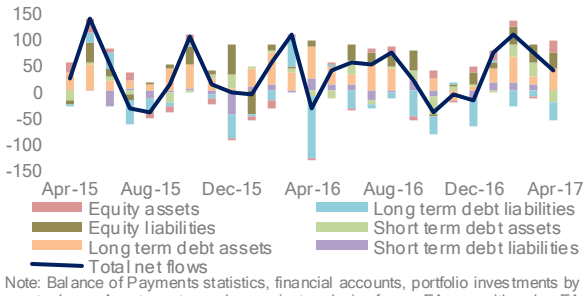

Note: Implied volatilities for 3M options on exchange rates. 5Y-MA EUR is the five-year moving average of the implied volatility for 3M options on EUR-USD exchange rate.
Sources: Bloomberg, ESMA.

A.6
**Market confidence**



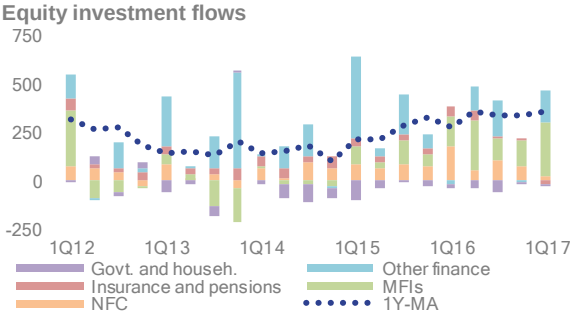

Note: European Commission survey of EU financial services sector and subsectors (NACE Rev.2 64, 65, 66). Confidence indicators are averages of the net balance of responses to questions on development of the business situation over the past three months, evolution of demand over the past three months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

A.7
**Portfolio investment flows**



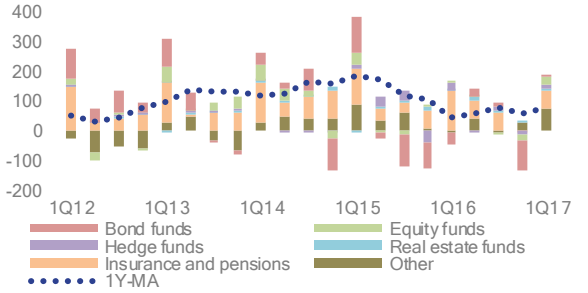

Note: Balance of Payments statistics, financial accounts, portfolio investments by asset class. Assets=net purchases (net sales) of non-EA securities by EA investors. Liabilities=net sales (net purchases) of EA securities by non-EA investors. Total net flows=net outflows (inflows) from (into) the EA. EUR bn.
Sources: ECB, ESMA.

A.8
**Equity investment flows**



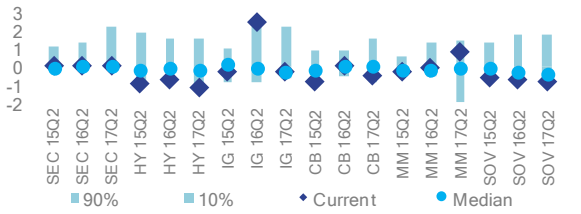

Note: Quarterly Sector Accounts. Investment flows by resident sector in equity (excluding investment fund shares) and debt securities, EUR bn. 1Y-MA=one-year moving average of all investment flows.
Sources: ECB, ESMA.

A.9
**Institutional investment flows**



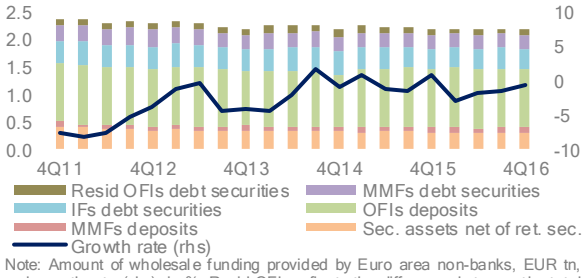

Note: EA institutional investment flows by type of investor, EUR bn. Other=financial vehicle corporations, mixed funds, other funds. 1Y-MA=one-year moving average of all investment flows.
Sources: ECB, ESMA.

A.10
**Debt issuance**



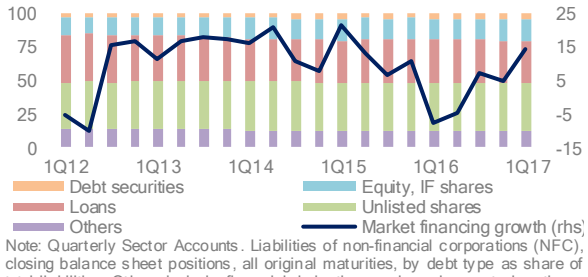

Note: Growth rates of issuance volume, in %, normalised by standard deviation for the following bond classes, following Eikon classification: securitised (SEC); high-yield (HY); investment grade (IG); covered bonds (CB); money market (MM); sovereign (SOV). Percentiles computed from 12Q rolling window. All data include securities with a maturity higher than 18M, except for MM (maturity less than 12M). Bars denote the range of values between the 10th and 90th percentiles. Missing diamond indicates no issuance for previous quarter.
Sources: Thomsons Reuters Eikon, ESMA.

A.11
**Non-bank wholesale funding**




Note: Amount of wholesale funding provided by Euro area non-banks, EUR tn, and growth rate (rhs), in %. Resid OFIs reflects the difference between the total financial sector and the known sub-sectors within the statistical financial accounts (i.e. assets from banking sector, insurances, pension funds, FVCs, investment funds and MMFs).
Sources: ECB, ESMA.

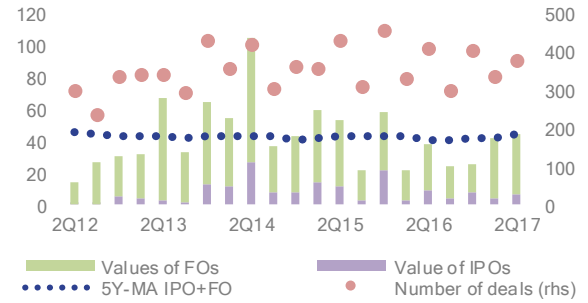
A.12
**Market financing**




Note: Quarterly Sector Accounts. Liabilities of non-financial corporations (NFC), closing balance sheet positions, all original maturities, by debt type as share of total liabilities. Others include: financial derivatives and employee stock options; insurance, pensions and standardised guarantee schemes; trade credits and advances of NFC; other accounts receivable/payable. Market financing growth: annual growth in debt securities and equity and investment fund (IFs) liabilities.
Sources: ECB, ESMA.

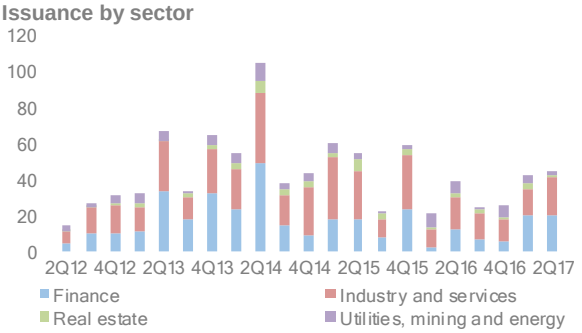
## Equity markets

A.13
**Issuance by deal type**



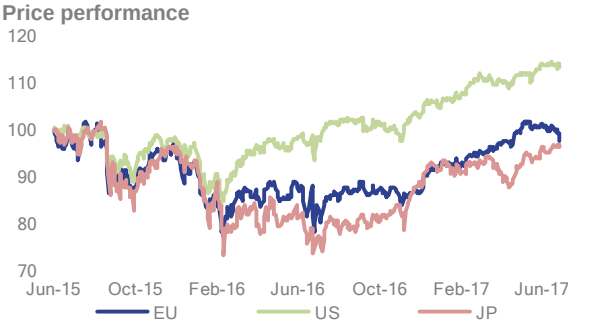

Note: EU equity offerings (IPOs and follow-on) and number of deals, EUR bn. 5Y-MA=five-year moving average of the total value of equity offerings.
Sources: Thomson Reuters Eikon, ESMA.

A.14
**Issuance by sector**



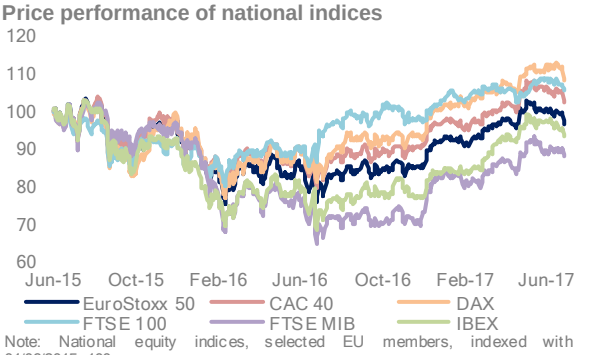

Note: EU equity issuance by sector, EUR bn. Finance includes: Banking and investment services; insurance; investment trusts.
Sources: Thomson Reuters Eikon, ESMA.

A.15
**Price performance**



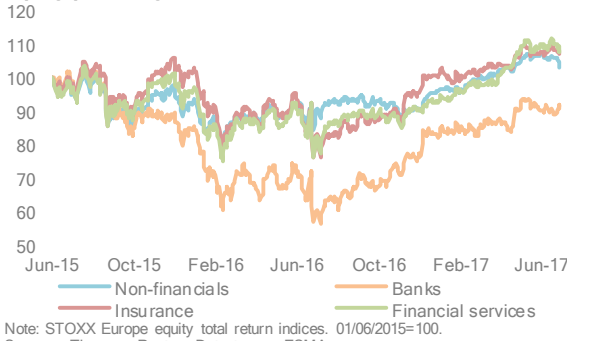

Note: Datastream regional equity indices for the EU, the US and Japan, indexed with 01/06/2015=100. Indices in their regional currency.
Sources: Thomson Reuters Datastream, ESMA.

A.16
**Price performance of national indices**



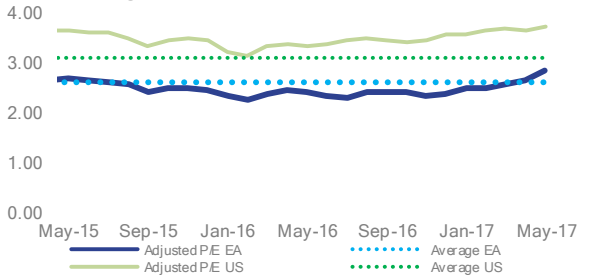

Note: National equity indices, selected EU members, indexed with 01/06/2015=100.
Sources: Thomson Reuters Datastream, ESMA.

A.17
**Equity prices by sector**



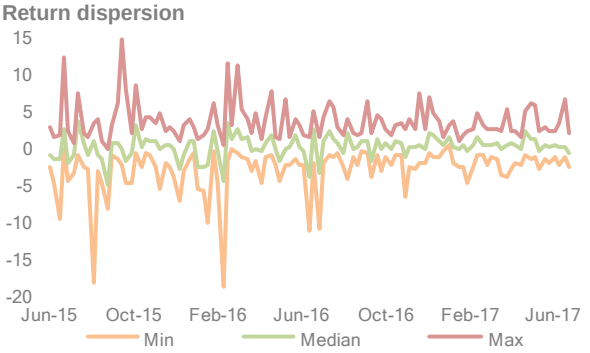

Note: STOXX Europe equity total return indices. 01/06/2015=100.
Sources: Thomson Reuters Datastream, ESMA.

A.18
**Price-earning ratios**



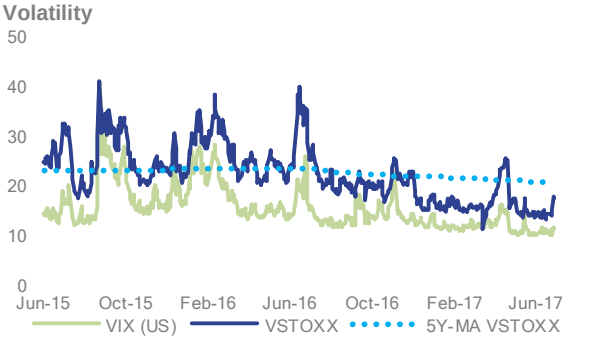

Note: Monthly earnings adjusted for trends and cyclical factors via Kalman filter methodology based on OECD leading indicators; units of standard deviation; averages computed from 8Y. Data available until the end of May 2017.
Sources: Thomson Reuters Datastream, ESMA.

A.19
**Return dispersion**



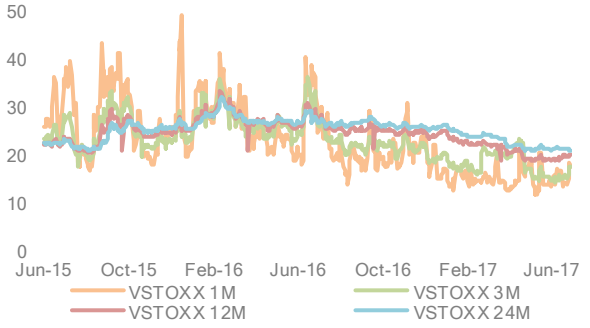

Note: Dispersion of the weekly returns of the main equity indices in the EU.
Sources: Thomson Reuters Datastream, ESMA.

A.20
**Volatility**



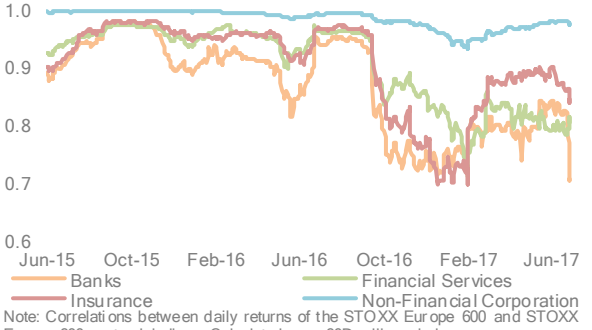

Note: Implied volatility of EuroStoxx50 (VSTOXX) and S&P 500 (VIX), in %.
Sources: Thomson Reuters Datastream, ESMA.

A.21
**Implied volatility**



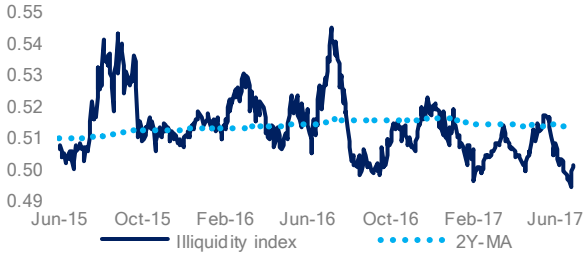

Note: Eurostoxx50 implied volatilities, measured as price indices, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.22
**Correlation STOXX Europe 600 and sectoral indices**



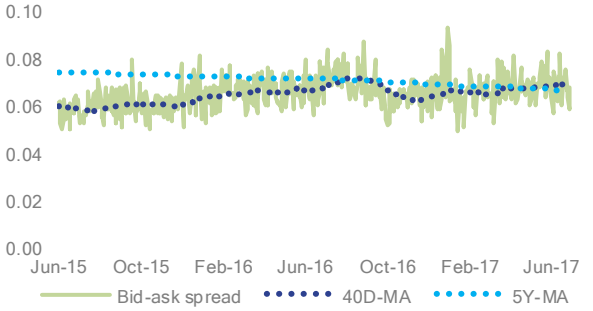

Note: Correlations between daily returns of the STOXX Europe 600 and STOXX Europe 600 sectoral indices. Calculated over 60D rolling windows
Sources: Thomson Reuters Datastream, ESMA.

A.23
**ESMA composite equity liquidity index**




Note: Composite indicator of illiquidity 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.

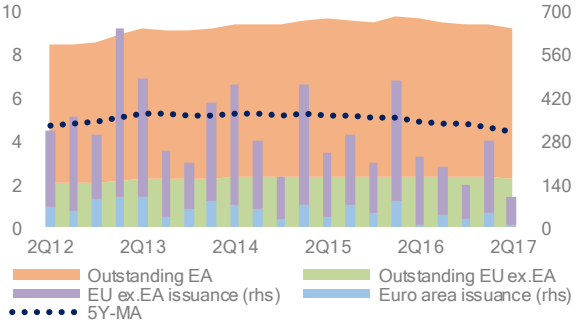
A.24
**Bid-ask spread**




Note: Liquidity measure 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.

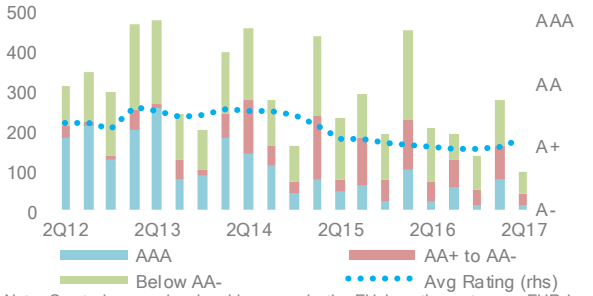
## Sovereign-bond markets

A.25
**Issuance and outstanding**



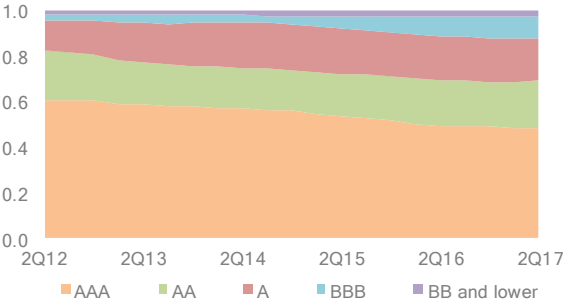

Note: Quarterly issuance (rhs), EUR bn, and outstanding debt, EUR tn.
Sources: Thomson Reuters Eikon, ESMA.

A.26
**Issuance by credit rating**



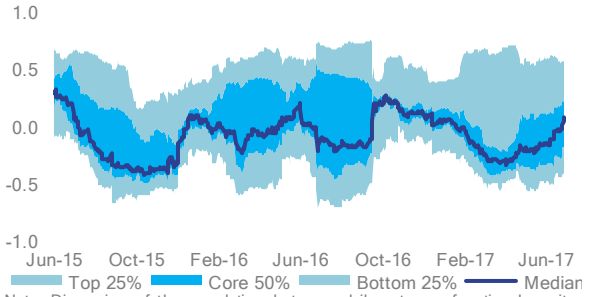

Note: Quarterly sovereign bond issuance in the EU by rating category, EUR bn. Avg Rating = Weighted average rating computed as a one-year moving average of ratings converted into a numeric scale (AAA=1, AA+=2, etc).
Sources: Thomson Reuters EIKON, ESMA.

A.27
**Rating distribution**



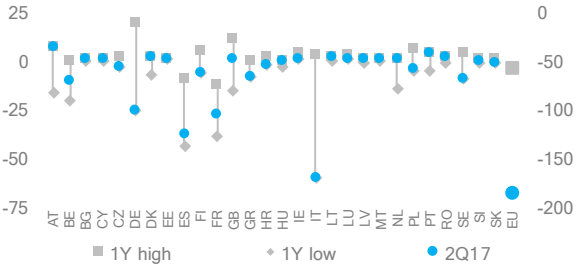

Note: Outstanding amount of sovereign bonds as of issuance date by rating category, in % of the total.
Sources:Thomson Reuters Eikon, ESMA.

A.28
**Equity-sovereign bond correlation dispersion**



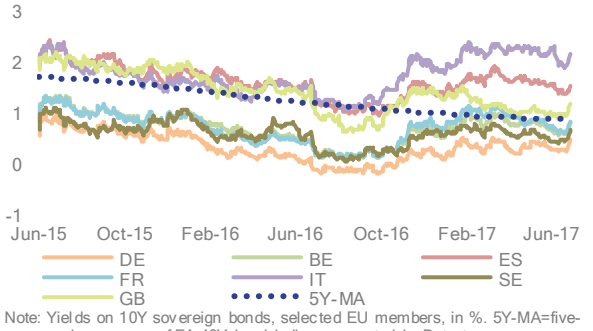

Note: Dispersion of the correlation between daily returns of national equity indices and national sovereign debt return index, for 16 countries in the EU, over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

A.29
**Net issuance by country**



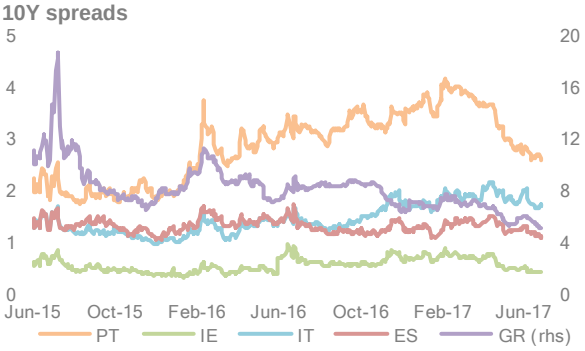

Note: Quarterly net issuance of EU sovereign debt by country, EUR bn. Net issuance calculated as the difference between new issuance over the quarter and outstanding debt maturing over the quarter. Highest and lowest quarterly net issuance in the past year are reported. EU total on right-hand scale.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

A.30
**10Y yields**



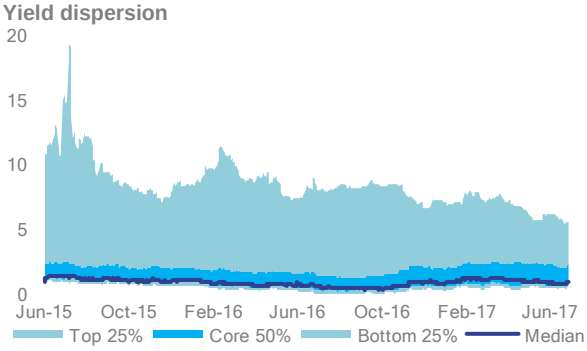

Note: Yields on 10Y sovereign bonds, selected EU members, in %. 5Y-MA=five-year moving average of EA 10Y bond indices computed by Datastream.
Sources: Thomson Reuters Datastream, ESMA.

A.31
**10Y spreads**



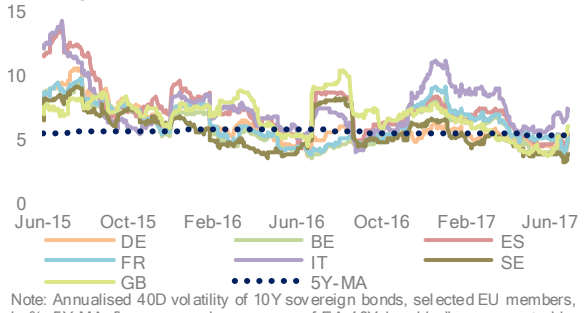

Note: Selected 10Y EA sovereign bond risk premia (vs. DE Bunds), in %.
Sources: Thomson Reuters Datastream, ESMA.

A.32
**Yield dispersion**



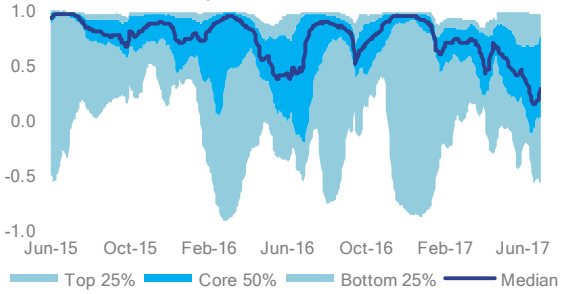

Note: Dispersion of yields on 10Y sovereign bonds of EU 17 countries, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.33
**Volatility**



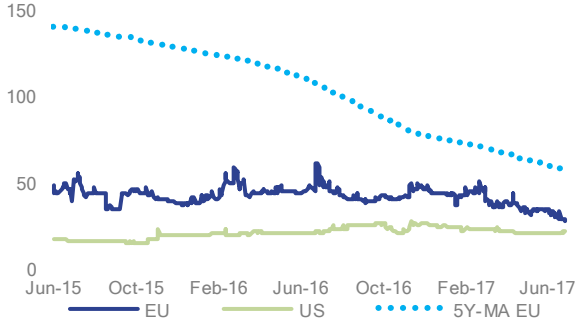

Note: Annualised 40D volatility of 10Y sovereign bonds, selected EU members, in %. 5Y-MA=five-year moving average of EA 10Y bond indices computed by Datastream.
Sources: Thomson Reuters Datastream, ESMA.

A.34
**Yield correlation dispersion**



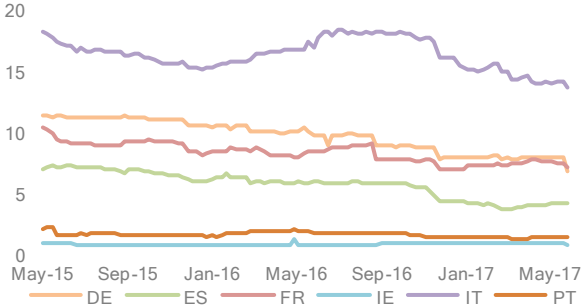

Note: Dispersion of correlations between 10Y DE Bunds and other EU countries' sovereign bond redemption yields over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

A.35
**CDS spreads**



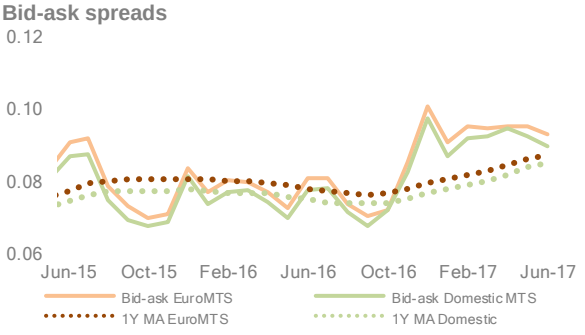

Note: Datastream CDS sovereign indices (5 years, mid-spread).
Sources: Thomson Reuters Datastream, ESMA.

A.36
**CDS volumes**



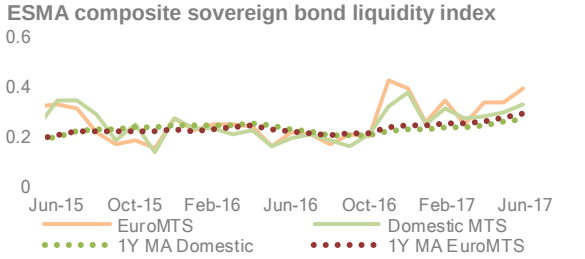

Note: Value of outstanding net notional sovereign CDS for selected countries, in USD bn.
Sources: DTCC, ESMA.

A.37
**Bid-ask spreads**



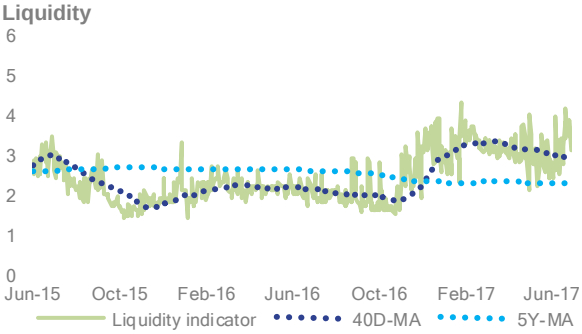

Note: Bid-ask spread as average bid-ask spread over one month across ten EU markets, Domestic and Euro MTS, in %. 1Y MA = one-year moving average.
Sources: MTS, ESMA.

A.38
**ESMA composite sovereign bond liquidity index**



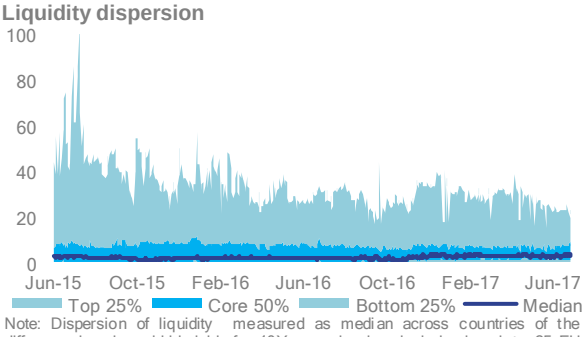

Note:Composite indicator of market liquidity in the sovereign bond market for the domestic and Euro MTS platforms, computed by applying the principal component methodology to four input liquidity measures (Amihud illiquidity coefficient, Bid-ask spread, Roll illiquidity measure and Turnover). 1Y MA = one-year moving average. The indicator range is between 0 (higher liquidity) and 1 (lower liquidity).
Sources: MTS, ESMA.

A.39
**Liquidity**




Note: Liquidity measured as median across countries of the difference in bid-ask yields for 10Y sovereign bonds, in basis points. 25 EU countries are included.
Sources: Bloomberg, ESMA.

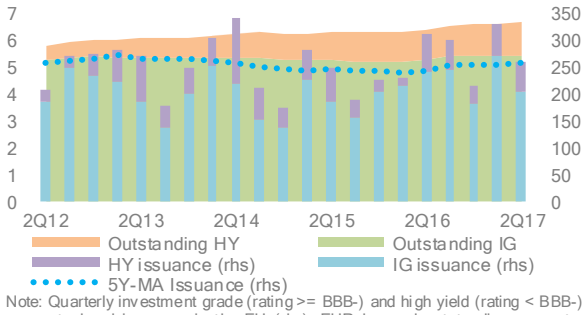
A.40
**Liquidity dispersion**




Note: Dispersion of liquidity measured as median across countries of the difference in ask and bid yields for 10Y sovereign bonds, in basis points. 25 EU countries are included.
Sources: Bloomberg, ESMA.

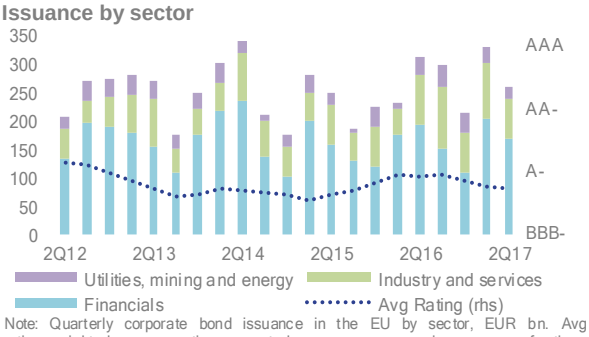
## Corporate-bond markets

A.41
**IG and HY bond issuance**



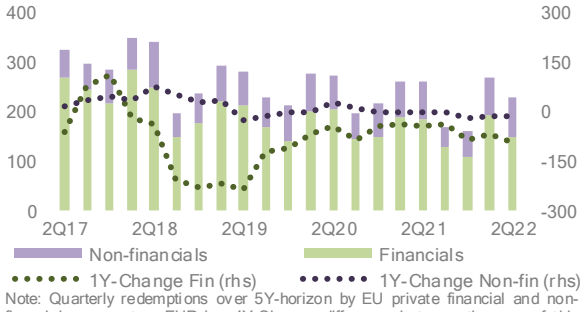

Note: Quarterly investment grade (rating >= BBB-) and high yield (rating < BBB-) corporate bond issuance in the EU (rhs), EUR bn, and outstanding amounts, EUR tn.
Sources: Thomson Reuters EIKON, ESMA.

A.42
**Issuance by sector**



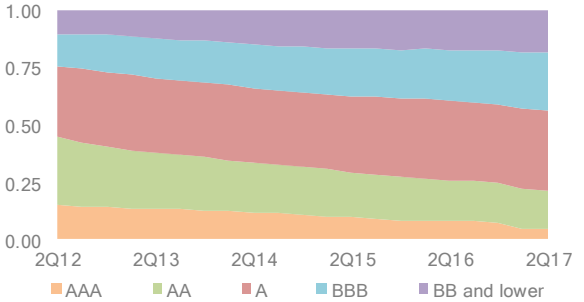

Note: Quarterly corporate bond issuance in the EU by sector, EUR bn. Avg rating=weighted average rating computed as a one-year moving average of ratings converted into a numerical scale (AAA=1, AA+=2, etc).
Sources: Thomson Reuters EIKON, ESMA.

A.43
**Debt redemption profile by sector**



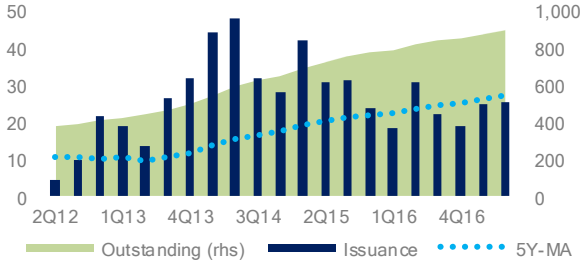

Note: Quarterly redemptions over 5Y-horizon by EU private financial and non-financials corporates, EUR bn. 1Y-Change=difference between the sum of this year's (four last quarters) and last year's (8th to 5th last quarters) redemptions.
Sources: Thomson Reuters EIKON, ESMA.

A.44
**Rating distribution**



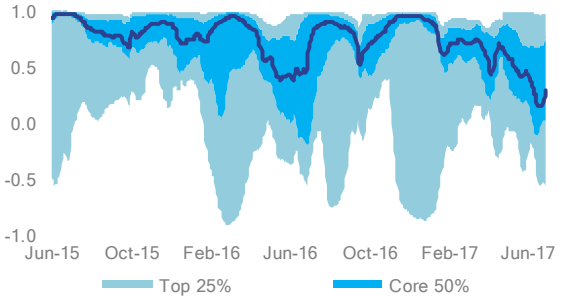

Note: Outstanding amount of corporate bonds as of issuance date by rating category, in % of the total.
Sources: Thomson Reuters Eikon, ESMA.

A.45
**Hybrid capital instruments**



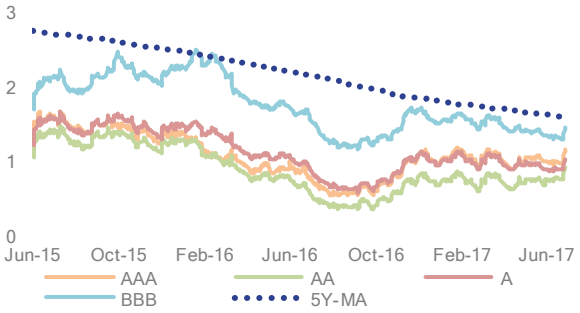

Note: Hybrid capital. Outstanding amount computed as the cumulative sum of previously issued debt minus the cumulative sum of matured debt prior to reference date, EUR bn. Eikon Thomson Reuters hybrid capital classification is used.
Sources: Thomson Reuters Eikon, ESMA.

A.46
**Sovereign-corporate yield correlation**



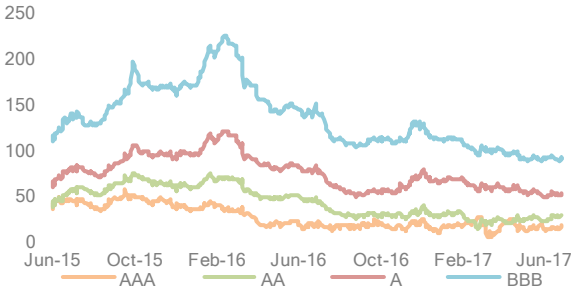

Note: Dispersion of correlations between 10Y DE Bunds and other EU countries' sovereign bond redemption yields over 60D rolling windows.
Sources: Thomson Reuters Datastream, ESMA.

A.47
**Yields by credit rating**



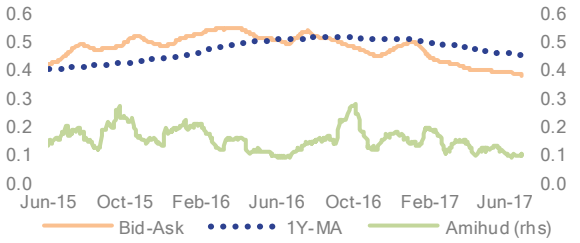

Note: Markit iBoxx euro corporate bond indices for maturities 5-7 years, in %. 5Y-MA=five-year moving average of all indices.
Sources: Thomson Reuters Datastream, ESMA.

A.48
**Spreads by credit rating**



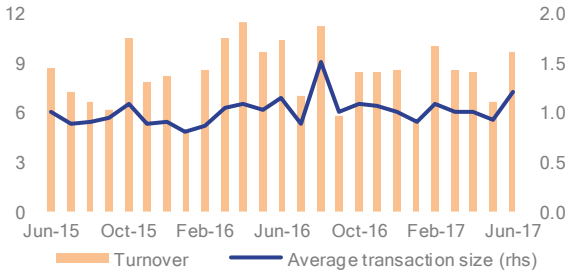

Note: EA non-financial corporate bond spreads by rating between iBoxx non-financial corporate yields and ICAP Euro Euribor swap rates for maturities from 5 to 7 years, basis points.
Sources: Thomson Reuters Datastream, ESMA.

A.49
**Bid-ask spreads and Amihud indicator**




Note: EUR Markit iBoxx corporate bond index bid-ask spread, in %, computed as a one-month moving average of the iBoxx components in the current composition. 1Y-MA=one-year moving average of the bid-ask spread. Amihud liquidity coefficient index between 0 and 1. Highest value indicates less liquidity.
Sources: IHS Markit, ESMA.

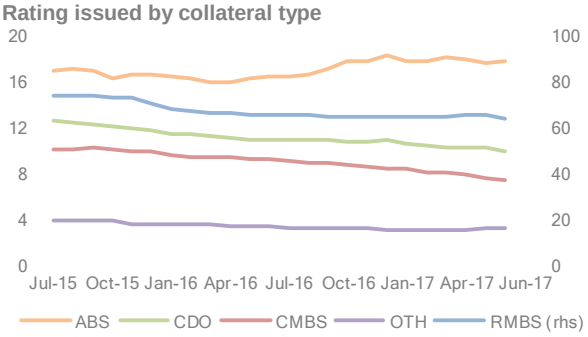
A.50
**Turnover ratio and average trade size**




Note: Average transaction size for the corporate bond segment as the ratio of nominal amount of settlement instructions to number of settled instructions, in EUR mn. Turnover is the one-month moving average of the ratio of trading volume over outstanding amount, in %.
Sources: IHS Markit, ESMA.

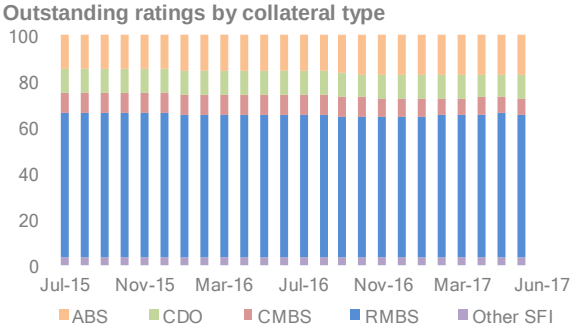
## Credit quality

A.51
**Rating issued by collateral type**



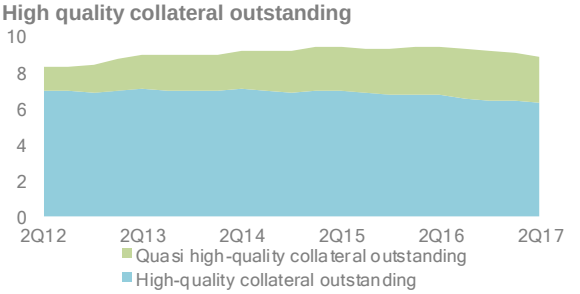

Note: Number of rated structured finance instruments by asset class, hundreds.
Sources: RADAR, ESMA.

A.52
**Outstanding ratings by collateral type**



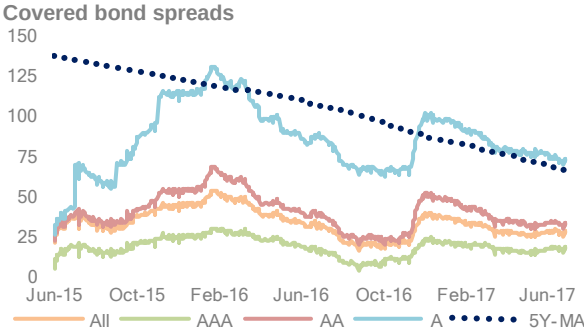

Note: Outstanding EU ratings of structured finance instruments by asset class, in % of total.
Sources: RADAR, ESMA.

A.53
**High quality collateral outstanding**



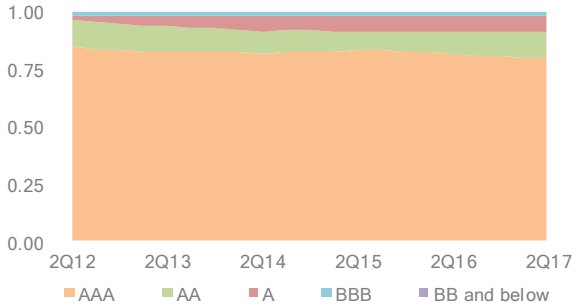

Note: Outstanding amount of debt securities issued, EUR tn. High-quality collateral is the sum of outstanding debt securities issued by EU governments with a rating equal to or higher than BBB-.Quasi high-quality is outstanding corporate debt with a rating equal to or higher than AA-.
Sources: Thomson Reuters Eikon, ESMA.

A.54
**Covered bond spreads**



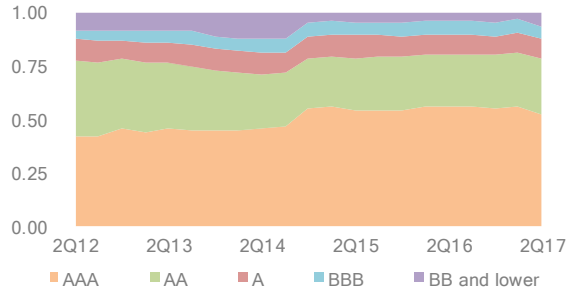

Note: Asset swap spreads based on iBoxx covered bond indices, basis points. 5Y-MA=five-year moving average of all bonds.
Sources: Thomson Reuters Datastream, ESMA.

A.55
**Rating distribution of covered bonds**



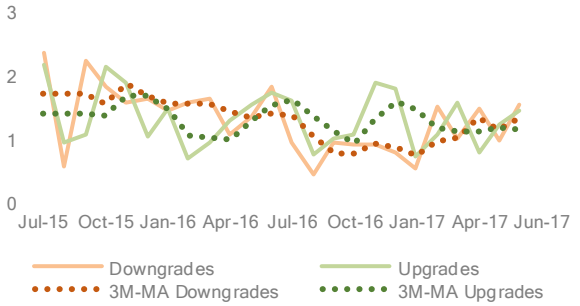

Note: Outstanding amount of covered bonds by rating category, in % of total.
Sources: Thomson Reuters Eikon, ESMA.

A.56
**Rating distribution of securitised products**



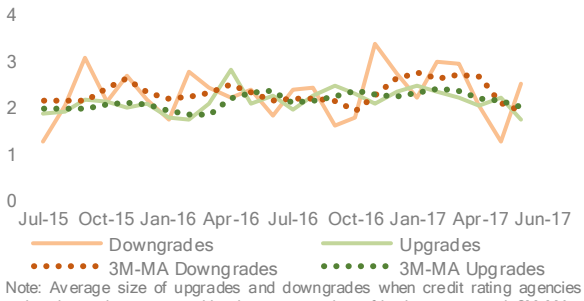

Note: Outstanding amount of securitised products as of issuance date by rating category, in % of total.
Sources: Thomson Reuters Eikon, ESMA.

A.57
**Rating changes**



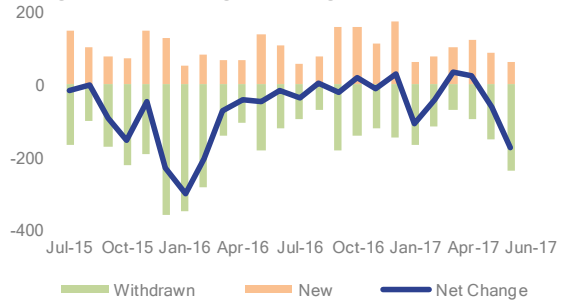

Note: Number of rating changes on securitised assets, thousands. 3M-MA = three month moving average.
Sources: RADAR, ESMA.

A.58
**Size of rating changes**



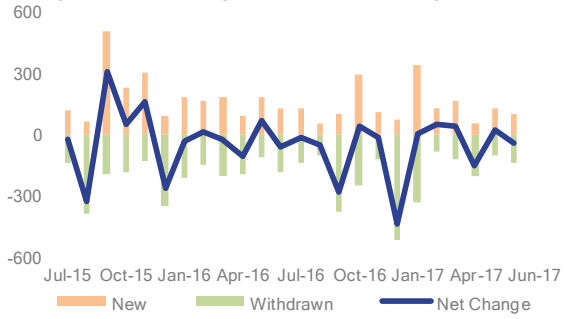

Note: Average size of upgrades and downgrades when credit rating agencies took rating actions on securitised assets, number of buckets traversed. 3M-MA = three month moving averages of upgrades and downgraes.
Sources: RADAR, ESMA.

A.59
**Change in outstanding SFI ratings**



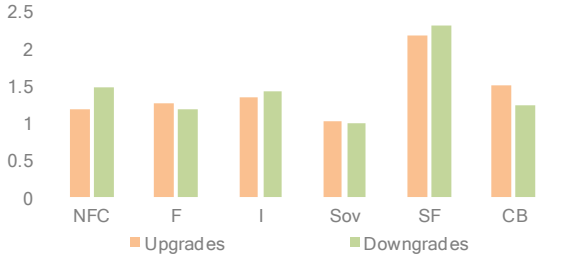

Note: Number of withdrawn and new ratings for structured finance instruments.
Sources: RADAR, ESMA

A.60
**Change in outstanding covered bond ratings**



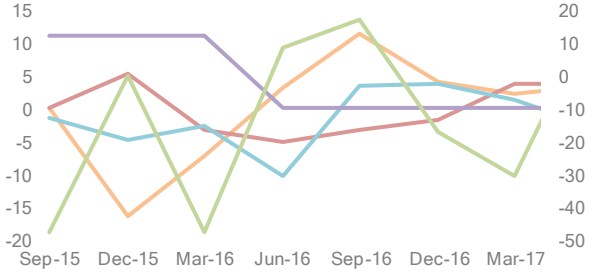

Note: Number of withdrawn and new ratings for covered bonds.
Sources: RADAR, ESMA.

A.61
**Rating actions**



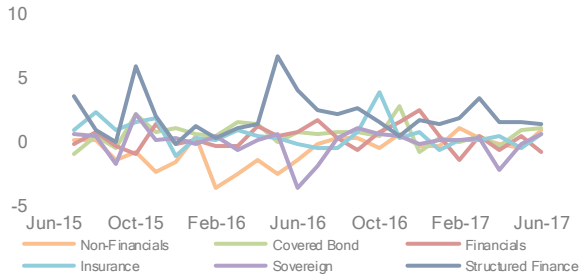

Note: Average size of upgrades and downgrades from all credit rating agencies, excluding CERVED and ICAP, by asset class for 17H1, average number of notches. NFC = Non Financials, F = Financials, I = Insurance, Sov = Sovereign, SF = Structured Finance, CB = Covered Bonds.
Sources: RADAR, ESMA

A.62
**Non-financial corporates rating changes**



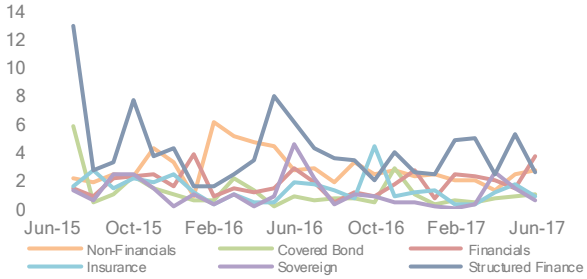

Note: Number of upgrades minus downgrades for ES, GR, IE, IT and PT, in % of outstanding ratings. Data from Fitch Ratings, Moody's, S&P's.
Sources: RADAR, ESMA

A.63
**Rating changes**




Note: Net change in ratings from all credit rating agencies, excluding CERVED and ICAP, by asset class computed as a percentage number of upgrades minus percentage number of downgrades over number of outstanding ratings.
Sources: RADAR, ESMA.

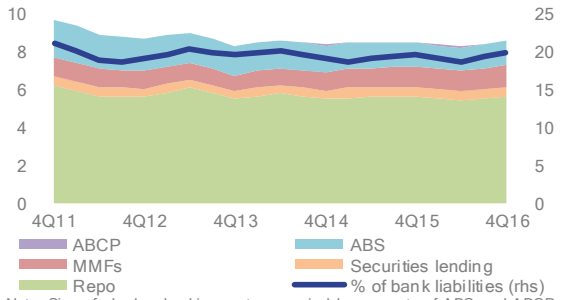
A.64
**Rating volatility**




Note: Volatility of ratings by all credit rating agencies, excluding CERVED and ICAP, by asset class computed as number of rating changes over number of outstanding ratings.
Sources: RADAR, ESMA.

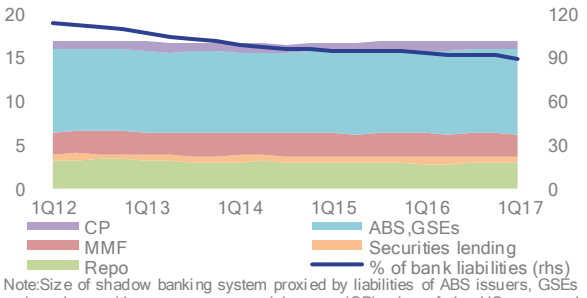
## Market-based credit intermediation

A.65
**EU shadow banking liabilities**



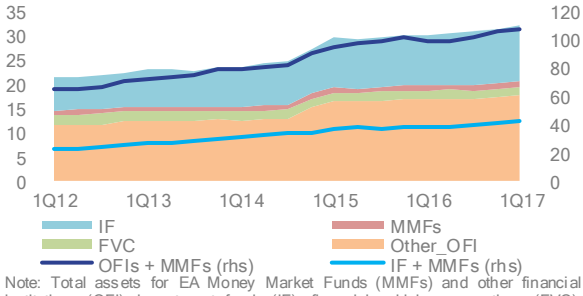

Note: Size of shadow banking system proxied by amounts of ABS and ABCP outstanding, size of the EU repo market and EU securities on loan (collateralised with cash), and liabilities of MMF, in EUR tn. In % of bank liabilities on rhs.
Sources: ECB, AFME, ICMA, Markit Securities Finance, ESMA.

A.66
**US shadow banking liabilities**



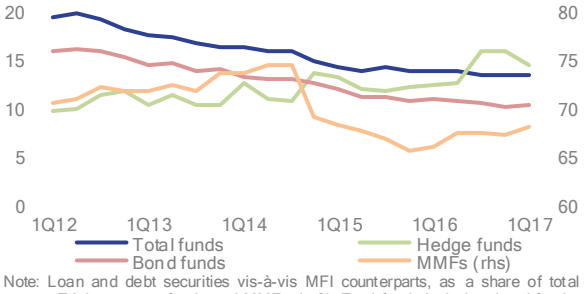

Note:Size of shadow banking system proxied by liabilities of ABS issuers, GSEs and pool securities, open commercial paper (CP), size of the US repo and securities lending (collateralised with cash) markets, and liabilities of Money Market Funds, in USD tn. In % of bank liabilities on rhs.
Sources: Federal Reserve Flow of Funds, Thomson Reuters Datastream, ESMA.

A.67
**MMFs and other financial institutions**



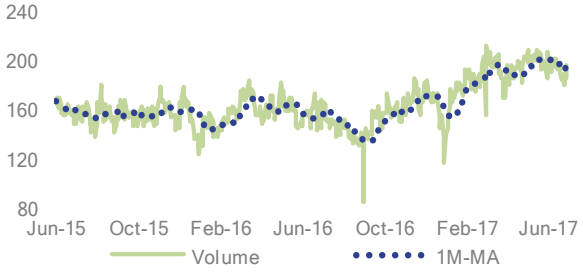

Note: Total assets for EA Money Market Funds (MMFs) and other financial institutions (OFI): investment funds (IF), financial vehicle corporations (FVC), other OFI estimated with ECB Quarterly Sector Accounts MFUA, in EUR tn. In % of bank assets on rhs.
Sources: ECB, ESMA.

A.68
**Financial market interconnectedness**



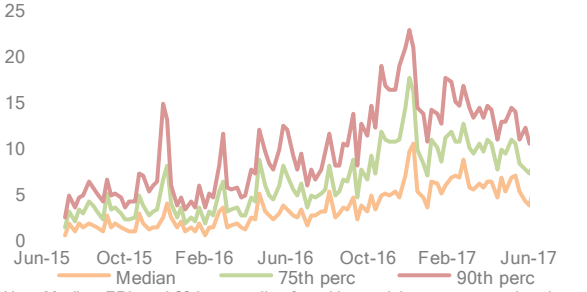

Note: Loan and debt securities vis-à-vis MFI counterparts, as a share of total assets. EA investment funds and MMFs, in %. Total funds includes: bond funds, equity funds, mixed funds, real estate funds, hedge funds, MMFs and other non-MMF investment funds.
Sources: ECB, ESMA.

A.69
**Sovereign repo volumes**



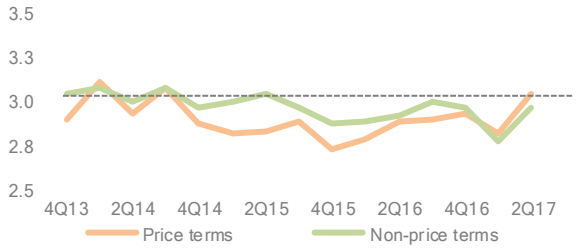

Note: 1M-MA of specific and general collateral transaction volumes executed through CCPs in seven sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), EUR bn. Index volumes filter out atypical transactions.
Sources: RepoFunds Rate, ESMA.

A.70
**Sovereign repo market specialness**



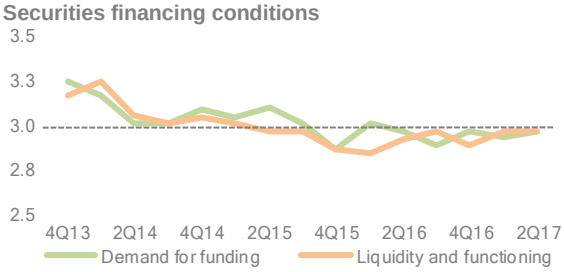

Note: Median, 75th and 90th percentile of weekly specialness, measured as the difference between general collateral and special collateral repo rates on government bonds in selected countries.
Sources: RepoFunds Rate, ESMA.

A.71
**Credit terms in SFT and OTC deribvatives**



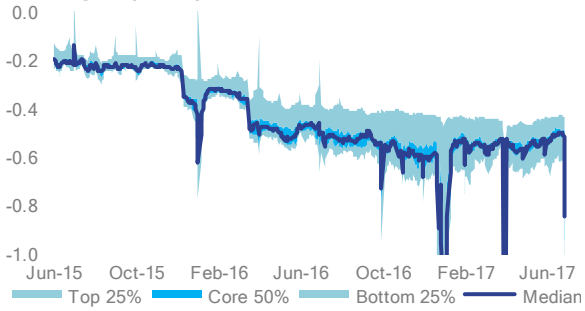

Note: Weighted average of responses to the question: "Over the past three months, how have terms offered as reflected across the entire spectrum of securities financing and OTC derivatives transaction types changed?" 1=tightened considerably, 2=tightened somewhat, 3=remained basically unchanged, 4= eased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

A.72
**Securities financing conditions**



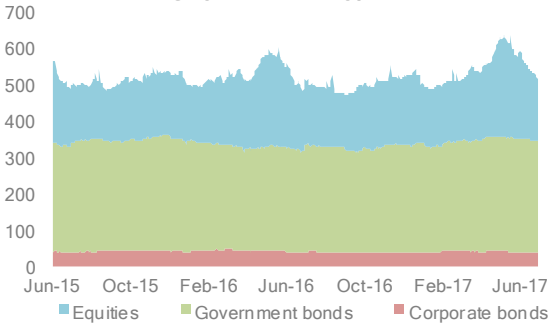

Note: Weighted average of responses to the questions: "Over the past 3M, how has demand for funding / how have liquidity and functioning for all collateral types changed?" 1= decreased / deteriorated considerably, 2= decreased / deteriorated somewhat, 3= remained basically unchanged, 4= increased / improved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

A.73
**Sovereign repo dispersion**



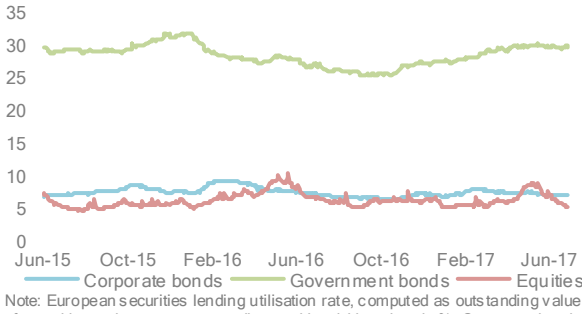

Note: Dispersion of seven sovereign EUR repo markets (AT, BE, DE, FI, FR, IT and NL), volume-weighted average of fixed rate index value, in %.
Sources: RepoFunds Rate, ESMA.

A.74
**Securities lending by instrument type**



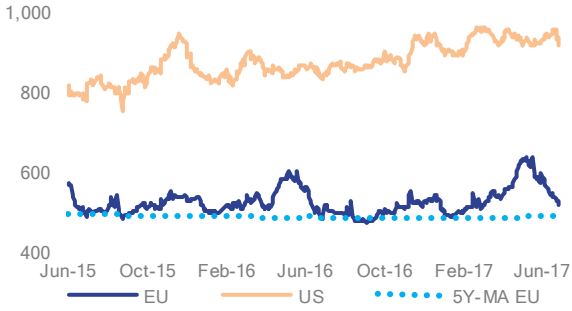

Note: Total value of EU securities on loan, EUR bn.
Sources: Markit Securities Finance, ESMA.

A.75
**Securities utilisation rate**



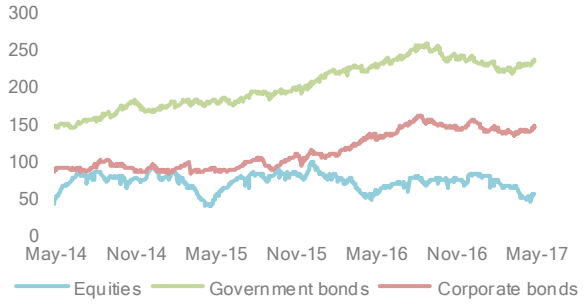

Note: European securities lending utilisation rate, computed as outstanding value of securities on loan over outstanding total lendable value, in %. Corporate bonds comprise EUR denominated bonds only.
Sources:Markit Securities Finance, ESMA.

A.76
**Securities lending by region**



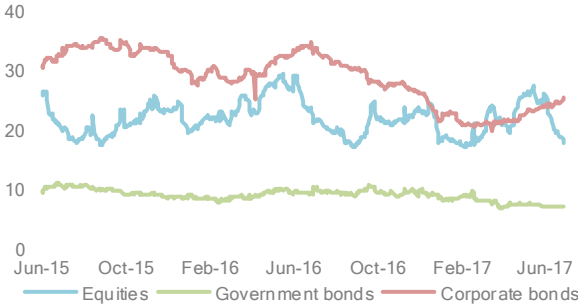

Note: Total value of EU and US securities on loan, EUR bn. 5Y-MA EU=five-year moving average for EU securities.
Sources: Markit Securities Finance, ESMA.

A.77
**Securities lending contracts tenure**



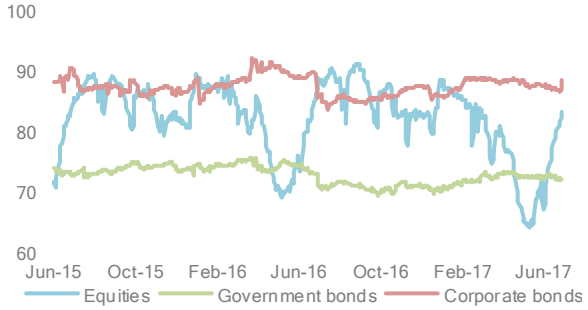

Note: Average tenure of EU securities lending contracts, days.
Sources: Markit Securities Finance, ESMA.

A.78
**Securities lending against cash collateral**



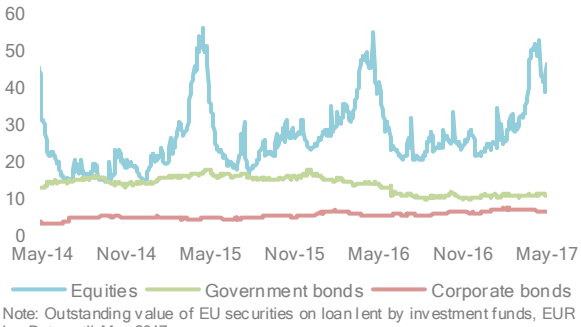

Note: Ratio of European securities on loan collateralised with cash over total securities on loan, outstanding values, in %.
Source: Markit Securities Finance, ESMA.

A.79
**Securities lending with open maturity**



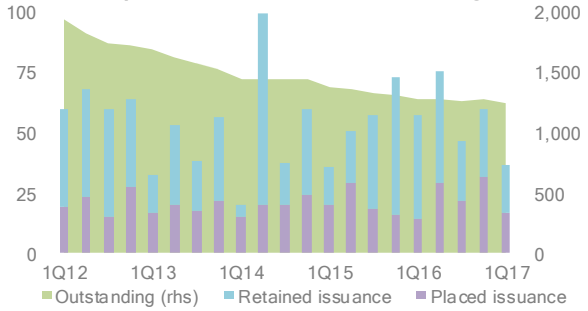

Note: Ratio of European securities on loan at open maturity over total securities on loan, outstanding values, in %.
Sources: Markit Securities Finance, ESMA.

A.80
**Securities lending by investment funds**



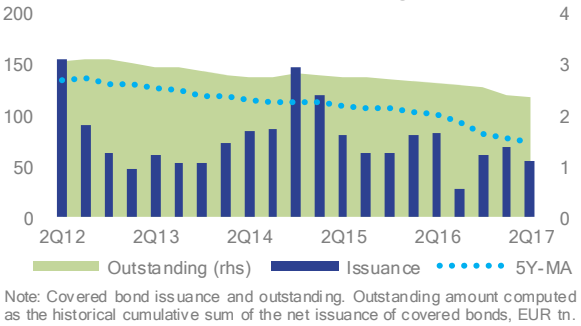

Note: Outstanding value of EU securities on loan lent by investment funds, EUR bn. Data until May 2017.
Sources: Markit Ssecurities Finance, ESMA.

A.81
**Securitised products 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.

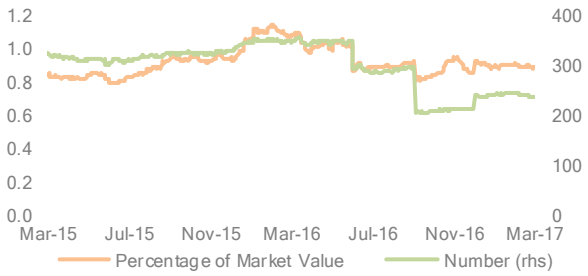
A.82
**Covered bond issuance and outstanding**




Note: Covered bond issuance and outstanding. Outstanding amount computed as the historical cumulative sum of the net issuance of covered bonds, EUR tn. Issuance in EUR bn. 5Y-MA = five-year moving average of issuance.
Sources: Thomson Reuters Eikon, ESMA.

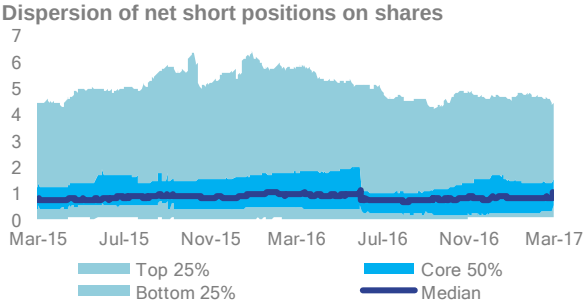
## Short selling

A.83
**Value of short selling positions on shares**



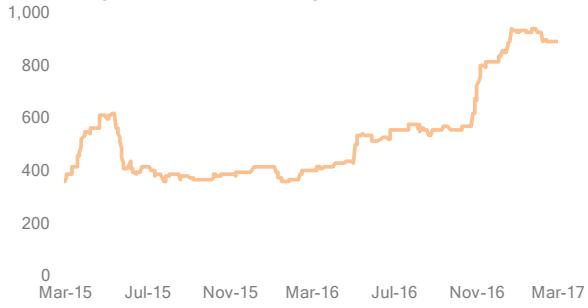

Note: Market value of short selling positions as percentage of total market value in the EU (lhs). Number of listed shares on which short positions were reported by NCAs under EU Short Selling Regulation (rhs).
Sources: National Competent Authorities, Datastream, ESMA.

A.84
**Dispersion of net short positions on shares**



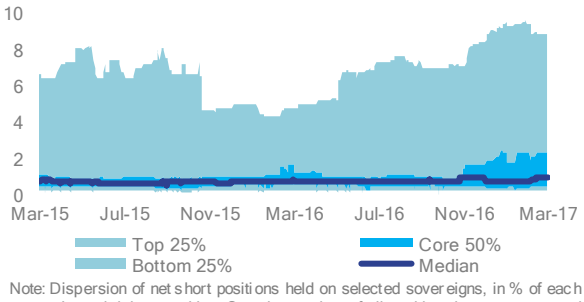

Note: Dispersion of net short positions by country as percentage of market value of those positions relative to each country's blue chip index market value. Sample consists of all equities that were reported since 01/11/2012.
Sources: National Competent Authorities, Datastream, ESMA.

A.85
**Net short positions on sovereigns**




Note: Duration-adjusted short positions held on sovereigns in EA, EUR bn. Sample consists of EA Member States that reported since 01/11/2012.
Sources: National Competent Authorities, ESMA.

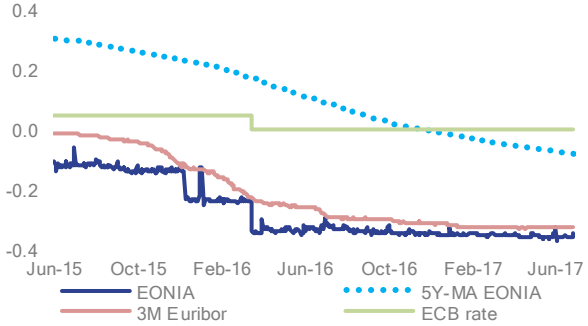
A.86
**Dispersion of net short positions on sovereigns**




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.

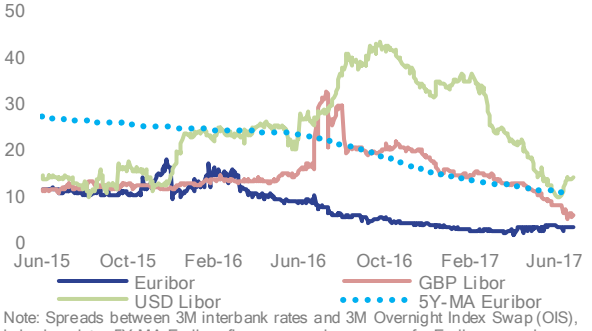
## Money markets

A.87
**Interest rates**



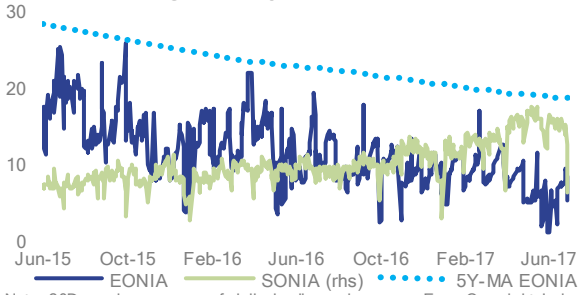

Note: Money market rates, in %.
Sources: Thomson Reuters Datastream, ESMA.

A.88
**Spreads to OIS**



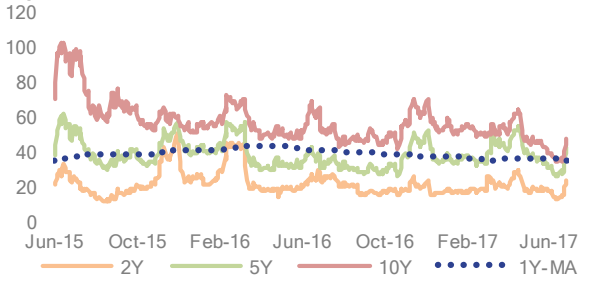

Note: Spreads between 3M interbank rates and 3M Overnight Index Swap (OIS), in basis points. 5Y-MA Euribor=five-year moving average for Euribor spread.
Sources: Thomson Reuters Datastream, ESMA.

A.89
**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.

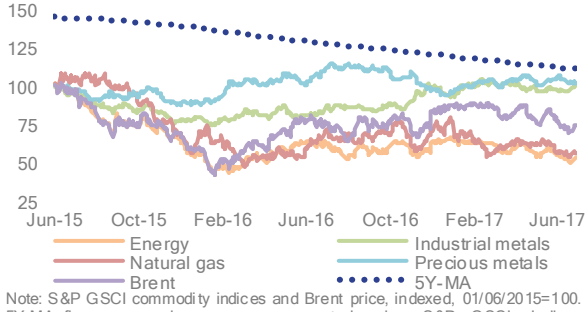
A.90
**Implied volatilities**




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.

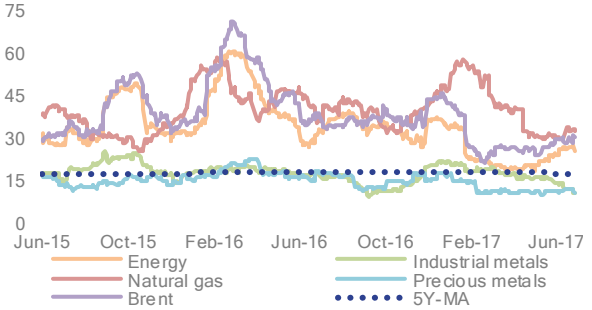
## Commodity markets

A.91
**Prices**



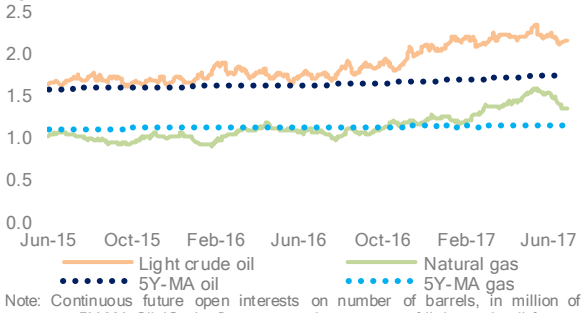

Note: S&P GSCI commodity indices and Brent price, indexed, 01/06/2015=100. 5Y-MA=five-year moving average computed using S&P GSCI. Indices denominated in USD.
Sources: Thomson Reuters Datastream, ESMA.

A.92
**Volatility**



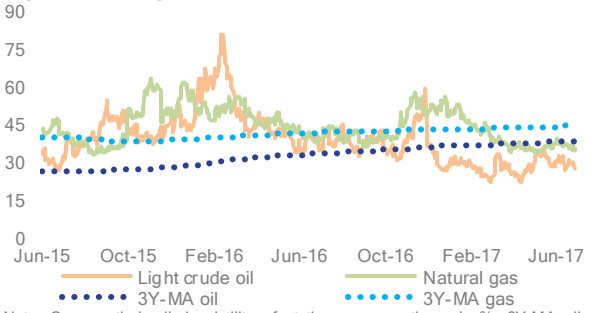

Note: Annualised 40D volatility of S&P GSCI commodity indices and Brent price, in %. 5Y-MA=five-year moving average computed using S&P GSCI.
Sources: Thomson Reuters Datastream, ESMA.

A.93
**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.

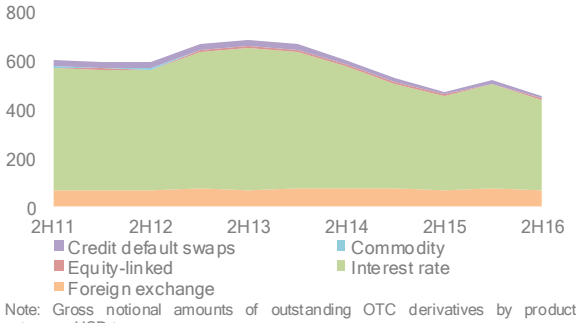
A.94
**Implied volatility**




Note: One-month implied volatility of at the money options, in %. 3Y-MA oil (gas)= one-year moving average of light crude oil (natural gas).
Sources: Thomson Reuters Datastream, ESMA.

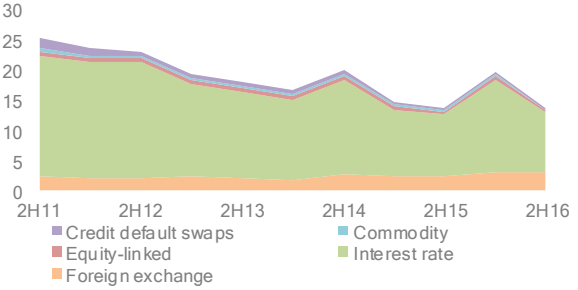
# Derivatives markets

A.95
**OTC notional outstanding**



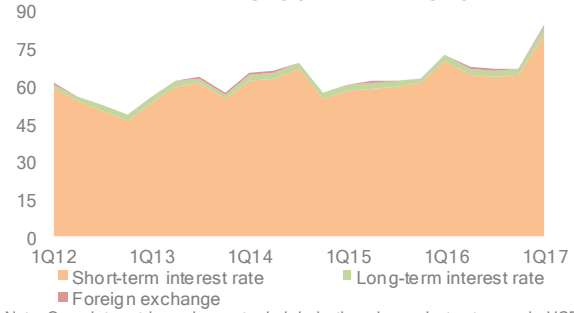

Note: Gross notional amounts of outstanding OTC derivatives by product category, USD tn.
Sources: Bank for International Settlements, ESMA.

A.96
**OTC market value**



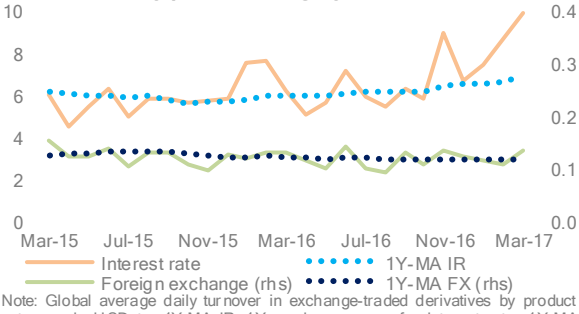

Note: Gross market values of outstanding OTC derivatives by category, USD tn. Gross market values represent the cost of replacing all open contracts at the prevailing market prices.
Sources: Bank for International Settlements, ESMA.

A.97
**ETD notional outstanding by product category**



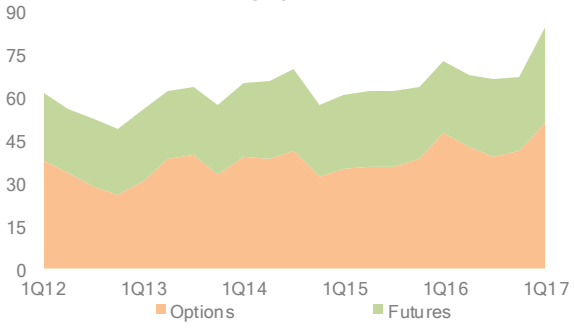

Note: Open interest in exchange-traded derivatives by product category, in USD tn.
Sources: Bank for International Settlements, ESMA.

A.98
**ETD turnover by product category**



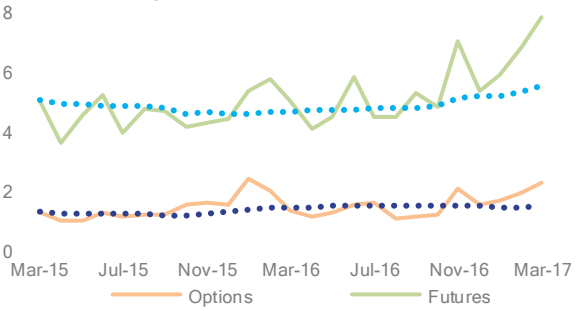

Note: Global average daily turnover in exchange-traded derivatives by product category, in USD tn. 1Y-MA IR=1Y moving average for interest rate, 1Y-MA FX=1Y moving average for foreign exchange.
Sources: Bank for International Settlements, ESMA.

A.99
**ETD notional outstanding by asset class**



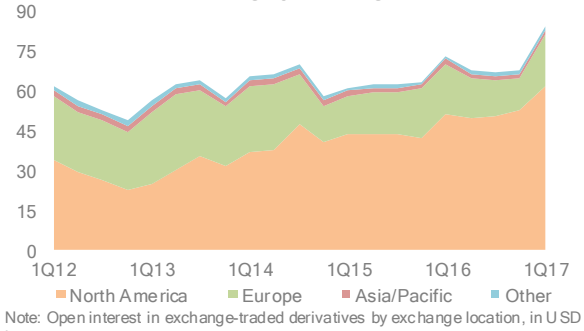

Note: Open interest in exchange-traded derivatives by asset class, in USD tn.
Sources: Bank for International Settlements, ESMA.

A.100
**ETD turnover by asset class**



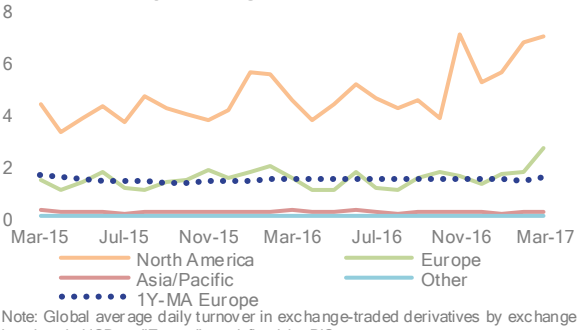

Note: Global average daily turnover in exchange-traded derivatives by asset class, in USD tn.
Sources: Bank for International Settlements, ESMA.

A.101
**ETD notional outstanding by exchange location**




Note: Open interest in exchange-traded derivatives by exchange location, in USD tn.
Sources: Bank for International Settlements, ESMA.

A.102
**ETD turnover by exchange location**

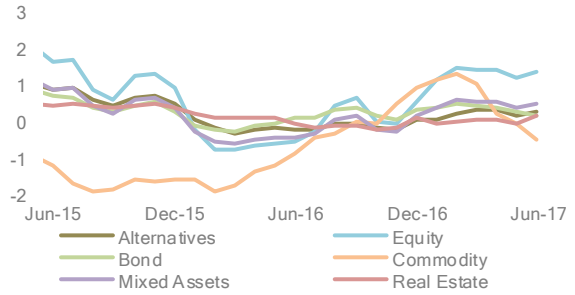



Note: Global average daily turnover in exchange-traded derivatives by exchange location, in USD tn. "Europe" as defined by BIS.
Sources: Bank for International Settlements, ESMA.

# Investors

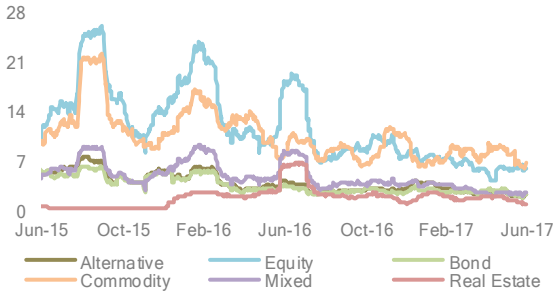
## Fund industry

A.103
**Fund performance**



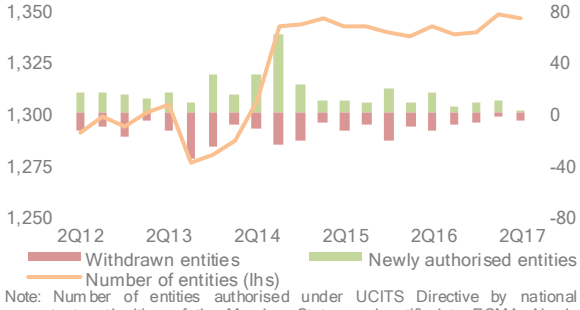

Note: EU-domiciled investment funds' annual average monthly returns, asset weighted, in %.
Sources:Thomson Reuters Lipper, ESMA.

A.104
**Fund volatility**



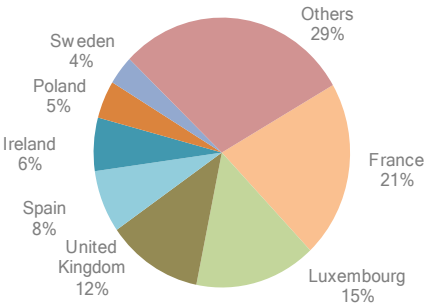

Note: Annualised 40D historical return volatility of EU domiciled mutual funds, in %.
Sources: Thomson Reuters Lipper, ESMA.

A.105
**Entities authorised under UCITS**



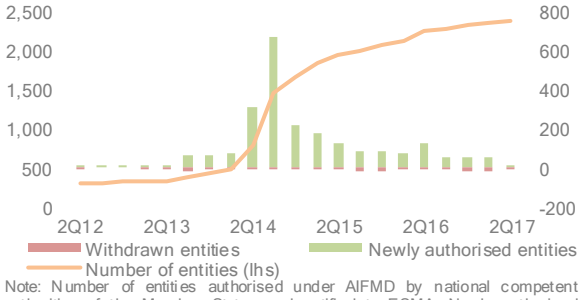

Note: Number of entities authorised under UCITS Directive by national competent authorities of the Member States and notified to ESMA. Newly authorised entities and withdrawn entities on the right axis.
Sources: ESMA Registers.

A.106
**Share of entities authorised under UCITS by country**



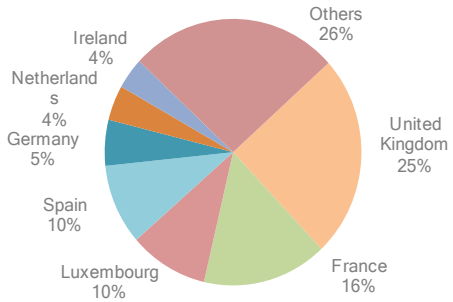

Note: Number of entities authorised under UCITS Directive by national competent authorities and notified to ESMA, in %.
Sources: ESMA Registers.

A.107
**Entities authorised under AIFMD**



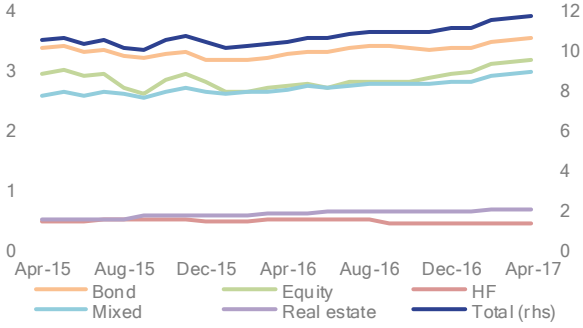

Note: Number of entities authorised under AIFMD by national competent authorities of the Member States and notified to ESMA. Newly authorised entities and withdrawn entities on the right axis.
Sources: ESMA Registers.

A.108
**Share of entities authorised under AIFMD by country**



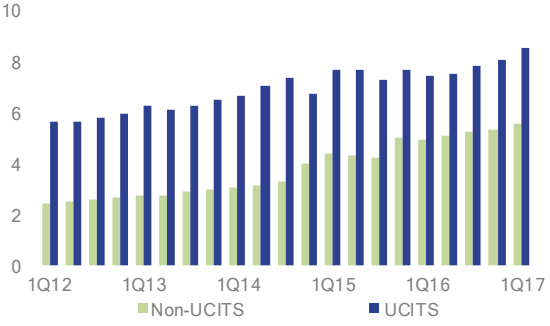

Note: Number of entities authorised under AIFMD by national competent authorities and notified to ESMA, in %.
Sources: ESMA Registers.

A.109
**Assets by market segment**



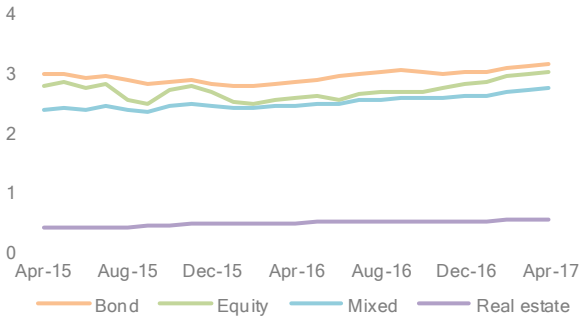

Note: AuM of EA funds by fund type, EUR tn. HF=Hedge funds.
Sources: ECB, ESMA.

A.110
**NAV by legal form**



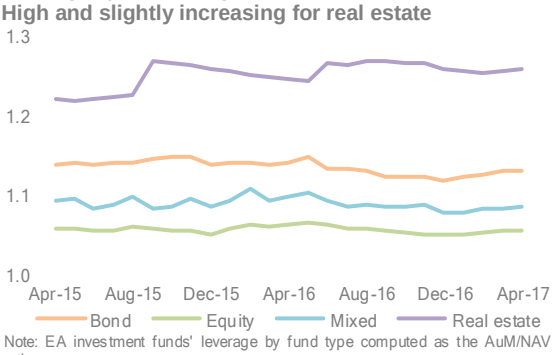

Note: NAV of EU fund industry, EUR tn. Quarterly data.
Sources: EFAMA, ESMA.

A.111
**NAV by fund market segment**



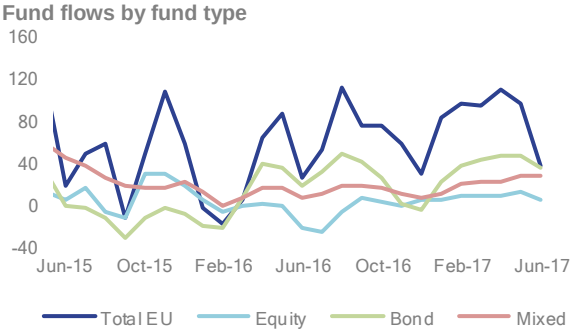

Note: EA Investment funds' NAV by fund type, EUR tn.
Sources: ECB, ESMA.

A.112
Leverage by market segment
**High and slightly increasing for real estate**



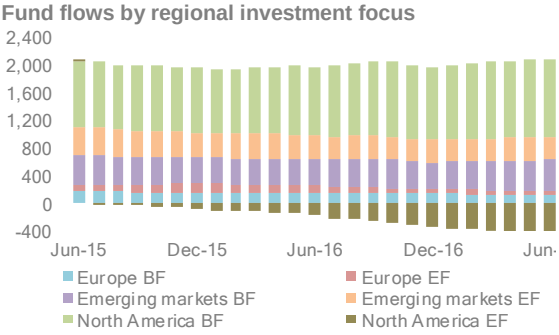

Note: EA investment funds' leverage by fund type computed as the AuM/NAV ratio.
Sources: ECB, ESMA.

A.113
**Fund flows by fund type**



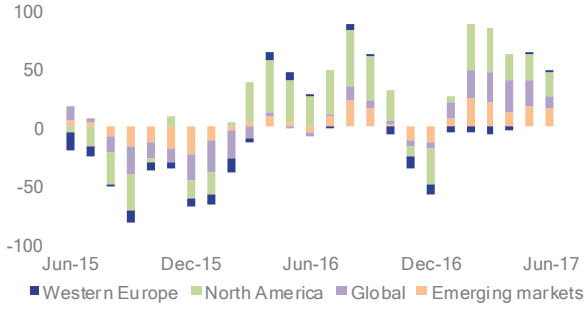

Note: EU-domiciled funds' 2M cumulative net flows, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.114
**Fund flows by regional investment focus**



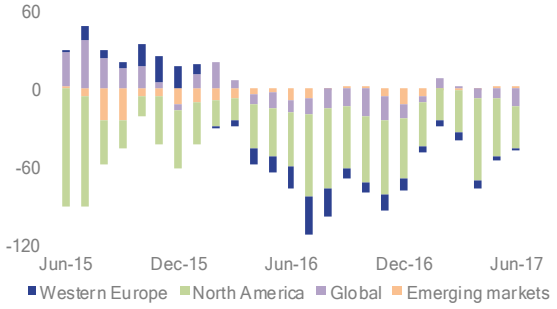

Note: Cumulative net flows into bond and equity funds (BF and EF) over ti since 2004 by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.115
**Bond fund flows by regional investment focus**



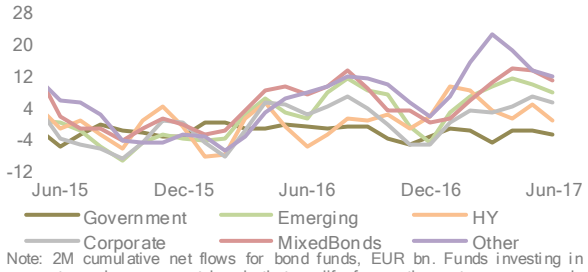

Note: 2M cumulative bond flows by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.116
**Equity fund flows by regional investment focus**



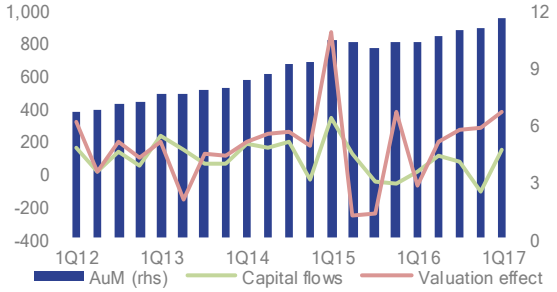

Note: 2M cumulative equity flows by regional investment focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.117
**Net flows for bond funds**



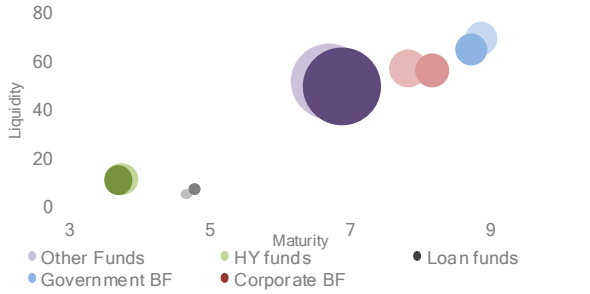

Note: 2M cumulative net flows for bond funds, EUR bn. Funds investing in corporate and government bonds that qualify for another category are only reported once (e.g. funds investing in emerging government bonds will be reported as Emerging; funds investing in HY corporate bonds will be reported as HY).
Sources: Thomson Reuters Lipper, ESMA.

A.118
**Net asset valuation**



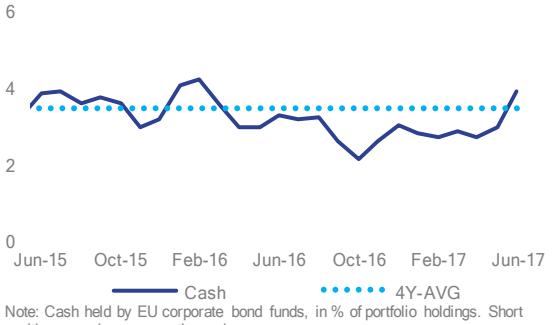

Note: Net valuation effect related to the AuM of EA investment funds, computed as the intraperiod change in AuM, net of flows received in the respective period. Capital flows and valuation effects in EUR bn. AuM expressed in EUR tn.
Sources: ECB, ESMA.

A.119
**Liquidity risk profile of EU bond funds**



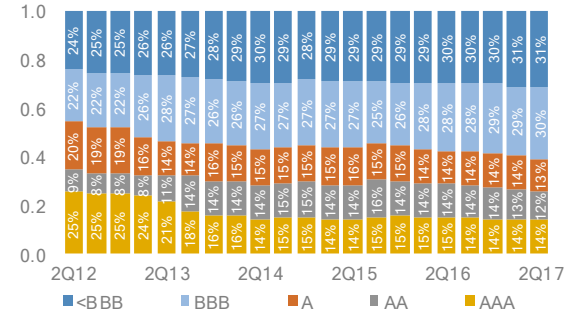

Note: Fund type reported according to the average liquidity ratio, in % (Y-axis), the effective average maturity of assets (X-axis) and size. Each series is reported for 2 years, i.e. 2016 (bright colours) and 2017 (dark colours).
Sources: Thomson Reuters Lipper, ESMA.

A.120
**Cash as percentage of assets**



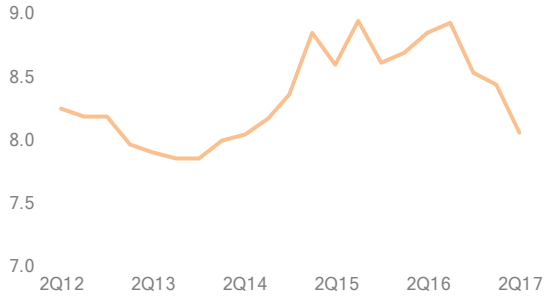

Note: Cash held by EU corporate bond funds, in % of portfolio holdings. Short positions can have a negative value.
Sources: Thomson Reuters Lipper, ESMA.

A.121
**Credit quality of bond funds assets**




Note: Ratings of bonds held by EU bond funds, data in % of total assets.
Sources: Thomson Reuters Lipper, ESMA and Standard & Poor's.

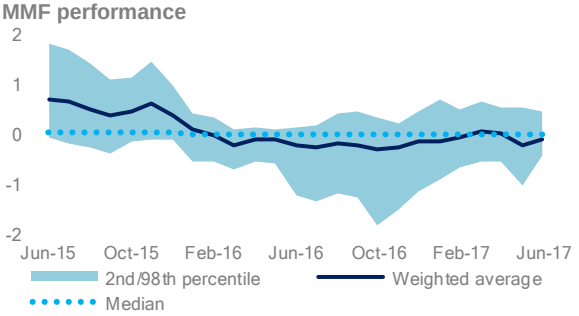
A.122
**Maturity of assets of EU bond funds**




Note: Weighted average effective maturity of EU bond funds' assets, data in years.
Sources: Thomson Reuters Lipper, ESMA

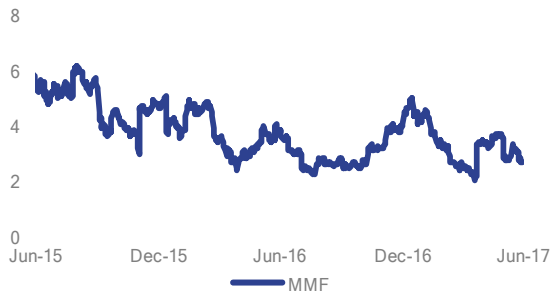
## Money market funds

A.123
**MMF performance**



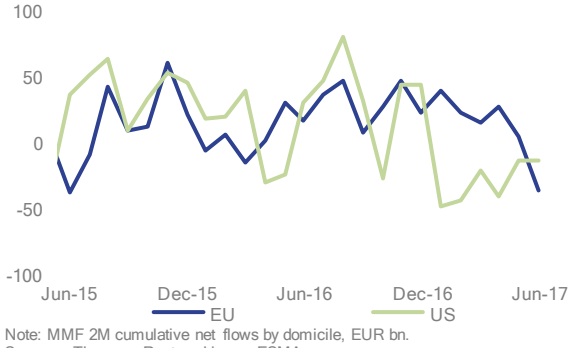

Note: EU-domiciled MMFs' average yearly returns by month, asset-weighted, in %. The graph shows the median and average asset-weighted returns and the difference between the returns corresponding to the 98th and 2nd percentile.
Sources: Thomson Reuters Lipper, ESMA.

A.124
**MMF volatility**



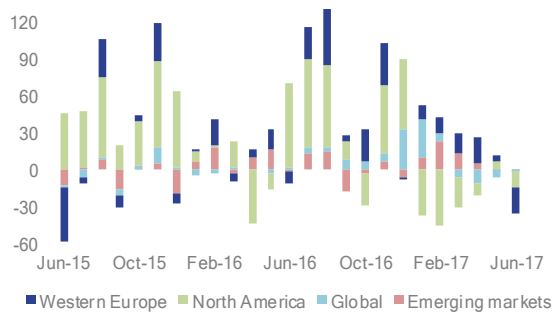

Note: Annualised 40D historical return volatility of EU-domiciled MMF, in %.
Sources: Thomson Reuter Lipper, ESMA.

A.125
**MMF flows by domicile**



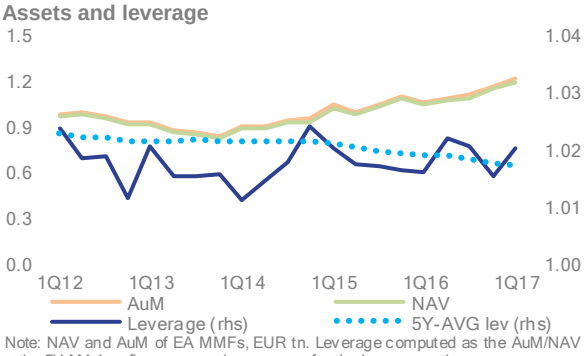

Note: MMF 2M cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.126
**MMF flows by geographical focus**



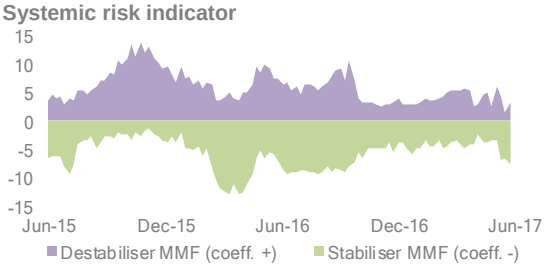

Note: MMF 2M cumulative net flows by geographical focus, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.127
**Assets and leverage**



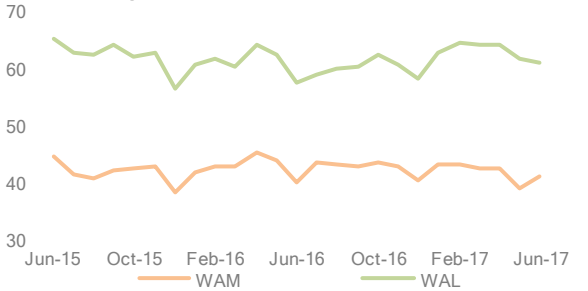

Note: NAV and AuM of EA MMFs, EUR tn. Leverage computed as the AuM/NAV ratio. 5Y-MA lev=five-year moving average for the leverage ratio.
Sources: ECB, ESMA.

A.128
**Systemic risk indicator**



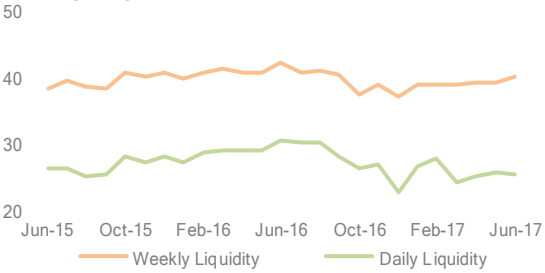

Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coefficients for individual fund returns' impact on the mean sector return and respective estimators. Coefficients stem from VEC models regressing individual fund returns and moments of the entire industry's return distribution on lags and general financial market indices. Measures aggregated across individual regressions.
Sources: Thomson Reuters Lipper, Thomson Reuter Datastream, ECB, ESMA.

A.129
**MMF maturity**




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.

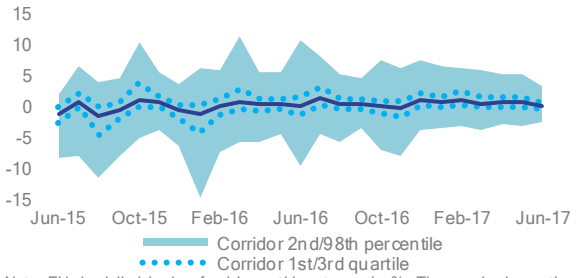
A.130
**MMF liquidity**




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.

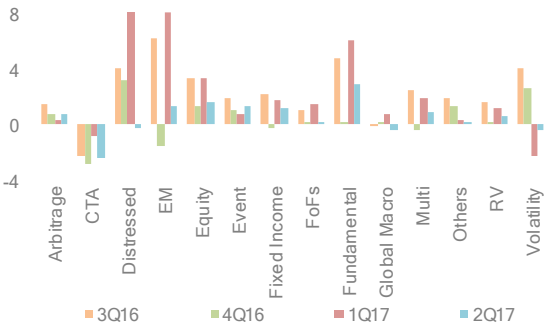
## Alternative funds

A.131
**Hedge fund returns**



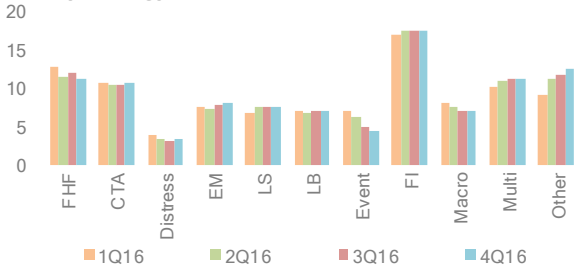

Note: EU-domiciled hedge funds' monthly returns, in %. The graph shows the median returns, the difference between the returns corresponding to the 2nd and 98th percentiles and the difference between the returns corresponding to the 1st and 3rd quartiles.
Sources: Barclayhedge, Eurekahedge, TASS, HFR, ESMA.

A.132
**Hedge fund performance by strategy**



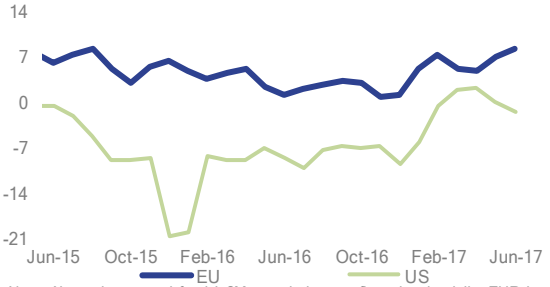

Note: Quarterly mean sector returns of EU hedge fund by strategy, in %.
Sources: BarclayHedge, Eurekahedge, TASS, HFR, ESMA.

A.133
**AuM by strategy**



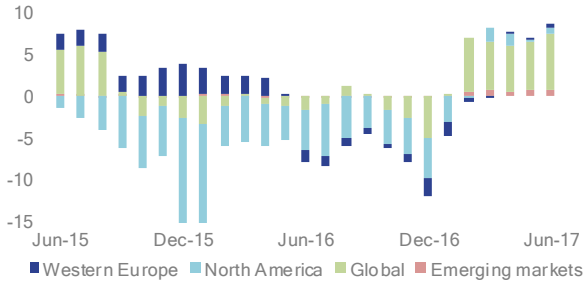

Note: Market share of hedge funds' AuM by strategy: Fund of hedge funds, Commodity Trading Advisor, distressed debt, emerging market, long/short equity, equity long bias, event-driven, fixed income, macro, multi-strategy, other. Funds of hedge funds are not included in the total. In % of total.
Sources: BarclayHedge, ESMA.

A.134
**Fund flows by domicile**



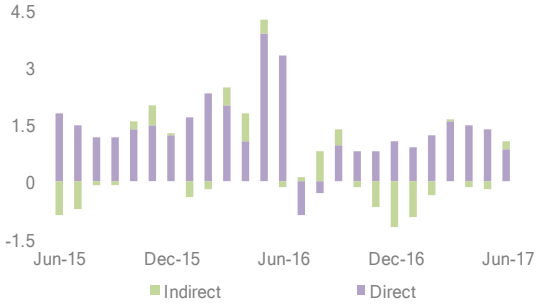

Note: Alternative mutual funds' 2M cumulative net flows by domicile, EUR bn. Data on alternative mutual funds represents only a subset of the entire alternative fund industry.
Sources: Thomson Reuters Lipper, ESMA.

A.135
**Alternative fund flows by geographical focus**



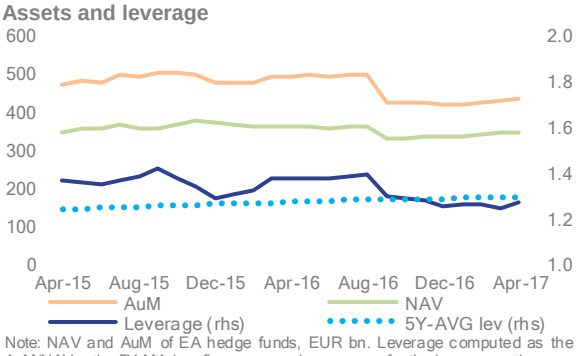

Note: Alternative mutual funds' 2M cumulative net flows by geographical focus, EUR bn. Data on alternative mutual funds represents only a subset of the entire alternative fund industry.
Sources: Thomson Reuters Lipper, ESMA.

A.136
**Direct and indirect property fund flows**



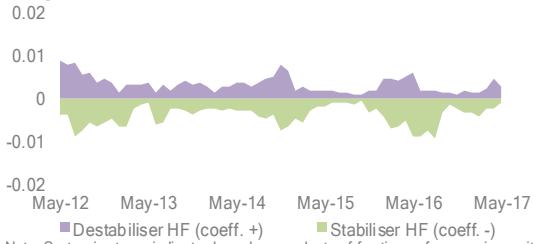

Note: 2M cumulative flows for direct and indirect EU property funds. Indirect property funds invest in securities of real estate companies, including REITs.

A.137
**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.

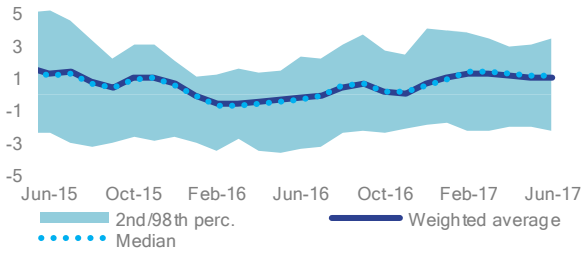
A.138
**Hedge fund interconnectedness**




Note: Systemic stress indicator based on products of fractions of regressions with positive (negative) estimated coefficients for individual fund returns' 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.
Sources: Barclayhedge, Eurekahedge, TASS, HFR, ESMA.

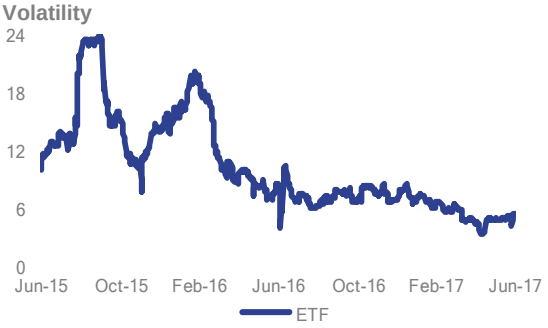
## Exchange-traded funds

A.139
**Returns**



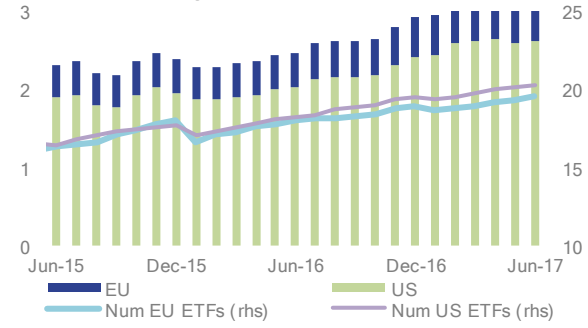

Note: EU-domiciled ETFs' average yearly returns by month, asset-weighted, %. The graph shows the median and average asset-weighted returns and the difference between the returns corresponding to the 98th and the 2nd percentile (light blue corridor).
Sources: Thomson Reuters Lipper, ESMA.

A.140
**Volatility**



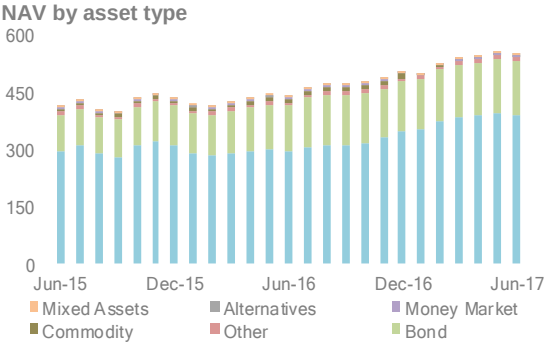

Note: Annualised 40D historical return volatility of EU-domiciled ETF, in %.
Sources: Thomson Reuters Lipper, ESMA.

A.141
**NAV and number by domicile**



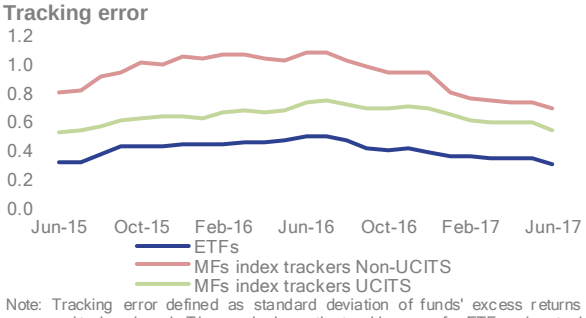

Note: NAV of ETFs, EUR tn, and number of ETFs, hundreds.
Sources: Thomson Reuters Lipper, ESMA.

A.142
**NAV by asset type**



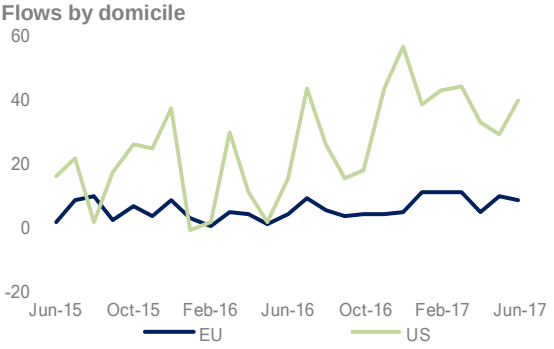

Note: NAV of EU ETFs by asset type, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.143
**Tracking error**



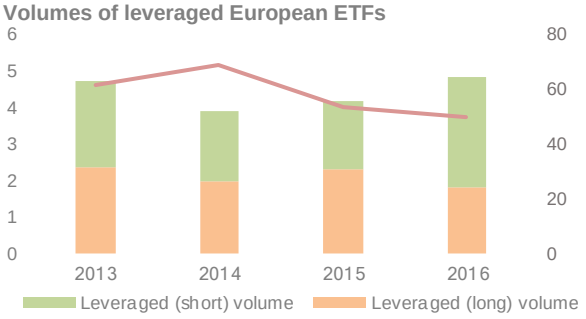

Note: Tracking error defined as standard deviation of funds' excess returns compared to benchmark. The graph shows the tracking error for ETF and mutual funds (MFs) both UCITS and non-UCITS. Yearly standard deviation reported on monthly frequency. End-of-month data.
Sources: Thomson Reuters Lipper, ESMA.

A.144
**Flows by domicile**



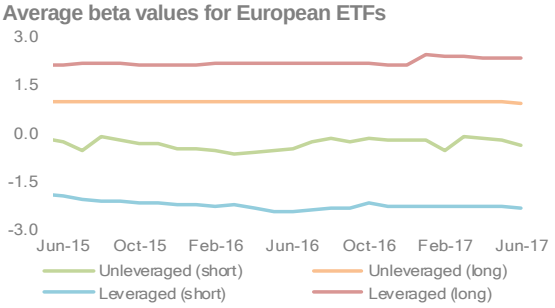

Note: ETF non-cumulative net flows by domicile, EUR bn.
Sources: Thomson Reuters Lipper, ESMA.

A.145
**Volumes of leveraged European ETFs**



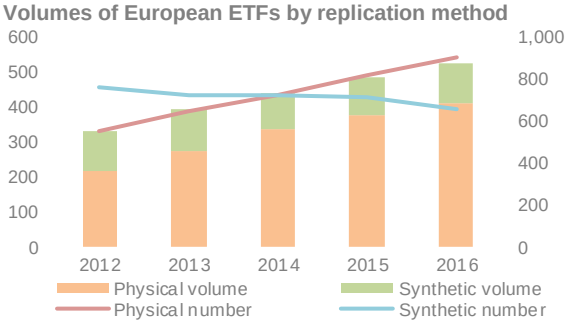

Note: Volumes of leveraged long and leveraged short ETFs with primary listings in Europe, in EURbn (lhs). Numbers of these products (rhs), plotted as line.
Sources: ETFGI, ESMA.

A.146
**Average beta values for European ETFs**



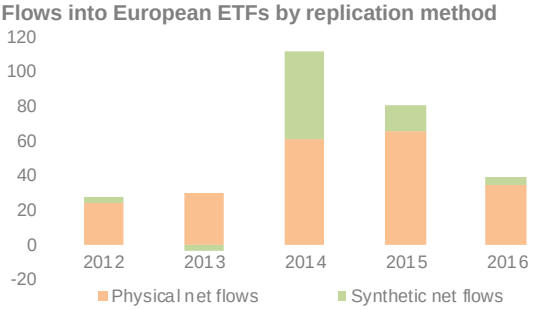

Note: Leveraged ETFs are self-reported. The annual average monthly beta is measured as the volatility of a fund return in comparison to its benchmark. An unleveraged ETF replicating its benchmark will typically have a beta close to 1.0.
Sources: Thomson Reuters Lipper, ESMA.

A.147
**Volumes of European ETFs by replication method**




Note: Volumes of physical and synthetic ETFs with primary listings in Europe, in EURbn (lhs), plotted as bars. Numbers of these products (rhs), plotted as lines.
Sources: ETFGI, ESMA.

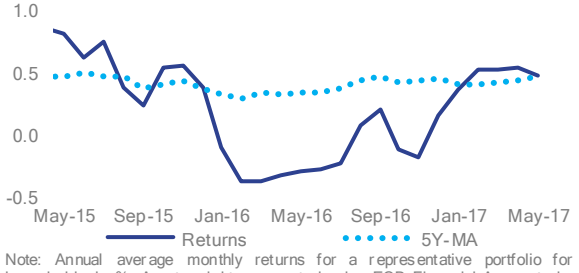
A.148
**Flows into European ETFs by replication method**




Note: Net flows of physical and synthetic ETFs with primary listings in Europe, EURbn.
Sources: ETFGI, ESMA.

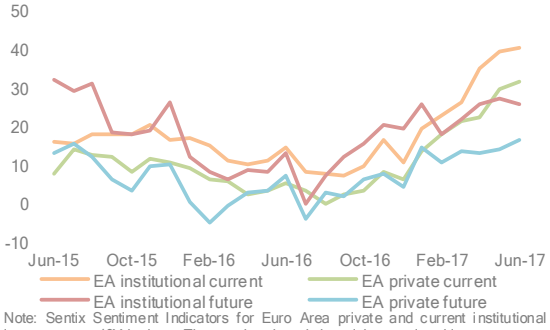
# Retail investors

A.149
**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.150
**Investor sentiment**

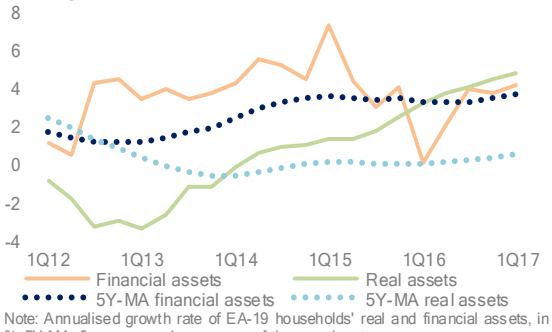



Note: Sentix Sentiment Indicators for Euro Area private and current institutional investors on a 10Y horizon. The zero benchmark is a risk-neutral position.
Sources: Thomson Reuters Datastream, ESMA.

A.151
**Disposable income**

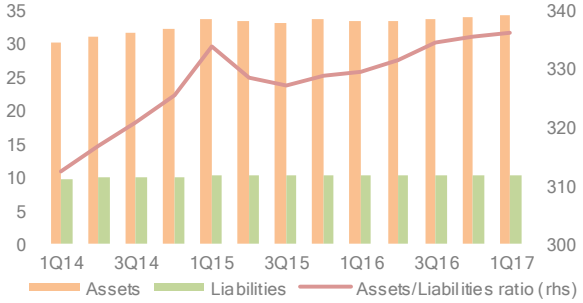

Note: Annualised growth rate of weighted-average gross disposable income for 11 countries (AT, BE, DE, ES, FI, FR, IE, IT, NL, PT, SI), in %.
Sources: Eurostat, Thomson Reuters Datastream, ESMA.

A.152
**Asset growth**



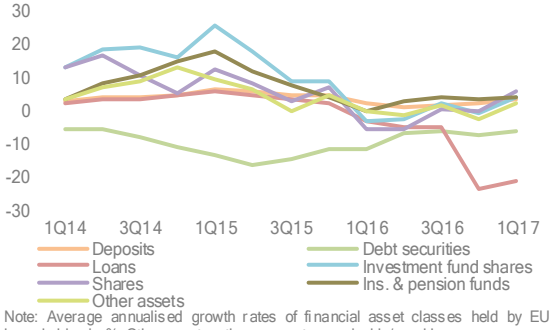

Note: Annualised growth rate of EA-19 households' real and financial assets, in %. 5Y-MA=five-year moving average of the growth rate.
Sources: ECB, ESMA.

A.153
**Household assets to liabilities ratio**



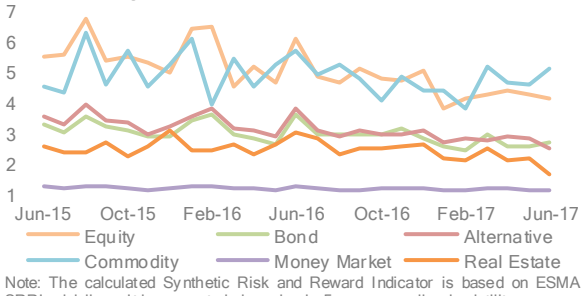

Note: EU households' financial assets and liabilities, EUR tn. Assets/Liabilities ratio in %.
Sources: ECB, ESMA.

A.154
**Growth rates in financial assets**



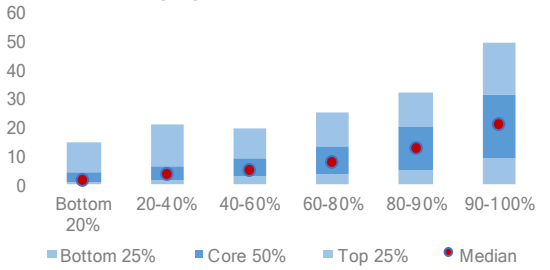

Note: Average annualised growth rates of financial asset classes held by EU households, in %. Other assets=other accounts receivable/payable.
Sources: ECB, ESMA.

A.155
**Retail fund synthetic risk and reward indicator**



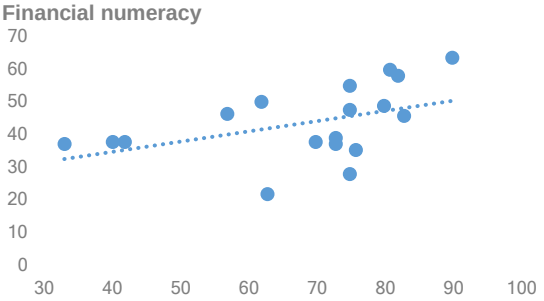

Note: The calculated Synthetic Risk and Reward Indicator is based on ESMA SRRI guidelines. It is computed via a simple 5-year annualised volatility measure which is then translated into categories 1-7 (with 7 representing higher levels of volatility).
Sources: Thomson Reuters Lipper, ESMA.

A.156
**Share ownership by income**



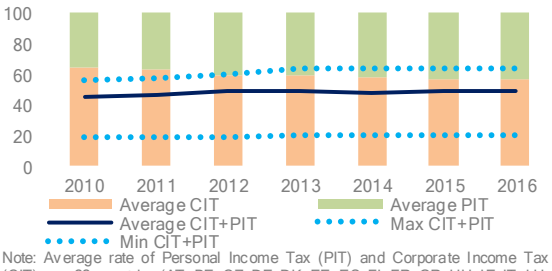

Note: Dispersion of the national percentages of households owning shares, by their income group. Data for EA countries (excl. LT), HU and PL for 2011-2015, %. 'Bottom 25%' represents the range of values from minimum to 1st quartile, 'Core 50%' interquartile range, and 'Top 25%' from 3rd quartile to maximum.
Sources: ECB HFCS, ESMA.

A.157
**Financial numeracy**



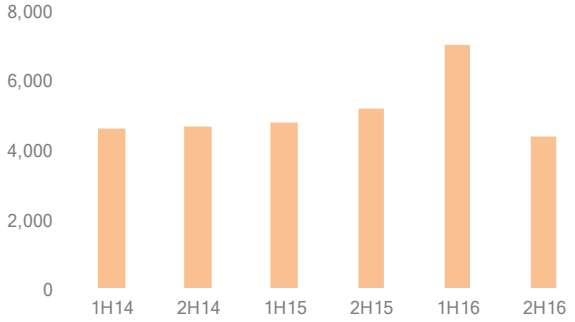

Note: X-axis: Numeracy = share of respondents with correct answers (three numerical questions asked). Y-axis = households in EA (excl. IE, LT), HU and PL holding debt in 2011-2015, %.
Sources: ECB HFCS, ESMA.

A.158
**Investment taxation**



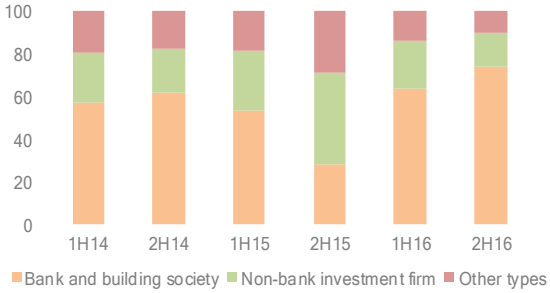

Note: Average rate of Personal Income Tax (PIT) and Corporate Income Tax (CIT) over 22 countries (AT, BE, CZ, DE, DK, EE, ES, FI, FR, GR, HU, IE, IT, LU, LV, NL, PL, PT, SE, SI, SK, UK), weighted by total value of funds, equities and debt securities held by households, plotted with lines. Shares of total tax rate on dividend income via PIT and CIT plotted with bars. Data in %.
Sources: ECB, OECD, ESMA.

A.159
**Total complaints**



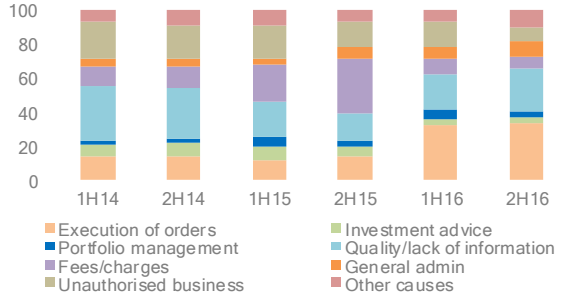

Note: Total complaints reported directly to NCAs. Data collected by NCAs.
Sources: ESMA complaints database.

A.160
**Complaints data by type of firm**



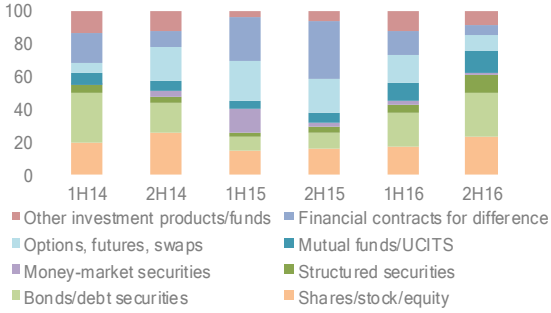

Note: Complaints reported via firms by type of firm, % of total. Data collected by NCAs.
Sources: ESMA complaints database.

A.161
**Complaints data by cause**




Note: Complaints reported directly to NCAs by financial instrument, % of total. Data collected by NCAs.
Sources: ESMA complaints database.

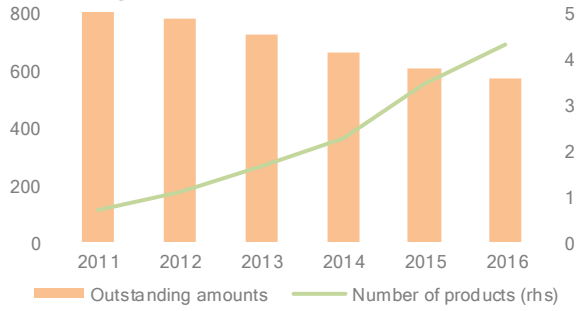
A.162
**Complaints data by instrument**




Note: Complaints reported by financial instrument, % of total. Data collected by NCAs.
Sources: ESMA complaints database.

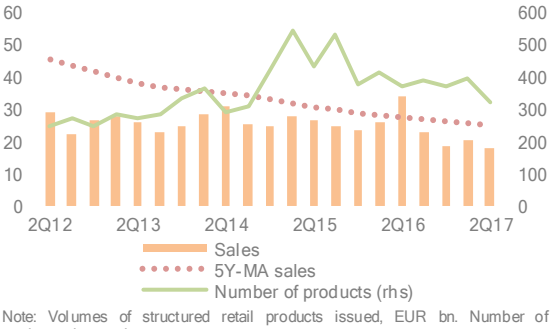
## Structured retail products

A.163
**Outstanding**



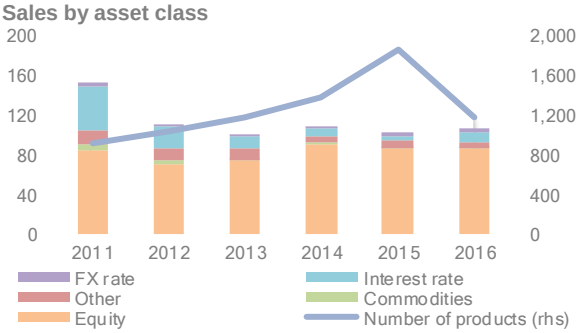

Note: Outstanding amounts, EUR bn. Number of products, mn.
Sources: StructuredRetailProducts.com, ESMA.

A.164
**Sales**



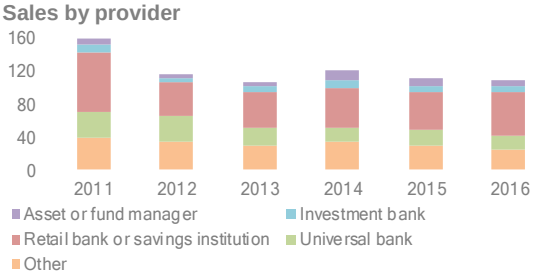

Note: Volumes of structured retail products issued, EUR bn. Number of products, thousand.
Sources: Structured Retail Products, ESMA.

A.165
**Sales by asset class**



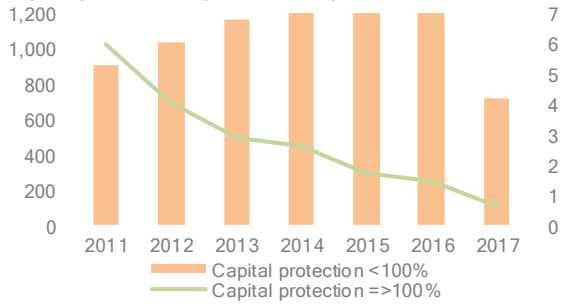

Note: Volumes of structured products sold to retail investors by asset class, EUR bn. Number of products sold, thousand.
Sources: Structured Retail Products, ESMA.

A.166
**Sales by provider**



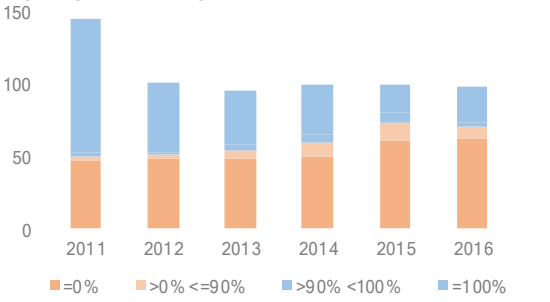

Note: Annual volumes of structured products sold to retail investors by provider, EUR bn. Others include: academic institutions; asset or fund managers; brokerage; commercial banks; independent financial advisers; insurance and pension companies; private banks or wealth managers; securities companies; SPV.
Sources: Structural Retail Products, ESMA.

A.167
**Capital protection by number of products sold**



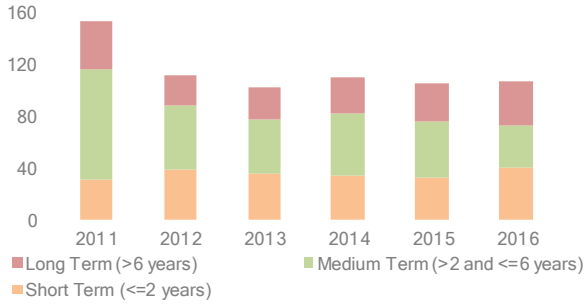

Note: Number of structured products sold to retail investors by type of capital protection, thousands. 2017 data until June.
Sources: Structured Retail Products, ESMA.

A.168
**Capital protection by volume sold**



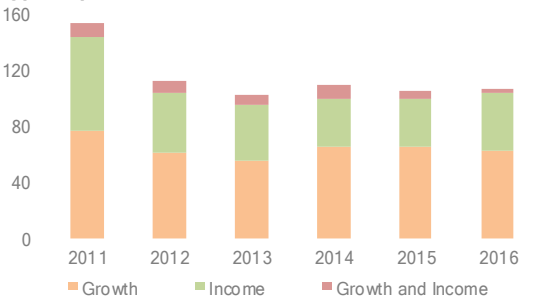

Note: Volumes of structured products sold to retail investors by level of capital protection, EURbn.
Sources: Structured Retail Products, ESMA.

A.169
**Investment term**




Note: Annual volumes of structured products sold to retail investors by investment term, EURbn.
Sources: Structured Retail Products, ESMA.

A.170
**Type of product**

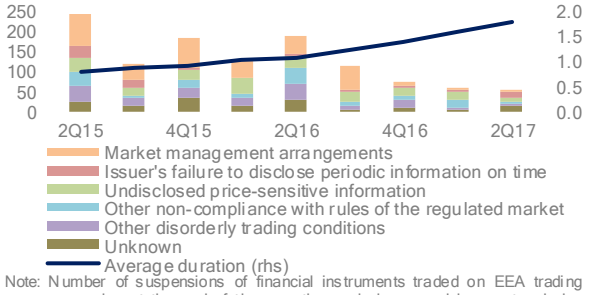



Note: Volumes of structured products sold to retail investors by type, EURbn.
Sources: Structured Retail Products, ESMA.

# Infrastructures and services

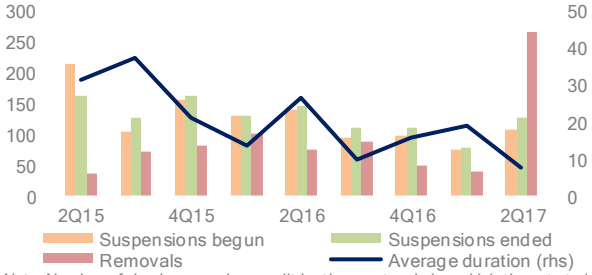
## Trading venues and MiFID entities

A.171
**On-going trading suspensions by rationale**



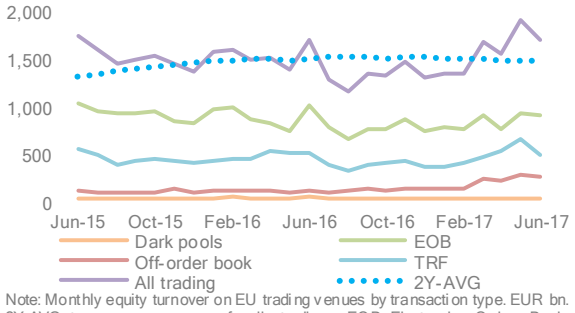

Note: Number of suspensions of financial instruments traded on EEA trading venues on-going at the end of the reporting period, grouped by quarter during which they started and by rationale. Average duration, in years, computed as the mean of the difference between the end-of-quarter date and the start date.
Sources: ESMA Registers.

A.172
**Trading suspensions – lifecycle and removal**



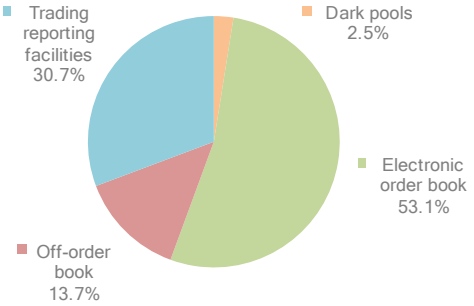

Note: Number of dead suspensions, split by the quarter during which they started and ended, and removals of financial instruments traded on EEA trading venues. Average duration of dead suspensions, in days, computed as the mean of the difference between the end-of-quarter date and the start date.
Sources: ESMA Registers.

A.173
**Equity trading turnover by transaction type**



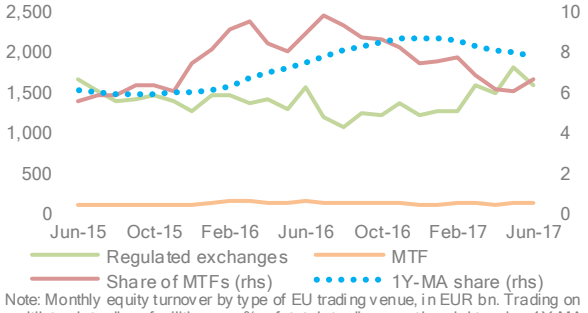

Note: Monthly equity turnover on EU trading venues by transaction type. EUR bn. 2Y-AVG=two-year average of all trading, EOB=Electronic Order Book, TRF=Trade Reporting Facilities.
Sources: FESE, ESMA.

A.174
**Share of equity trading by transaction type**



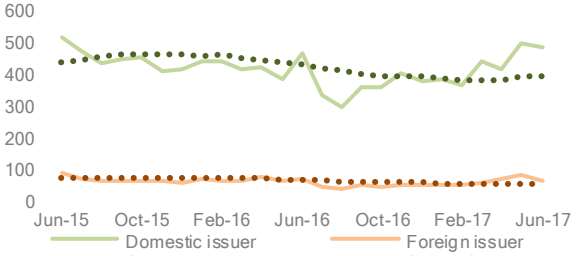

Note: Share of equity turnover by transaction type over the reporting period, as % of total.
Sources: FESE, ESMA.

A.175
**Equity trading turnover by type of trading venue**



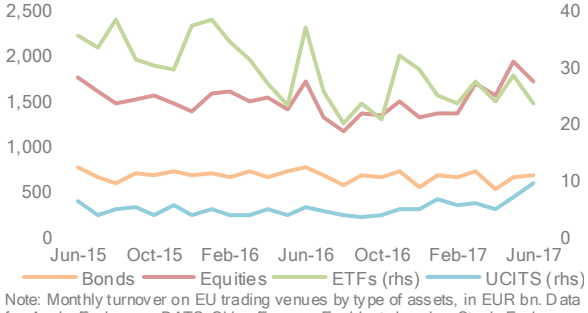

Note: Monthly equity turnover by type of EU trading venue, in EUR bn. Trading on multilateral trading facilities as % of total trading on the right axis. 1Y-MA share=one-year moving average share of MTFs.
Sources: FESE, ESMA.

A.176
**Equity trading turnover by origin of issuer**



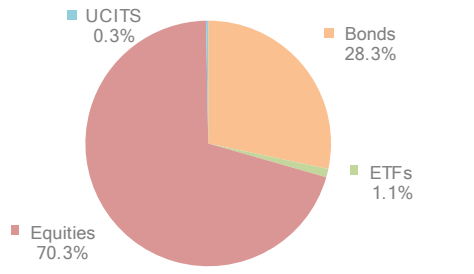

Note: Monthly equity turnover on EU trading venues by origin of the traded equity, in EUR bn. Data for London Stock Exchange, Equiduct and BATS Chi-X Europe are not reported. Foreign equities are issued in a country other than that of the trading venue.
Sources: FESE, ESMA.

A.177
**Turnover by type of assets**



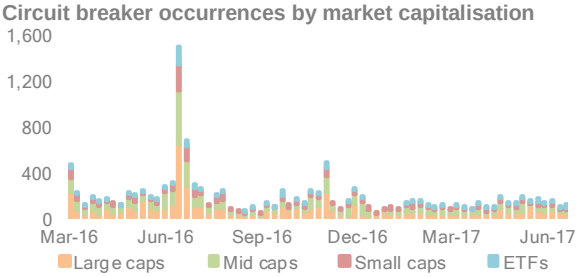

Note: Monthly turnover on EU trading venues by type of assets, in EUR bn. Data for Aquis Exchange, BATS Chi-x Europe, Equiduct, London Stock Exchange, TOM MTF and Turquoise are not reported for bonds, ETFs and UCITS.
Sources: FESE, ESMA.

A.178
**Share of turnover by type of assets**



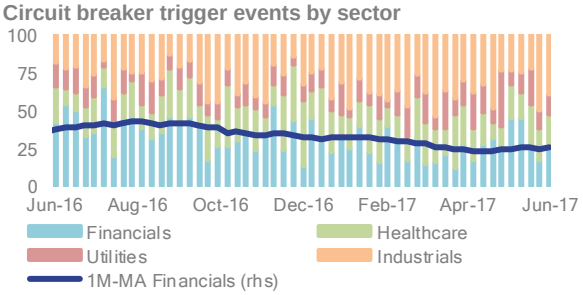

Note: Share of turnover by asset classes, in % of total turnover over the reporting period. Data for Aquis Exchange, BATS Chi-x Europe, Equiduct, London Stock Exchange, TOM MTF and Turquoise are not reported for bonds, ETFs and UCITS.
Sources: FESE, ESMA.

A.179
**Circuit breaker occurrences by market capitalisation**



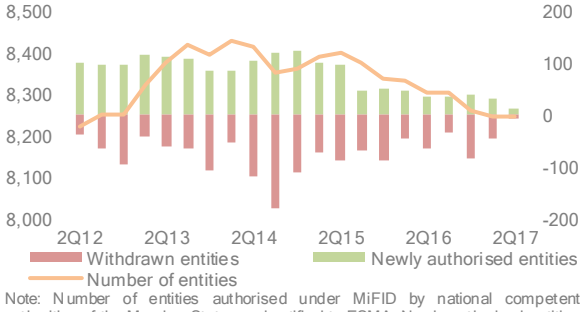

Note: Number of daily circuit breaker trigger events by type of financial instrument and by market cap. Results displayed as weekly aggregates.The analysis is based on a sample of 10,000 securities, including all constituents of the STOXX Europe 200 Large/Mid/Small caps and a large sample of ETFs tracking the STOXX index or sub-index.
Sources: Morningstar Real-Time Data, ESMA.

A.180
**Circuit breaker trigger events by sector**



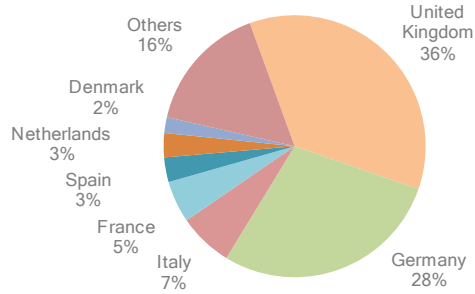

Note: Percentage of circuit breaker trigger events by economic sector. Results displayed as weekly aggregates.The analysis is based on a sample of 10,000 securities, including all constituents of the STOXX Europe 200 Large/Mid/Small caps and a large sample of ETFs tracking the STOXX index or sub-index.
Sources: Morningstar Real-Time Data, ESMA.

A.181
**Number of entities authorised under MiFID**




Note: Number of entities authorised under MiFID by national competent authorities of the Member States and notified to ESMA. Newly authorised entities and withdrawn entities on the right axis.
Sources: ESMA Registers.

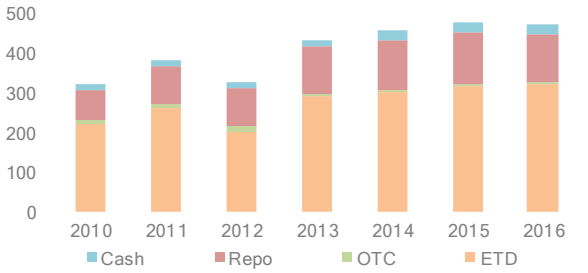
A.182
**Share of entities authorised under MiFID by country**




Note: Number of entities authorised under MiFID by national competent authorities and notified to ESMA, in %.
Sources: ESMA Registers.

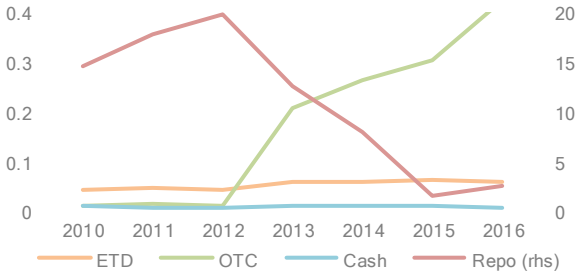
## Central counterparties

A.183
**Value cleared**



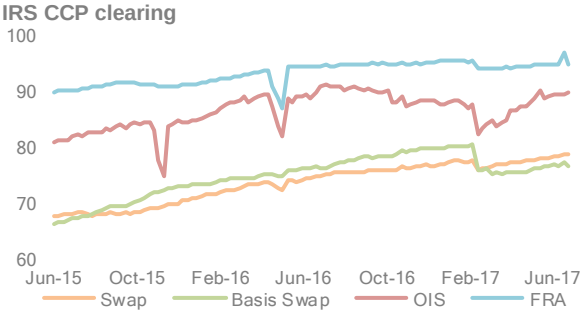

Note: Volume of transactions cleared by reporting CCPs. Annual data, EUR tn, for Cash, Repos, non-OTC and OTC derivatives. LCH Ltd, although the largest CCP in terms of volume in the OTC segment, is not reported due to uneven reporting during the period.
Sources: ECB, ESMA.

A.184
**Trade size**



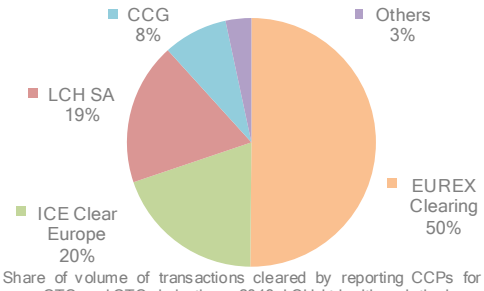

Note: Average size of transactions cleared by reporting CCPs, for Cash, Repos, non-OTC and OTC derivatives. Annual data, EUR mn. LCH Ltd, although the largest CCP in terms of volume in the OTC segment, is not reported due to uneven reporting during the period.
Sources: ECB, ESMA.

A.185
**IRS CCP clearing**



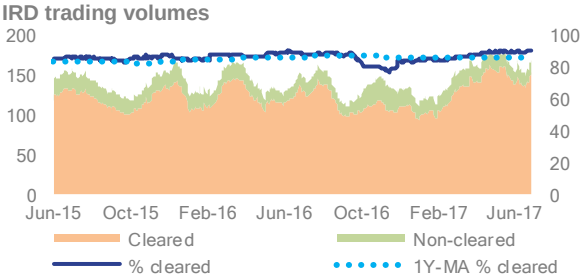

Note: OTC interest rate derivatives cleared by CCPs captured by Dealer vs. CCP positions, in % of total notional amount. Spikes due to short-term movements in non-cleared positions.
Sources: DTCC, ESMA.

A.186
**Share of transactions cleared by CCPs**



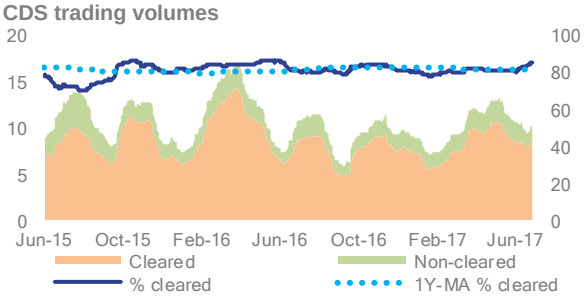

Note: Share of volume of transactions cleared by reporting CCPs for Cash, Repos, non-OTC and OTC derivatives, 2016. LCH Ltd, although the largest CCP in terms of volume in the OTC segment, is not reported due to uneven reporting during the period.
Sources: ECB, ESMA.

A.187
**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 notional data, in USD bn. ISDA SwapsInfo data are based on publicly available data from DTCC Trade Repository LLC and Bloomberg Swap Data Repository.
Sources: ISDA SwapsInfo, ESMA.

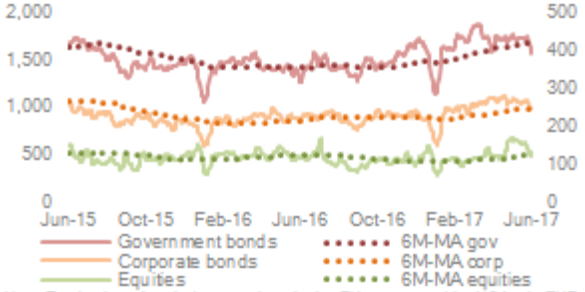
A.188
**CDS trading volumes**




Note: Daily trading volumes for the main EUR CDS indices including Itraxx Europe, Itraxx Europe Crossover, Itraxx Europe Senior Financials. 40D-MA notional data, in USD bn. ISDA SwapsInfo data are based on publicly available data from DTCC Trade Repository LLC and Bloomberg Swap Data Repository.
Sources: ISDA SwapsInfo, ESMA.

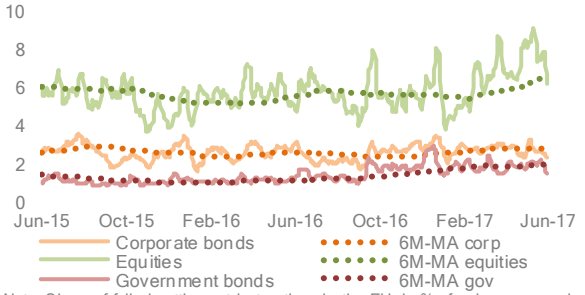
## Central securities depositories

A.189
**Settlement activity**



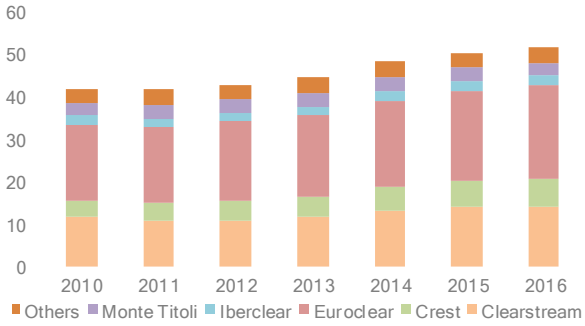

Note: Total value of settled transactions in the EU as reported by NCAs, in EUR bn, one-week moving averages. 6M-MA=six-month moving average. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.

A.190
**Settlement fails**



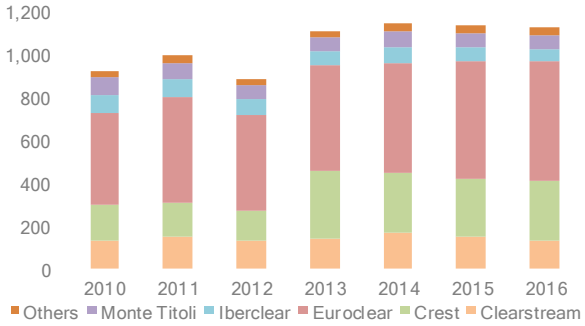

Note: Share of failed settlement instructions in the EU, in % of value, one-week moving averages. 6M-MA=six-month moving average. Free-of-payment transactions not considered.
Sources: National Competent Authorities, ESMA.

A.191
**Securities held in CSD accounts**




Note: Value of securities held by EU CSDs in accounts, EUR tn.
Sources: ECB, ESMA.

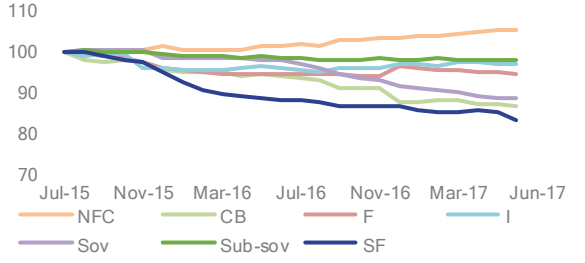
A.192
**Value of settled transactions**




Note: Value of settlement instructions processed by EU CSDs, EUR tn.
Sources: ECB, ESMA.

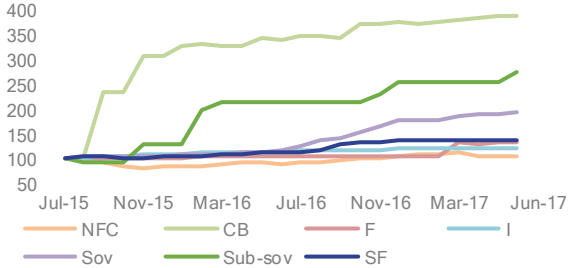
## Credit rating agencies

A.193
**Outstanding ratings issued by the top 3 CRAs**




Note: Evolution of outstanding ratings of S&P, Moody's and Fitch (Jul2015=100). NFC = Corporates, CB = Covered bonds, F = Financials, I = Insurance, Sov = Sovereigns, Sub-sov = Sub-sovereign, SF = structured finance.
Sources: RADAR, ESMA

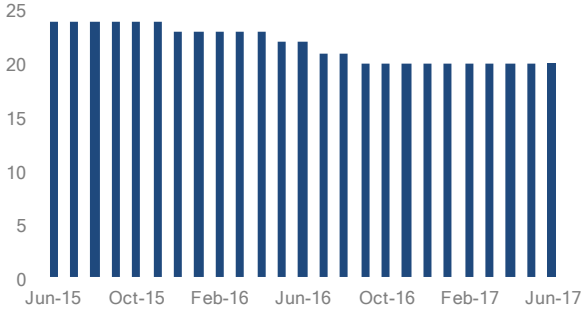
A.194
**Outstanding ratings excluding the top 3 CRAs**




Note: Evolution of outstanding ratings by asset type. All CRAs excluding S&P, Moody's and Fitch (Jul2015=100). NFC = Corporates, CB = Covered bonds, F = Financials, I = Insurance, Sov = Sovereigns, Sub-sov = Sub-sovereign, SF = structured finance.
Sources: RADAR, ESMA.

# Financial benchmarks

A.195
**Number of Euribor panel banks**

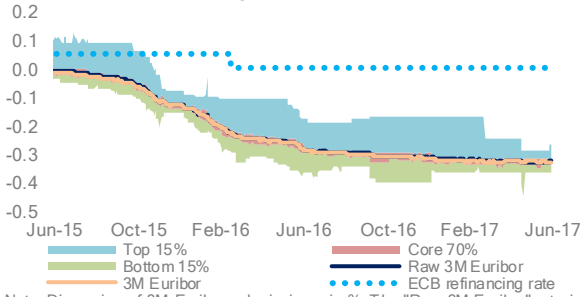



Note: Number of banks contributing to the Euribor panel; non-viability is assumed at 12 contributing banks.
Sources: European Money Markets Institute, ESMA.

A.196
**Dispersion in Euribor contributions**

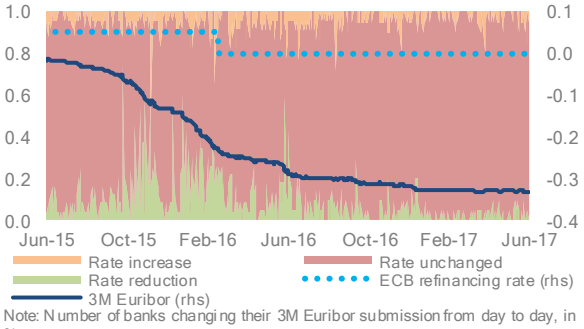

Note: Normalised difference in percentage points between the highest contribution submitted by panel banks and the corresponding Euribor rate. The chart shows the maximum difference across the 8 Euribor tenors.
Sources: European Money Markets Institute, ESMA.

A.197
**Euribor submission 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.

A.198
**Euribor submission variation**




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 |
| CTA | Commodity Trading Advisors funds |
| DTCC | Depository Trust and 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 |
| IRD | Interest Rate Derivative |
| 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 |
| NFC | Non Financial Corporation |
| 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 |
| SFT | Securities Financing Transaction |
| UCITS | Undertaking for Collective Investment in Transferable Securities |
| YTD | Year to Date |

*Countries abbreviated according to ISO standards*
*Currencies abbreviated according to ISO standards*


esma
European Securities and
Markets Authority