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Research Report

The distribution of excess liquidity in the euro area

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Luca Baldo, Benoît Hallinger, Caspar Helmus, Niko Herrala, Débora Martins, Felix Mohing, Filippos Petroulakis, Marc Resinek, Olivier Vergote, Benoît Usciati, Yizhou Wang

The distribution of excess liquidity in the euro area

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Abstract

Since 2008, excess liquidity – defined as the sum of holdings of central bank reserves in excess of reserve requirements and holdings of equivalent central bank deposits – has tended to accumulate in specific euro area countries and in a small, slowly changing group of credit institutions.

Despite the stability of the concentration of excess liquidity in specific countries over time, the relevance of individual drivers has changed. First, risk aversion has played a much smaller role in explaining the concentration since 2013 than it did at the time of "flight-to-quality" phenomena in the period 2010-12. Second, the location of the relevant market infrastructures (i.e. central securities depositories, securities settlement systems and TARGET2 accounts) used by counterparties that sold assets to the Eurosystem has been a more important driver directing flows in the period 2015-16. In addition, the more recent concentration of excess liquidity is explained by the combination of a number of factors, such as banks following strict internal credit limits, investment incentives created by yield differences across the euro area and the "home bias" in euro area government bond holdings. Overall, the net cross-border flows of liquidity that resulted also determined TARGET2 balances.

At the individual bank level, when controlling for banks' capital, non-performing loans, credit risk and profitability, excess liquidity holdings in relation to total assets are found to be higher for smaller and better-capitalised banks, and for banking groups with liquidity centralised at the head institution. In addition, participation in Eurosystem longer-term refinancing operations and deposit inflows are associated with liquidity accumulation. Finally, new regulatory initiatives such as the liquidity coverage ratio are explained to be creating incentives to hold or not to distribute liquidity, thereby affecting its distribution.

Keywords: excess liquidity, financial structure, asset purchase programme, bank characteristics, regulatory changes.

JEL codes: D39, E41, E44, E50, G01, G28.

Non-technical summary

Excess liquidity, i.e. holdings of central bank reserves in excess of minimum reserve requirements and holdings of equivalent central bank deposits, has tended to accumulate in specific euro area countries and banks over time, seemingly independently of how liquidity is provided by the Eurosystem. In particular, around 80-90% of excess liquidity is being held in Germany, France, the Netherlands, Finland and Luxembourg, and the top-50 banks hold consistently 70-80% of excess liquidity. While the rise in the total amount of excess liquidity between 2008 and 2012 was largely driven by banks' increased demand for liquidity as a result of heightened risk, the surge in excess liquidity since March 2015 mainly relates to Eurosystem asset purchases. This concentration raises a number of questions such as what is driving the excess liquidity distribution across the euro area or why does liquidity generated through the ECB's expanded asset purchase programme (APP) constantly end up in a limited number of jurisdictions with broadly the same institutions. The purpose of this paper is to investigate the factors behind the observed distribution of excess liquidity, both at a country and a bank level.

At the country level, the high level of risk and high aversion to taking risk were the main factors explaining cross-border flows during the sovereign debt crisis of 2010-12, with "flight to quality" leading to a concentration of excess liquidity in countries such as Germany, France, the Netherlands, Finland and Luxembourg. Risk aversion has declined and played a much smaller role since then, but banks report that their investment decisions remain subject to strict internal risk limits and need to comply with new regulations. The interaction of remaining risk aversion, investment incentives created by yield differences across the euro area (versus the rate on the deposit facility which is the remuneration of excess liquidity) and incentives created by new regulations leaves liquidity in much the same countries in 2016 as observed before. For instance, banks in lower-rated countries may find it more attractive to invest liquidity inflows in domestic bonds or foreign assets with higher yields than the rate on the deposit facility, with the "home bias" in government bond investments dampening risk considerations. At the same time, banks in higher-rated countries often face (internal) risk limits restricting them to low-risk domestic investments which often yield lower returns than the deposit facility and thus make excess liquidity holdings more attractive.

The paper shows that the location of market infrastructures and accounts used by counterparties participating in the APP has played an important role in directing liquidity flows in the more recent period. Also, the concentration of bank business models that attract more excess liquidity in certain euro area countries plays a certain role. As regards the APP, the national central banks (NCBs) have bought bonds in amounts close to their share in the ECB's capital key, but the liquidity injected through purchases has not been as proportionally distributed across euro area countries. In fact, the bulk of the APP portfolio has been bought from counterparties whose head institution is domiciled outside the euro area and whose liquidity is kept on accounts in certain euro area countries, such as Germany and

Luxembourg. In addition, non-euro area investors have been the main original sellers of euro area government bonds. As the latter investors are likely to manage their euro holdings in financial centres of the euro area typically located in specific euro area countries, they add to the concentration of liquidity holdings. Once the money reached these countries, the prevailing investment incentives sketched out above have contributed to its remaining there.

As TARGET2 balances result from net cross-border flows of liquidity, the factors that led to a concentration of excess liquidity in specific countries via such cross-border flows have been the same factors explaining the build-up of TARGET2 balances. Studying the drivers of excess liquidity distribution therefore also helps us to better understand TARGET2 balances, i.e. the net positions of the individual central banks participating in this payment system vis-à-vis the ECB.

At the bank level, the results of a survey conducted among bank treasurers suggest that many factors influence the level of excess liquidity held. The most important is deemed to be the bank business model and the related liquidity management strategy, followed by regulatory requirements and risk management policies. An analysis of bank balance sheet characteristics suggests that banks with specific business models (e.g. investment banks, clearing institutions, etc.) tend to hold more excess liquidity relative to the size of their balance sheet than other business models (e.g. retail and wholesale banks). Moreover, smaller and better-capitalised banks tend to cumulate relatively more excess liquidity, as smaller banks are less equipped to reinvest funds in the money market and higher capital may attract more liquidity inflows. Precautionary motives seem to also be playing a role as banks with a higher non-performing loan ratio cumulate more excess liquidity. Also, longer-term funding (in particular longer-term central bank refinancing) and deposit inflows are positively correlated with changes in excess liquidity in different periods of time. With respect to the role of the liquidity management of banking groups, groups with higher liquidity holdings tend to concentrate excess liquidity at group head offices.

Finally, the paper explains how specific liquidity and capital regulations treat liquidity holdings favourably, creating incentives for banks to hold and not to distribute excess liquidity. In particular, the leverage ratio, the liquidity coverage ratio and the net stable funding ratio might hinder the circulation of excess liquidity as they tend to discourage activity in the money market. However, among those regulations the leverage ratio may also have a counter effect by penalising the accumulation of liquidity on a bank's balance sheet.

Overall, the findings are a first step in understanding the economic impact of the distribution of excess liquidity in the euro area. If driven by risk aversion, concentration tends to reflect a lack of market access for certain banks, and may imply that monetary policy transmission is hampered, as was the case during the financial crisis in the period 2007-08 and during the euro area sovereign debt crisis in the period 2009-12. Instead, if concentration is largely determined by financial structure, bank business models and financial regulation, when only a few banks experience funding stress, as during the period 2015-16, concentrated excess liquidity holdings are not an indication that the transmission of monetary policy is being hampered.

1 Introduction

Before the global financial crisis, the Eurosystem implemented monetary policy under so-called neutral or balanced liquidity conditions, meaning that the Eurosystem supplied just enough central bank liquidity to credit institutions to allow them to satisfy the reserves they are required to hold on accounts with the Eurosystem.[1] Money markets distributed money efficiently and banks saw no need to hoard central bank liquidity, implying also that overnight money market rates fluctuated close to the rate on the main refinancing operations of the ECB (i.e. the minimum bid rate for those operations) as intended. By contrast, since the start of the global financial crisis in 2008, banks have accumulated large and varying amounts of central bank liquidity on their accounts with the Eurosystem. The distribution of this "liquidity" across the euro area is the focus of this paper. As a starting point, Box 1 explains how central bank money arises in general terms.

The paper focuses on excess liquidity, which is defined as the sum of: (1) the excess reserves held by credit institutions on current accounts with the Eurosystem, i.e. the amount held on those accounts in excess of their minimum reserve requirements[2]; (2) recourse to the deposit facility of the Eurosystem; and (3) the liquidity deposited by credit institutions with the Eurosystem through weekly operations for an amount equal to the Securities Markets Programme outstanding portfolio, at the time these operations were conducted.[3] While banks held insignificant amounts of excess liquidity before the crisis, excess liquidity reached high levels in 2012 and 2016.

The rise in the total amount of liquidity held by the banking system between 2008 and 2012 was driven by a combination of at least three factors: (i) banks' higher demand for central bank liquidity; (ii) a change in the refinancing operations' auction procedure of the Eurosystem; and (iii) the offer of longer-term refinancing operations. As of October 2008, the Eurosystem changed the auction procedure in its refinancing operations to fixed rate full allotment (FRFA), in which banks can access unlimited reserves at a fixed rate against eligible collateral. The rising and less predictable demand for central bank liquidity that emerged during the crisis had made such a change necessary (see e.g. ECB, 2010, and Eser et al., 2012, for more details on the Eurosystem's reaction to the crisis). By supplying more central bank liquidity in its refinancing operations, e.g. via longer-term refinancing operations

1 This means the Eurosystem also provides sufficient central bank liquidity to satisfy demand stemming from autonomous factors.

2 Minimum reserve requirements are the amount each bank is required to hold on current accounts with its national central bank on average over the maintenance period (MP).

3 Component (2) takes into account the fact that banks also placed larger amounts on the deposit facility in particular during the period when the rate on that facility was higher than zero. (3) is not part of the standard definition of excess liquidity used in other publications, but has been included for this study to take into account one-week deposits that would otherwise have been excess reserves or deposits that have been held on the deposit facility on a daily basis. The inclusion of (3) does not materially alter the results of the study. In terms of remuneration, (1) has been remunerated at the lowest of zero and the rate on the deposit facility, (2) has been remunerated at the rate on the deposit facility, while for (3) the rate was determined in the auctions, where a maximum bid rate equal to the rate of the main refinancing operations applied.

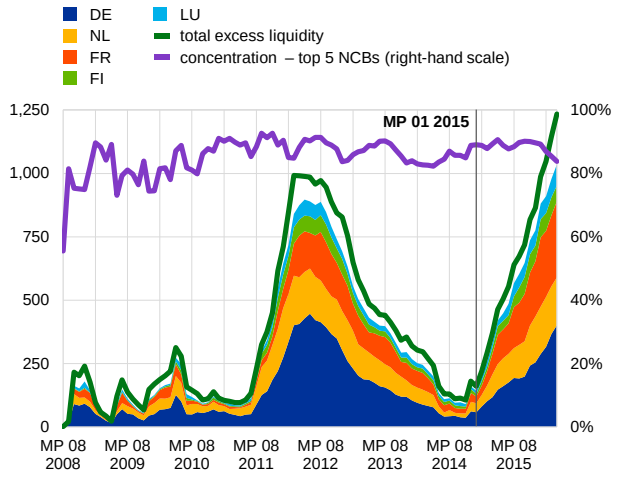
which attracted significant participation, the Eurosystem allowed excess liquidity in the banking system to rise. After reaching close to €1 trillion in 2012, excess liquidity contracted to slightly below €100 billion during the period of financial market stabilisation observed in 2013 and 2014, when banks' demand for reserves fell as the three-year longer-term refinancing operations were reimbursed.

Since March 2015, the Eurosystem has actively injected significant amounts of central bank liquidity into the financial system through its expanded asset purchase programme (APP) to address the risks of a too prolonged period of low inflation, which has led to a new rise in excess liquidity. This time, however, excess liquidity is largely supply-driven rather than demand-driven. Therefore, the associated rise in excess liquidity is not a reflection of stress in the banking system with high demand in refinancing operations, as it was during the financial and sovereign debt crises, but rather a mechanical effect of the asset purchases.[4] Demand by credit institutions for central bank liquidity in Eurosystem refinancing operations has also contributed to the rise in excess liquidity, because the Eurosystem has maintained its full allotment procedure and offered attractive operations in the form of targeted longer-term refinancing operations (TLTROs). However, asset purchases have become the dominant central bank operation and driving factor of excess liquidity over time.

Chart 1

Concentration of excess liquidity at specific national central banks – absolute amount

(EUR billions, 2008-16)

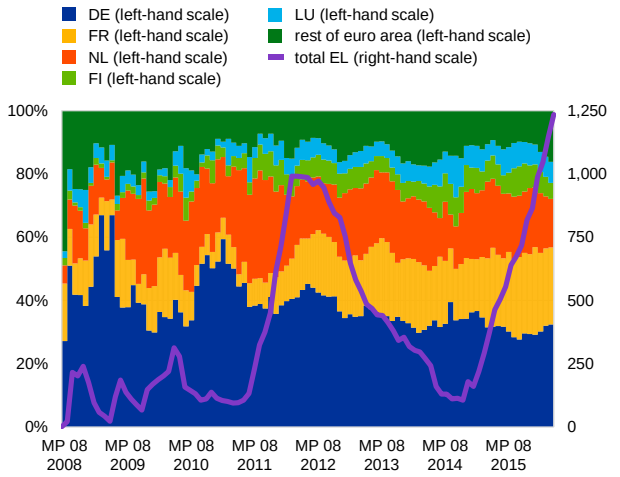


Source: Eurosystem.
Notes: Maintenance period (MP) averages. The vertical line indicates the start of the APP.

Chart 2

Concentration of excess liquidity at specific national central banks – shares

(percentage shares and EUR billions, 2008-16)



Source: Eurosystem.
Note: MP averages.

Excess liquidity is concentrated in a small number of euro area countries, with around 80-90% of excess liquidity being held in Germany, France, the Netherlands, Finland and Luxembourg. This concentration is fairly stable over time and largely

[4] The Eurosystem aims to purchase a specific value of bonds per month. While the decision to sell a bond is still up to the private investor and counterparties may decide to participate less in refinancing operations, persistent central bank purchases will drive up the total level of liquidity in the system. Also, the initial seller of a bond is often a non-bank investor, while the injected central bank money is only held by banks.

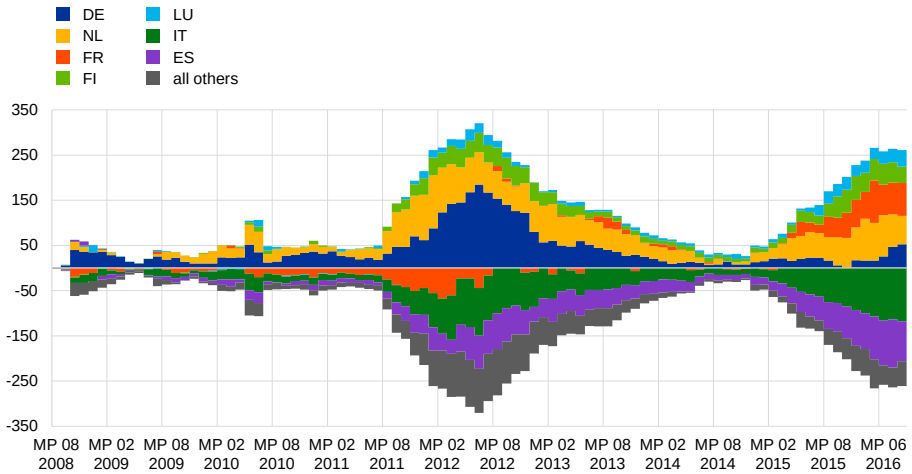
independent of the level of excess liquidity and the way it is provided by the Eurosystem (see Charts 1 and 2).

When taking into account the size of the respective banking system, it turns out that the Netherlands, Luxembourg, Finland and France have attracted relatively more excess liquidity, while the opposite is the case for mainly Spain and Italy. Chart 3 illustrates this by approximating the size of the banking system by the level of minimum reserve requirements. The deviations of actual excess liquidity from a hypothetical distribution of excess liquidity based on reserve requirements are material at the country level. While Germany had large amounts of excess liquidity compared with the level of minimum reserve requirements of its banks during the period 2011-13, this has changed in recent years even though Germany is still the largest absolute holder of excess liquidity.

Chart 3

Deviations of actual excess liquidity holdings from the hypothetical distribution of excess liquidity based on the size of the country's banking system

(EUR billions, 2008-16)



Source: Eurosystem.
Notes: MP averages. The hypothetical distribution is based on the size of the minimum reserve requirements of banks in the country (a proxy for the size of the banking system) and indicates how excess liquidity would be distributed according to each country's share in total reserve requirements. A positive (negative) value indicates that a country holds more (less) excess liquidity than its share in reserve requirements.

Excess liquidity is also concentrated within a relatively small number of institutions. Chart 4 shows that the top-50 liquidity holders (in absolute amounts) held between 65% and 83% of the total excess liquidity, while representing only between 13% and 40% of the aggregate minimum reserve requirement. Since the start of the APP in 2015, the concentration of excess liquidity at institution level has decreased slightly. Furthermore, the composition of the top holders is changing only slowly. Banks that cumulated more than 80% of excess liquidity in 2012 accounted for slightly more than 50% of the aggregate amount in 2016 (see dotted blue line in Chart 4). For additional evidence on the concentration, see Chart 10.

This paper analyses why excess liquidity has remained concentrated in certain jurisdictions and within certain credit institutions. The concentration raises a number of questions, more specifically why do certain credit institutions accumulate excess

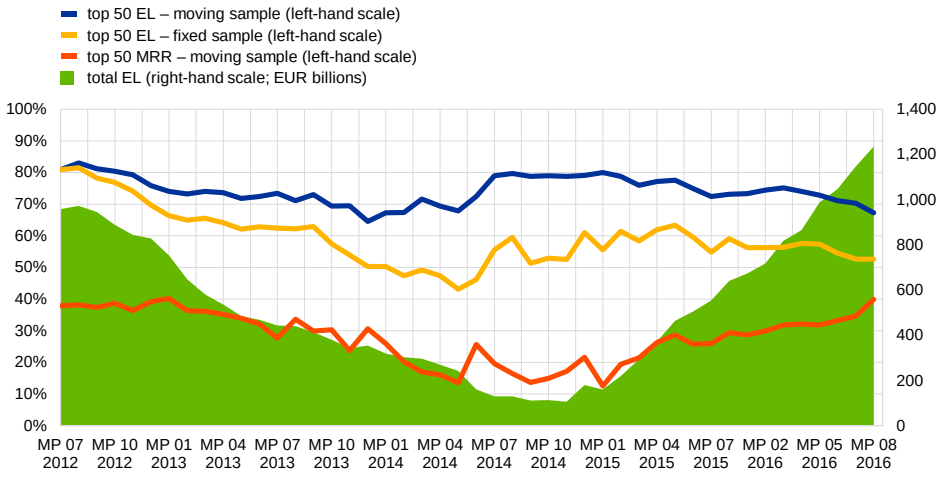
liquidity while others do not (i.e. which factors play a role). As regards the more recent period, it raises the question why liquidity generated through the APP constantly ends up with broadly the same institutions in a limited number of jurisdictions. This paper looks at the reasons for the uneven distribution as a starting point for understanding the implications of the distribution. Indeed, the distribution may also contain information about the transmission of monetary policy and the effects of non-standard measures. Although analysis on the latter topics goes beyond the purpose of this paper, the factors found to drive the more recent concentration of excess liquidity do not suggest that transmission is hampered.

While it is not possible to put forward a unique benchmark distribution which one would expect excess liquidity to comply with, or that would be desirable, the high concentration of the actual distribution nevertheless raises questions about its drivers. One may for instance expect a distribution closer to the capital key of the ECB, the minimum reserve requirements of banks (as a proxy of banking sector size) or the location of relevant accounts. Some of these potential benchmark distributions may even appear rather skewed, but still none predicts the high concentrations observed during the period 2008-16.

Chart 4

Concentration of excess liquidity at institution level

(percentages and EUR billions, 2012-16)



Source: Eurosystem.
Notes: MP averages. The blue solid line shows the share of excess liquidity (EL) held by the top-50 institutions in each MP (i.e. the sample changes over time). The red line shows the share of the minimum reserve requirement (MRR) of these institutions. The blue dashed line shows the share of EL held by those institutions that were the top-50 EL holders in MP 07 2012.

The paper first illustrates how, at a country level, the distribution of excess liquidity is driven by the financial structure of the euro area and differences in investment incentives, and explains the link to the TARGET2 balances of NCBs. Then it takes a more granular view by analysing excess liquidity at the bank level. For this purpose, it summarises the feedback received from counterparties as regards the reasons for holding excess liquidity. Next, it applies a regression analysis to carve out any relationships between excess liquidity holdings and bank characteristics. Finally, it analyses how regulation could hamper the distribution of liquidity. A summary of the analysis is also presented in Alvarez et al. (2017).

In general, excess liquidity concentration has received little attention in the literature apart from by Ennis and Wolman (2015) and Chang et al. (2014) analysing the distribution of US dollar excess liquidity during the financial crisis. Chang et al. (2014) found evidence of precautionary motives for reserve accumulation due to banks' concerns about their balance sheet risks and doubts about the availability of short-term funding. Ennis and Wolman (2015) show reserves were widely distributed across banks, with larger banks accumulating more liquidity when liquidity grew the most, and related evidence hinting at a role played by the US financial market structure. They also found that during the period of large-scale asset purchases, reserves ended up on the balance sheets of banks with relatively abundant capital. These drivers (precautionary motive, financial structure, capitalisation) also appear in the below analytical results for the euro area. In geographical terms, excess liquidity in the United States is very concentrated in New York, reflecting the location of accounts in that financial centre, but this fact receives little attention from analysts as banks are assumed to have access to that liquidity wherever they are situated either via their branches or by borrowing in the market. During the crisis, money market fragmentation prevented banks in some euro area countries from accessing liquidity located in financial centres (e.g. Germany or Luxembourg) due to risk aversion, and therefore the excess liquidity concentration deserves closer attention. In the euro area context, Demiralp et al. (2017) analyse the impact of excess liquidity holdings in the negative interest rate environment. They find that banks relying heavily on deposit funding have adjusted their balance sheets during the negative interest rate period by reducing their excess liquidity to fund more loans. This finding suggests excess liquidity holdings were playing an economic role by catalysing more active portfolio rebalancing.

The paper also contributes to the literature analysing the drivers of TARGET2 (im)balances, i.e. the net positions of Eurosystem national central banks in central bank money vis-à-vis the ECB, which have evolved in parallel to excess liquidity. Auer (2014), Bindseil et al. (2012), Cecchetti et al. (2012) and Cour-Thimann (2013) among others focused on explaining the rise in balances observed during the sovereign debt crisis and attached a crucial role to the flight to quality around that time. More recently, ECB (2016b) and Eisenschmidt et al. (2017) illustrated how cross-border APP transactions can give rise to changes in TARGET2 balances. This paper explains that (excess) liquidity needs to cross borders on a net basis to drive up TARGET2 balances and that both the financial crisis and the APP period saw significant net cross-border flows of excess liquidity. Consequently, the factors which explain rising and concentrated excess liquidity holdings also help in understanding TARGET2 balances.

The paper is structured as follows. Section 2 analyses the drivers of the excess liquidity concentration at the country level, while Section 3 analyses the drivers at the institution level. Section 4 concludes.

Box 1
Central bank money

Central bank money is traditionally defined as banknotes (physical central bank money) and commercial banks' deposits at the central bank (account-based central bank money or "liquidity"). Commercial banks need central bank money to fulfil their liquidity needs, which in the euro area primarily consist of the minimum reserve requirement imposed by the ECB and the public's demand for banknotes as well as precautionary holdings to address sudden payment needs. In the Eurosystem, the minimum reserve requirement can only be met by holding central bank money on a current account with a national central bank. This paper focuses only on account-based central bank liquidity, because the amount of physical central bank money in circulation, i.e. banknotes, is defined by the public's demand rather than resulting from monetary policy.

Central banks are the only entities capable of creating and absorbing central bank money. This privilege allows them to control the price of this money, i.e. the interest rate. Central bank money is a liability of the central bank in the same way as a private person's checking account is a liability of a commercial bank. Monetary policy instruments that create assets in the balance sheet of the central bank, such as outright purchases of securities or lending operations to counterparties, create central bank liquidity. This is because the Eurosystem funds these assets by issuing central bank money (a liability in the central bank balance sheet).

In addition to monetary policy, the supply of and demand for central bank liquidity also reflects changes in the so-called autonomous factors. "Autonomous factors" refer to items on the balance sheet of the central bank which have an impact on the central bank liquidity of the banking system, but are usually not directly steered by the central bank for monetary policy purposes (e.g. banknotes, deposits by the government or other account holders with the central bank, and central banks' own investment portfolios). The Eurosystem forecasts the development of these balance sheet items as part of the so-called "liquidity management" process: autonomous factor forecasts are used as an input for forecasting developments in central bank liquidity demand.

Commercial banks can influence the amount of central bank liquidity they hold at the individual level via transactions and hence also influence the distribution of central bank liquidity, but on aggregate the amount of central bank liquidity is determined solely by the size and composition of the central bank balance sheet.

Table A
Simplified balance sheet of the Eurosystem

(EUR millions, end-of-year values)

Assets (liquidity supply)	2006	2016	Change	Liabilities (liquidity demand)	2006	2016	Change
Monetary policy credit operations A5-A5.1	450,453	595,701	145,248	Commercial banks' deposits with the central bank L2.1	173,482	888,988	715,506
Marginal lending facility A5.1	88	172	84	Deposit facility L2.2	567	424,208	423,641
Monetary policy securities A7.1	0	1,654,026	1,654,026	Cash (banknotes) L1	628,238	1,126,216	497,978
Investment assets*	482,761	1,176,155	693,394	Other autonomous factors (net)	131,015	986,642	855,627
Total	933,302	3,426,054	2,492,752	Total	933,302	3,426,054	2,492,752

Source: ECB.
Notes: *Proxied by balance sheet items A1, A2, A3, A4, A6, A7.2 and A8.

Table A shows how the change in the Eurosystem aggregate balance sheet from end-2006 to end-2016 has led to large increases in central bank liquidity (commercial banks' deposits with the central bank, including current accounts used to fulfil reserve requirements, and the deposit facility). This increase has mainly occurred on the back of an increase in holdings of monetary policy securities. Investment assets, which also include foreign reserve holdings, have also grown but most of this is related to the increase in the gold price, which is subsequently reflected in an increase in "other autonomous factors (net)" that includes the revaluation accounts. The increase of banknotes in circulation has absorbed some of the increase in central bank liquidity that would have taken place had the stock of banknotes been steady.

2 Concentration across euro area countries

This section discusses the euro area financial structure and risk aversion as two important drivers of the excess liquidity distribution whose roles have changed over time. Box 2 explains what the developments implied for TARGET2 balances.

2.1 The role of risk aversion

The high level of excess liquidity and its concentration in specific jurisdictions observed around 2012 can be largely attributed to the high level of both perceived risk and risk aversion at the height of the sovereign debt crisis.[5] Banks in lower-rated countries experienced difficulties in financing themselves when foreign investors refrained from rolling over their investments and domestic investors partly fled to quality in other countries. In general, banks were hoarding liquidity and built up liquidity buffers, limiting the circulation of liquidity among banks and in particular across borders (see e.g. the drop in the transaction volume of the cross-border overnight money market (ECB, 2016a)). As a result, banks in lower-rated countries participated more significantly in the Eurosystem refinancing operations, raising the total amount of excess liquidity in the system. Chart 5a shows how banks in e.g. Spain and Italy accounted for significant shares of the high total Eurosystem outstanding amount of refinancing operations around 2012. This relatively high take-up in operations served mainly to fill emerging funding gaps, and the liquidity provided accumulated in countries that were least affected by the crisis via cross-border flows (Chart 1).[6]

Risk has declined since the height of the crisis and played a far smaller role in explaining the recent period of high excess liquidity and its concentration. Charts 5b-c illustrate how credit risk spreads have declined over time for both euro area government and covered bonds. Furthermore, the higher level of excess liquidity observed as of 2015 largely results from the Eurosystem's own purchases instead of the take-up by funding-stressed banks in Eurosystem refinancing operations (Chart 5a).[7]

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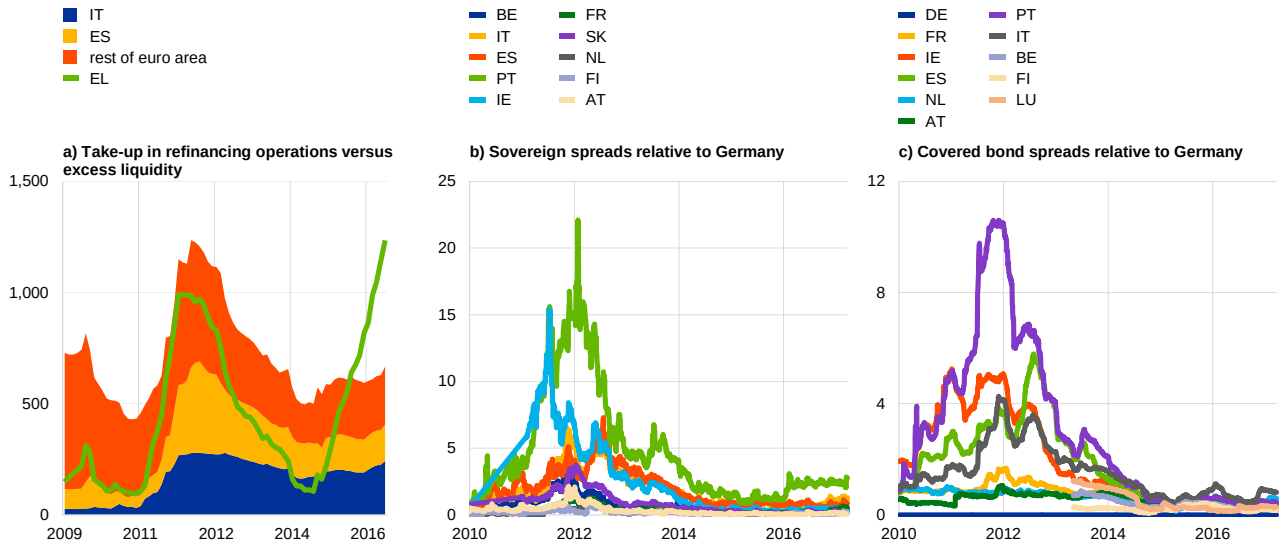
5 Risk aversion refers to the reluctance to make investments (in lower-rated countries) with a higher uncertainty of pay-off.

6 For exposition purposes, the distinction between the groups of higher- and lower-rated euro area countries is maintained throughout the paper as they largely correspond to the groups of high and low excess liquidity holders. This does not mean, however, that the rating as such is always the relevant distinguishing factor.

7 Participation in refinancing operations remained significant in 2014-16, but that largely reflects the TLTROs introduced at that time, with attractive cost and maturity conditions, when funding stress was at low levels. As differences in banks' funding costs remained to a certain extent (see e.g. the remaining dispersion of yields on covered bonds whose issuance forms a close alternative to participation in TLTROs), the attractiveness of the operations also varied across jurisdictions. Chart 5a shows that Italian and Spanish counterparties represented more than half of the take-up in TLTROs.

Chart 5

Reduced role of risk aversion from 2012 to 2016



Sources: Bloomberg, Eurosystem and Markit iBoxx.
Note: Take-up by banks for Spain, Italy and the rest of the Eurosystem, and total excess liquidity (EL).

Based on feedback from Eurosystem counterparties, bank analytical reports, as well as the remaining credit risk differentials as priced in the market (Chart 5), it seems that a certain level of risk aversion has also been persisting in 2016. This remaining risk aversion is expressed in the form of strict risk management practices, which were enhanced in the wake of the crisis. The Eurosystem asked 68 counterparties about the degree to which certain factors are driving their excess liquidity holdings. Eighty percent of respondents found the level of market rates and the risk management and credit (risk) limits of the bank to be at least marginally important, while most of them found those factors substantially important (Chart 11 in Section 3). The impact of these factors on excess liquidity appears to be linked. As bank treasurers face internal risk limits for the redeployment of excess liquidity – in terms of lending out the money or investing it in securities – they are unable to take on trades that cross these limits despite potentially attractive yields. At the same time, returns on low-risk investments may not be high enough to make entering into transactions worthwhile. See Section 3 for a further discussion of the survey results.

The remaining relatively low level of risk aversion interacts with yield differences across euro area investments and with incentives created by new regulations in such a way that excess liquidity is concentrated in much the same jurisdictions as in the period of high risk aversion. As of 2013, troubled banks started to regain market access and the market yield incentives were such that banks in lower-rated countries found it more attractive to invest their liquidity inflows rather than deposit them with the Eurosystem. In particular, domestic government bonds, many foreign assets and repos against domestic collateral earned a higher yield than the rate on the deposit facility even though credit spreads had come down. For the same reason, it was not profitable to actively try to attract large amounts of excess liquidity also given the increased length of the balance sheet and resulting regulatory costs (see Sub-section 3.2).

At the same time, banks in higher-rated countries often found excess liquidity holdings to be the attractive option, because yields on domestic bonds and repos were low and for significant periods of time even stood below the rate on the deposit facility. This means the risk-adjusted returns were not attractive, but even if they were, the remaining risk aversion as expressed in remaining credit and risk limits implied that banks in higher-rated countries could not invest extensively in lower-rated countries to take advantage of higher returns. Acharya and Steffen (2015) provide evidence that banks in higher-rated countries suffered losses due to exposure to sovereign debt of lower-rated countries, which may help to explain the persisting risk aversion at the level of those banks. Regulatory costs also reduced the appetite to take advantage of yield differentials on the interbank market (see Sub-section 3.2).

As time passed, such yield differentials kept declining, with for example rates on repos against Italian and Spanish government bonds moving close to the deposit facility rate, making such investments less attractive. Investors may then be attracted by higher-yielding foreign assets, where investment typically implies that the converted euro is circulating in financial centres of the euro area (see Section 2.2). Overall, the investment behaviours described above imply that when excess liquidity reached higher-rated countries through reinvestments and portfolio rebalancing, it tended to stay there.

Securities holdings statistics confirm that residents of lower-rated countries hold large shares of government bonds from their own (or other) lower-rated sovereign(s). The existence of such an investment bias supports the search-for-yield argument mentioned above. Chart 6 shows the shares invested in short-term bonds issued by lower-rated (vs. higher-rated) sovereigns per country of the investor. It shows investors from (higher-rated) lower-rated countries hold higher shares of bonds issued by (higher-rated) lower-rated sovereigns. For lower-rated countries, this suggests that liquidity inflows were used to take advantage of the yield opportunities, while for higher-rated countries it shows they did not fully make use of higher-yield opportunities in lower-rated countries (even if capital and liquidity regulations attach the same risk weight to all euro area government bonds).[8]

Banks in lower-rated countries show a significant home bias in their investment decisions despite the higher credit risk of domestic investments, suggesting they might have different investment strategies that reflect different risk/return considerations. In particular, the sovereign-bank nexus can reinforce the home bias as banks in lower-rated countries are likely to consider their fate being tied to their domestic sovereign, i.e. that they would face stress if their sovereign defaults irrespective of whether they hold these sovereign bonds or not. In this context, Ongena et al. (2016) find that banks in lower-rated countries increased their domestic bond holdings during the crisis, and it is likely that such holdings showed persistence also after the stress receded. In other words, the sovereign-bank nexus could create a bias in the risk/return considerations that favours investing in the

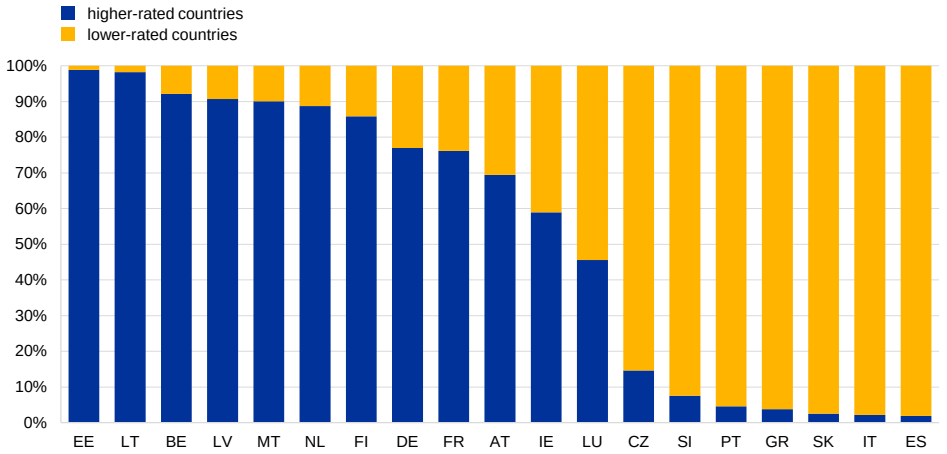
[8] Chart 6 would look very similar for holdings of longer-term euro area government bonds (e.g. around the ten-year maturity).

domestic sovereign. Overall, the home bias is a well-documented feature of financial markets that also existed before the crisis (Coeurdacier and Rey, 2013).

Chart 6

Shares invested in bonds issued by lower-rated sovereigns per investor country

(mid-2014 to 2016 averages)



Source: ECB Securities Holdings Statistics.
Notes: Lower-rated euro area sovereigns are defined as Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain. For each country of the investor, the chart shows the share of short-term euro area government bond holdings that were issued by lower-rated sovereigns versus higher-rated sovereigns. Short-term in this case refers to bonds with a remaining maturity of up to two years.

In addition, this substitution between government bond holdings and excess liquidity is facilitated by the new regulatory initiatives, which require banks to comply with certain capital and liquidity ratios. In particular for the liquidity coverage ratio both types of assets are treated as Level 1 high-quality liquid assets (HQLA) for the fulfilment of the ratio, implying that substitution between both asset types for yield reasons leaves the ratio unchanged. As can be seen from Chart 17 in Section 3, HQLA is mainly held in the form of securities in Italy, Portugal and Spain as opposed to excess liquidity.

One important implication of these investment incentives is that the lack of excess liquidity at the institution and country level observed in the most recent years can no longer be directly seen as a lack of funding or as a stress factor. Instead, it typically means these parties had pursued incentives to invest the inflows they had started to attract through deposits or APP proceeds, other than the drivers discussed in this paper that determine concentrated holdings. This situation differs fundamentally from the situation during the sovereign debt crisis.

2.2 The role of the euro area financial structure

The euro area financial structure determines the distribution of excess liquidity through at least two channels: (i) the geographical distribution of business models that attract larger shares of excess liquidity on their balance sheet; and (ii) the location of financial service providers and market infrastructures that manage accounts into which a substantial portion of the money injected by central bank asset

purchases flows. The latter has particularly played a role in directing liquidity flows since the APP started in 2015.

The concentration of excess liquidity in specific countries may partly reflect a higher density of business models that tend to hold more excess liquidity. For example, investment banks, custodians and clearing institutions are subject to very low minimum reserve requirements by virtue of their funding structure being less dependent on certain short-term deposits, but can cumulate a sizeable amount of excess liquidity through their activities.[9] To investigate the geographical distribution of business models, three business model categories can be distinguished: those with (i) low excess liquidity levels relative to minimum reserve requirements (Low EL/MRR) which includes wholesale banks, bad banks, universal banks and retail banks, (ii) medium excess liquidity levels relative to minimum reserve requirements (Mid EL/MRR) which includes custodians, specialised finance and governmental banks, and (iii) high excess liquidity levels relative to minimum reserve requirements (High EL/MRR) which includes private banks, investment banks, trade finance banks, and clearing and depository institutions. Chart 7 shows the allocation of excess liquidity to these three categories (left panel) and the share each category represents in the total assets of five national banking systems (right panel).

The geographical distribution of business models suggests that Luxembourg, France and Germany have a high concentration of banks whose business models are associated with high EL/MRR ratios. Indeed, those countries are known to host a higher share of financial service providers. Although entities with such business models are small in terms of total assets, they account for a significant share of the excess liquidity in those countries.

The geographical distribution of business models can only partly explain the excess liquidity concentration across countries. Section 3 will show that for the same business model there are strong differences in excess liquidity holdings across countries, implying that the country of residence seems to prevail on business model considerations.[10] Furthermore, Chart 7 shows that high EL/MRR types do not explain high excess liquidity in the Netherlands and Finland. Finland and the Netherlands appear to host a sizeable share of business models with low EL/MRR ratios, which, given their size (i.e. total assets) in the economy, also account for most of the excess liquidity holdings in their respective jurisdictions. Those countries may be hosting important retail banks that may be experiencing deposit inflows in the presence of high excess liquidity, with Nordic banks also typically holding euro accounts in Finland. Overall, this evidence suggests that more drivers must be behind the distribution of excess liquidity.

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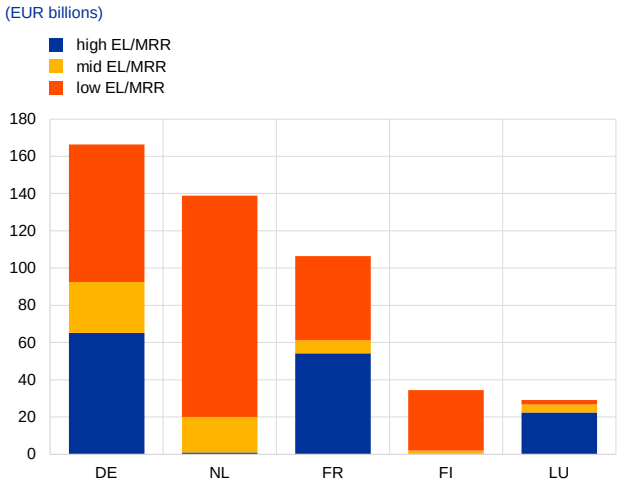
9 The minimum reserve requirement is calculated as a ratio of the reserve base of the institution. The liabilities included in the reserve base and to which a positive reserve ratio is applied are overnight deposits, deposits with an agreed maturity or a period of notice of up to two years, debt securities issued with a maturity of up to two years, and money market paper. Regulation (EC) No 1745/2003 of the ECB (ECB/2003/9) provides the legal framework.

10 Lower-rated euro area countries are defined in this study as Cyprus, Greece, Ireland, Italy, Portugal and Spain. This grouping mainly aims to group countries most affected by the global financial and sovereign debt crises, while the rating of e.g. Ireland has risen in the meantime.

Chart 7a

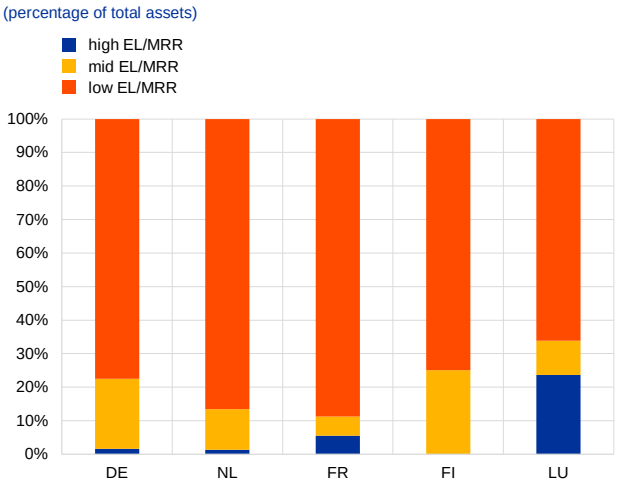
Excess liquidity by business model category



Sources: Bankscope and Eurosystem.
Notes: Excess liquidity (2016 averages) held by a sample of banks selected according to the methodology described in Section 3 for the five euro area countries with the largest amounts of excess liquidity. Banks are allocated to three groups according to the average EL/MRR ratio of their respective business model.

Chart 7b

Share of total assets by category of business model identified according to the average EL/MRR



Sources: Bankscope and Eurosystem.
Note: Share of total assets (as of 31 December 2015) by category of business model identified according to the average EL/MRR.

As of 2015, the APP became the main driver of the rise in excess liquidity. The acquiring central bank pays for its securities purchases in central bank money, meaning that the amount of central bank money in the financial system has to rise and mechanically drives up total excess liquidity held by banks with central banks. As net purchases of securities could be as much as €80 billion per month[11], the amount of liquidity injected by the APP is far larger than the amounts allotted in refinancing operations.

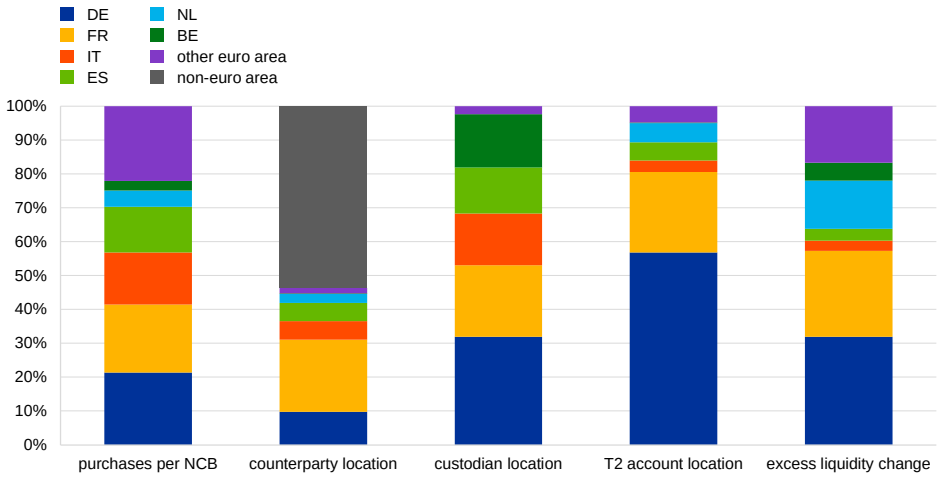
The asset purchases by national central banks have not led to a proportional increase in excess liquidity in their respective jurisdiction. The first bar of Chart 8 presents the share of asset purchases per NCB. The distribution of purchases is close to the share of NCBs in the ECB's capital key, because the purchases have largely been allocated according to that key. The fifth bar of Chart 8 shows that the increase in excess liquidity over the same period differed significantly from the NCB purchase amounts and instead tended to be concentrated in specific jurisdictions.

[11] Between March 2015 and March 2016, average monthly purchases amounted to €60 billion. Between April 2016 and March 2017, they stood at €80 billion and were reduced back to €60 billion as of April 2017.

Chart 8

APP money per jurisdiction – from purchase to excess liquidity holding

(percentages; 2015-16)



Sources: Eurosystem and TARGET2.
Notes: The first four bars map public sector purchase programme (PSPP) and covered bond purchase programme (CBPP) transactions to jurisdictions, considering the country of the purchasing national central bank; the counterparty location (i.e. the country of the (main) entity); the custodian location (a proxy for where the money vs. securities goes in a first step, typically the location of relevant custodians and clearing institutions); and TARGET2 (T2) account location (at which NCB the seller holds its real-time gross settlement (RTGS) account). The fifth bar presents the change in excess liquidity over the same period.

The injected liquidity often quickly left the country depending on the location of counterparties and settlement agents. The second bar in Chart 8 shows that more than 50% of purchases occurred with counterparties belonging to banking groups whose head institution was situated outside the euro area.[12] For NCBs that bought relatively larger shares from foreign counterparties, this implied that already in the early stages after purchases, liquidity was set to leave the country.[13] Despite possible foreign ownership, the euro-denominated liquidity is managed in specific locations within the euro area.[14] For example, the third bar in Chart 8 shows how in a very first step after purchases a large share of the "APP money" reached the custodians and clearing institutions that Eurosystem back offices transact with for the asset purchases, which were typically located in countries such as Germany, France and Belgium.[15] The APP money placed on cash accounts with these custodians and clearing institutions may circulate further as the owner uses it for other purposes, while unused balances are likely to be swept to TARGET2 accounts at the end of business day.[16]

[12] According to ECB (2016b), around 80% of bonds were purchased under the APP from counterparties that are not resident in the same country as the purchasing NCB.

[13] Counterparties here are the entities from which the Eurosystem directly bought securities. These often act as intermediaries for initial owners.

[14] The exceptions are TARGET2 accounts held in euro at certain non-euro area central banks that are part of the European System of Central Banks.

[15] Settlement of securities purchases typically takes the form of delivery versus payment, which can most easily occur for securities held at central depositories, which then in turn deliver the securities held on behalf of clients and receive payment on dedicated client accounts.

[16] In practice, however, it is not possible to earmark APP liquidity and trace its subsequent locations through payment systems beyond the settlement at custodians and clearing institutions that the Eurosystem deals with.

The location of the TARGET2 account of banks selling securities to the Eurosystem is most indicative of the likely destination of the central bank money right after securities sales.[17] As banks manage central bank money on their TARGET2 accounts the location of these accounts can act as a proxy for the settlement location of APP money even if money flows first through custodians and may change hands to some extent through direct reinvestments. As is apparent from the fourth bar in Chart 8, the location of the relevant accounts in the euro area is such that Germany is likely to attract a large share of the APP money in TARGET2. An important reason is that many of the non euro area APP counterparties hold their TARGET2 account in Germany.

There appears to be a certain redistribution of the money among the euro area countries with high holdings of excess liquidity towards countries such as the Netherlands, Finland and Luxembourg. In particular, as can be derived from Chart 8, Germany's share of excess liquidity is closer to 30% rather than the above 50% suggested by the TARGET2 account location, while the Netherlands attracts more liquidity than both NCB purchase amounts and TARGET2 account locations would suggest.

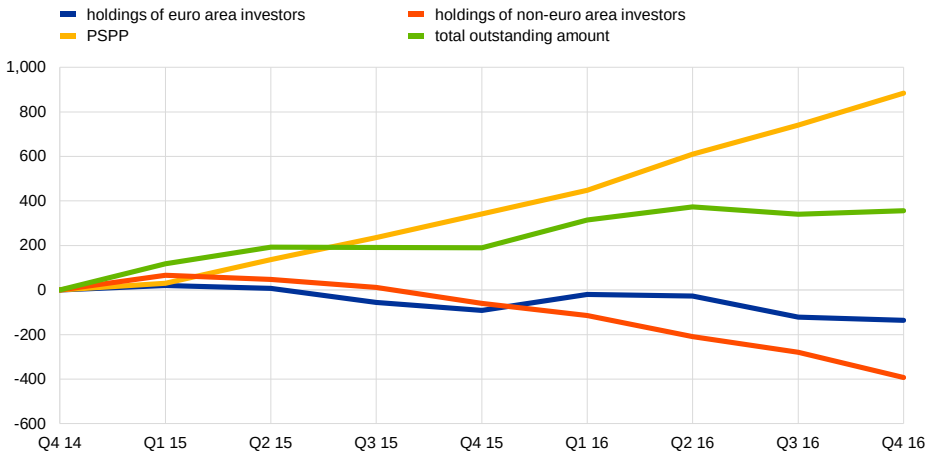
Non-euro area residents have reduced their holdings of euro area government bonds the most and they are likely to rely on financial services to manage their euro-denominated liquidity that are typically located in the financial centres of the euro area. Chart 9 shows the cumulative changes in euro area long-term general government bond holdings since the start of the APP for euro area versus non-euro area investors. The chart shows that the total outstanding amount of such bonds has risen, but the Eurosystem has bought more than the net issuance as part of its public sector purchase programme (PSPP), thereby reducing the amount held by the public and mostly the holdings of non-euro area residents. Those non-euro area investors are more likely to manage their euro holdings in financial centres of the euro area typically located in specific countries that have historically been financial gateways between the euro area and the rest of the world. Holdings of euro area residents, on the other hand, have not declined that much. Euro area residents may have been selling, but they have then largely restored their holdings by reinvesting in other, perhaps riskier government bonds (i.e. portfolio rebalancing up the "risk ladder"). Among those residents, the euro area banking sector in fact did not reduce its holdings of government bonds much, despite some banks being direct counterparties to the APP. It appears that APP counterparties have sourced the government bonds they sold to the Eurosystem to a significant degree from non-euro area initial sellers.

[17] See Box 2 for a definition of TARGET2.

Chart 9

Changes in euro area long-term general government bond holdings

(EUR billions, Q4 2014-Q4 2016)



Sources: ECB Securities Holdings Statistics and ECB..
Notes: Cumulative changes in nominal holdings since the last quarter of 2014. PSPP reflects the nominal value of the public sector purchase programme of government bonds. The total outstanding amount and holdings refer to bonds with a maturity above one year, which includes only a small set of non-eligible PSPP bonds. EA stands for euro area.

Overall, the location of market infrastructures used by APP counterparties is very indicative of where the liquidity created by the APP is set to flow after purchases, and why it has been concentrated across jurisdictions during the programme. Reinvestment of the liquidity is likely to rely on similar settlement and market infrastructures which would then add to the persistence of concentrated holdings. However, in the longer term, the financial structure and payment practices do not fully explain why excess liquidity does not rise more in countries like Spain and Italy in a context of abundant liquidity. The factors discussed in Section 2.1 also play a role in determining the investment decisions that drive excess liquidity holdings of agents and whether they reinvest reserves in other liquid assets.

Box 2

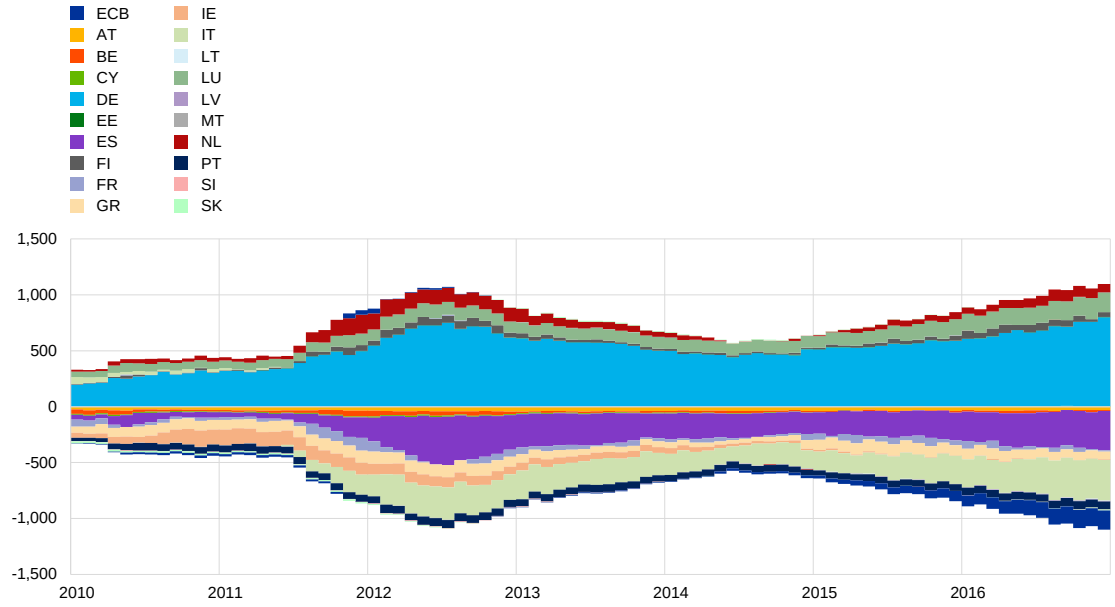
Implications for TARGET2 balances

TARGET2 balances have been on the rise again since the start of the APP (Chart A). TARGET2 is the second generation of the Trans-European Automated Real-time Gross settlement Express Transfer system, which registers payment transactions in central bank money between the accounts of private credit institutions with their national central bank, transactions related to monetary policy operations, and settlement of other financial market infrastructures. The net positions of the individual central banks participating in this payment system are referred to as TARGET2 balances, which can be either a claim or a liability vis-à-vis the ECB. Chart A shows how countries such as Germany and the Netherlands accumulated a claim and countries such as Spain and Italy a liability.

Chart A

TARGET2 claims (+) and liabilities (-)

(EUR billions, 2010-16)



Sources: Eurosystem and TARGET2.

TARGET2 balances are the mechanical accounting flipside of cross-border flows of central bank money between Eurosystem central banks. For TARGET2 balances to arise, the money needs to cross borders on a net basis. For example, when money injected via market operations by one national central bank accumulates as deposits at another NCB, the former accumulates a liability vis-à-vis the ECB while the latter accumulates a claim. During the sovereign debt crisis, troubled banks relied on central bank money (provided by their domestic NCBs) and the excess liquidity created in this way was mainly held at other NCBs after payments from banks' current accounts of lower-rated countries to banks' current accounts of higher-rated countries. Buiter et al. (2011) and ECB (2011) among others pointed out how this asymmetrical funding problem in the banking sector was driving up TARGET2 (im)balances during the crisis.

In the more recent period, the rise in TARGET2 balances has occurred in tandem with the rising APP portfolio of the Eurosystem. More specifically, TARGET2 balances are the result of the interaction between APP cross-border purchases, the euro area financial structure (that determines where money is handled) and the investment decisions of those that receive liquidity flows. If one NCB purchases assets from foreign counterparties, the money will leave that country following the purchases, representing a TARGET2 liability to the buying NCB and a TARGET2 claim against the central bank where the seller's TARGET2 account is located (see Eisenschmidt et al. (2017) for a dedicated discussion). In addition, as discussed above, the financial structure of the euro area and the interaction of strict risk management with yield differences across the euro area and associated investment incentives imply that money concentrates in certain euro area countries, making their NCBs likely to have a net TARGET2 claim position. Overall, the factors that led to cross-border flows and accumulation of excess liquidity in specific jurisdictions will be the same factors driving TARGET2 balances.

The balance of payments (BoP) keeps track of all transactions between a country and the rest of the world and TARGET2 balances are part of the BoP financial account (see e.g. Cecioni and Ferrero, 2012). In the period 2010-12, the BoP of troubled euro area countries shows that the decline in foreign investments in domestic securities and domestic monetary financial institutions (MFIs) was mirrored in an increase of TARGET2 liability positions. This is consistent with the fact that foreign investors did not roll over investments in for example Italian or Spanish (sovereign) securities and that the lack of access to the interbank market by banks in lower-rated countries led to higher central bank refinancing, overall raising the TARGET2 liability. Since the start of the APP, the increase in TARGET2 liabilities has no longer been driven by strong capital outflows originated by non-residents. Instead, the BoP for e.g. Italy suggests that it mainly mirrors Italian investments in foreign assets in line with portfolio rebalancing induced by the APP. Additionally, domestic banks seem to have reduced their cross-border funding and partly substituted it with central bank refinancing (TLTROs), contributing to the widening of TARGET2 balances; see Banca d'Italia (2017) for an illustration of the BoP developments for Italy and Eisenschmidt et al. (2017) for a more general discussion of the BoP in the APP context.

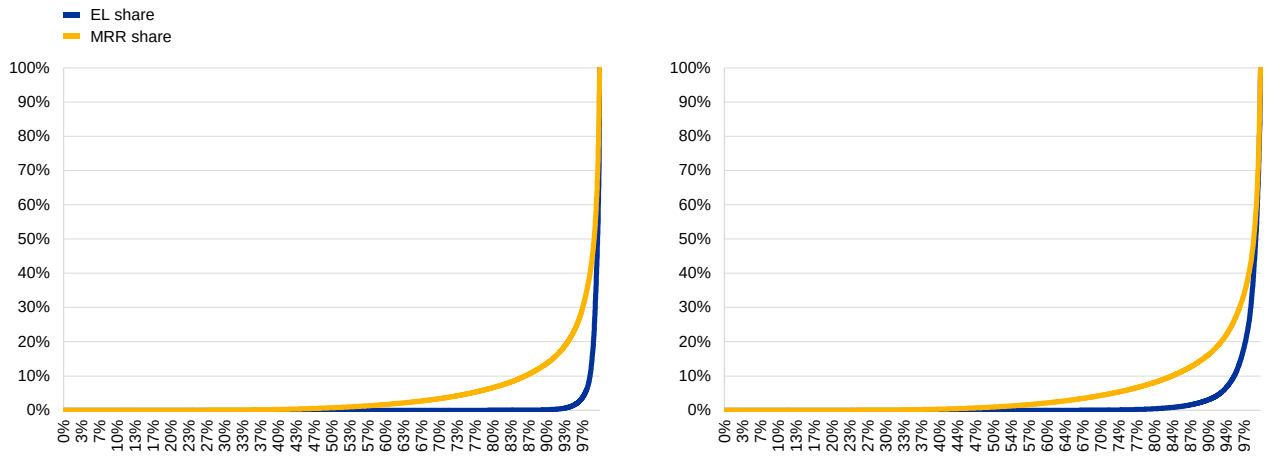
3 Concentration across banks

This section goes beyond the country perspective to provide evidence on how features of individual banks relate to the accumulation of excess liquidity (Chart 4). In addition, the incentives created by regulation in relation to holding and circulating excess liquidity are discussed. The section aims to provide insights into why excess liquidity is highly concentrated at the bank level. Lorenz curves show that excess liquidity holdings are more unequally distributed than what the amount of minimum reserve requirements (i.e. a proxy for bank size) would suggest (Chart 10).

Chart 10

Lorenz curves for the concentration of excess liquidity

(percentages, 8th maintenance period of 2012 and 2016)



Source: Eurosystem.
Note: Lorenz curves for the concentration of excess liquidity (blue line) and minimum reserve requirement (red line) in maintenance period (MP) 8 of 2012 and 8 of 2016.

3.1 Business models and bank characteristics associated with higher excess liquidity holdings

Information on the role of the business model and bank characteristics has been gathered in three ways: (i) a survey among bank treasurers; (ii) a statistical and panel data study quantifying the role of business models and balance sheet characteristics for a sample of banks; and (iii) an analysis of the link between liquidity management practices of bank groups and excess liquidity.

3.1.1 Qualitative feedback from a survey among bank treasurers on drivers of excess liquidity holdings

Eurosystem staff collected qualitative feedback by means of a standardised questionnaire from 68 banks in the course of 2016, covering banks with both high

and low excess liquidity holdings and located in both lower-rated and higher-rated countries.[18]

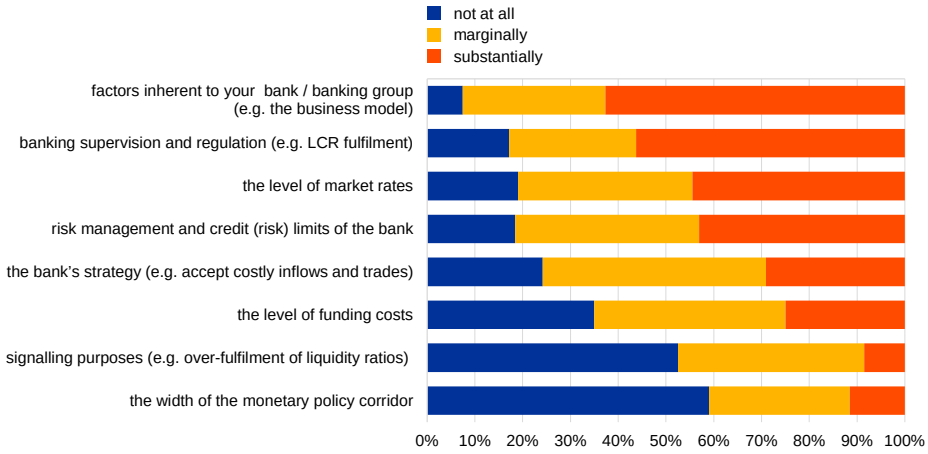
The replies to the survey suggest that many factors jointly determine the amount of excess liquidity at individual institutions or at banking group level, which signals the complexity in understanding excess liquidity distribution. In particular, none of the potential drivers put forward in the questionnaire was considered to be fully irrelevant. However, it is possible to rank the various factors according to how relevant they were considered by banks (Chart 11).

Factors inherent to the bank or banking group (e.g. the business model) were flagged as being most important in determining the level of excess liquidity held at the relevant institution. Most banks cited increasing retail and corporate deposit inflows as a major reason. Banking supervision and regulation are the second most important determinant where several regulatory ratios, in particular the liquidity coverage ratio (LCR)[19], were mentioned as playing a role in incentivising holdings and hampering redistribution. Some respondents also flagged the convenience of having a liquidity buffer and that strict own liquidity rules can lead to such buffers. The level of market rates and the risk management and credit (risk) limits of the bank came in as third and fourth most important drivers in the survey. As discussed in Section 2, the effect of these two drivers is linked and differences across jurisdictions in risk/return considerations appear to play an important role in explaining cross-border flows.

Chart 11

To what degree do the following factors determine the level of excess liquidity held?

(percentages)



Source: Eurosystem.
Note: Share of responses to a survey among 68 bank treasurers about their excess liquidity.

18 In addition, feedback received during regular meetings with counterparties was consistent with feedback received through the survey.

19 The LCR is an international standard agreed by the Basel Committee. It promotes the short-term resilience of a bank's liquidity risk profile. It does this by ensuring that a bank has an adequate stock of unencumbered high-quality liquid assets (HQLA) that can be converted into cash easily and immediately in private markets to meet its liquidity needs for a 30 calendar day liquidity stress scenario. See Section 3.2 for further details.

The bank's strategy and the level of funding costs are mainly seen as playing a marginal role. Banks, to a certain degree, accept costly inflows and trades as part of larger business deals or to maintain a longer-term relationship with the deposit holders. The level of funding costs plays a role because those banks that fund themselves at lower rates may not find it as costly to hold excess liquidity, and vice versa. In fact, anecdotal evidence suggests that banks with high liquidity inflows manage to pass on the negative rates in money markets, making their excess liquidity holdings less costly if not profitable. Furthermore, respondents indicated that signalling effects from over-compliance with financial and prudential ratios are not that important, implying that profit considerations are more important. Finally, the replies suggest that the size of the monetary policy corridor is not seen as having a major impact on the excess liquidity holdings and their redistribution.

3.1.2 Descriptive statistics on bank characteristics

The quantitative analysis relies on a sample of 341 financial institutions which have been selected with the purpose of being representative of (i) the top excess liquidity holders (i.e. banks holding the top 95% of excess liquidity in 2015) and (ii) the euro area banking system (i.e. once banks are identified as explained in point (i), all banks with an MRR larger than the median of this group of banks are also included in the sample). The banks were then classified into groups of eleven different business models.[20]

A high level of heterogeneity of excess liquidity holdings prevails across business models. The bulk of aggregate excess liquidity is held by retail and universal banks (by virtue of their size and prevalence). When looking at excess liquidity holdings in relation to the size of the institution (i.e. over total assets or over the MRR), it appears that trade finance banks, private banks, clearing and depository institutions, as well as custodian and investment banks hold by far the largest shares of excess liquidity on their balance sheet (Table 1).

[20] Universal banks, retail banks, investment banks, private banks and asset management companies, specialised governmental credit institutions, clearing and depository institutions, trade finance banks, wholesale banks, custodian banks, specialised finance banks, and bad banks.

Table 1

Excess liquidity over total assets by business model and for two groups of countries[21]

(percentages)

	Higher rated	Lower rated
Trade finance banks	106.8	N/A
Investment banks	36.8	0.3
Private banks/asset management companies	25.7	N/A
Clearing and depository institutions	25.0	N/A
Custodians	14.8	2.1
Wholesale banks	2.6	0.0
Universal banks	4.2	0.6
Specialised finance banks	3.6	N/A
Bad banks	3.6	N/A
Specialised governmental credit institutions	3.0	0.4
Retail banks	2.8	1.4
All models	9.8	1.0

Sources: Bankscope and Eurosystem.
Notes: The table reports average excess liquidity holdings in 2016, while total assets are end-of-year figures in 2015. Higher-rated countries are Austria, Belgium, Estonia, Finland, France, Germany, Luxembourg, Latvia, Malta, the Netherlands, Slovakia and Slovenia. Lower-rated countries are Cyprus, Ireland, Italy, Greece, Spain and Portugal. The grouping mainly aims to select countries most affected by the global financial and sovereign debt crises.

There appear to be good reasons why banks with these business models keep large shares of excess liquidity on their balance sheet. For instance, investment banks typically have a relatively less stable (i.e. more short-term) funding model. They rely more on interbank and other short-term financing compared with other business models. As they have a strong position on corporate and capital markets, investment banks are likely to attract excess liquidity from financials and corporates. Their excess liquidity may be used as a buffer to avoid maturity mismatches and allow for a smooth functioning of their business lines. Finally, investment banks are more likely to generate income through fees and commissions (off-balance-sheet business) and consequently are more likely to bear the cost of the negative rate on the deposit facility that applies to excess liquidity holdings.

As highlighted in Section 2, business models that hold more excess liquidity are located to a larger extent in a specific group of countries, but that only partly explains the concentration of excess liquidity across jurisdictions. There is a strong divide within the same business model group if we split the countries into two groups, with banks in one country group holding almost all excess liquidity (Chart 12), implying that country-specific factors prevail over banks' business model. This is particularly striking for investment banks. In terms of the excess liquidity ratio, the divide is also clear in both regions (Table 1): while in higher-rated countries, investment banks, custodian banks and private banks have the highest ratios, in lower-rated countries, the ratios are overall orders of magnitude lower, and the highest ratio is that of retail

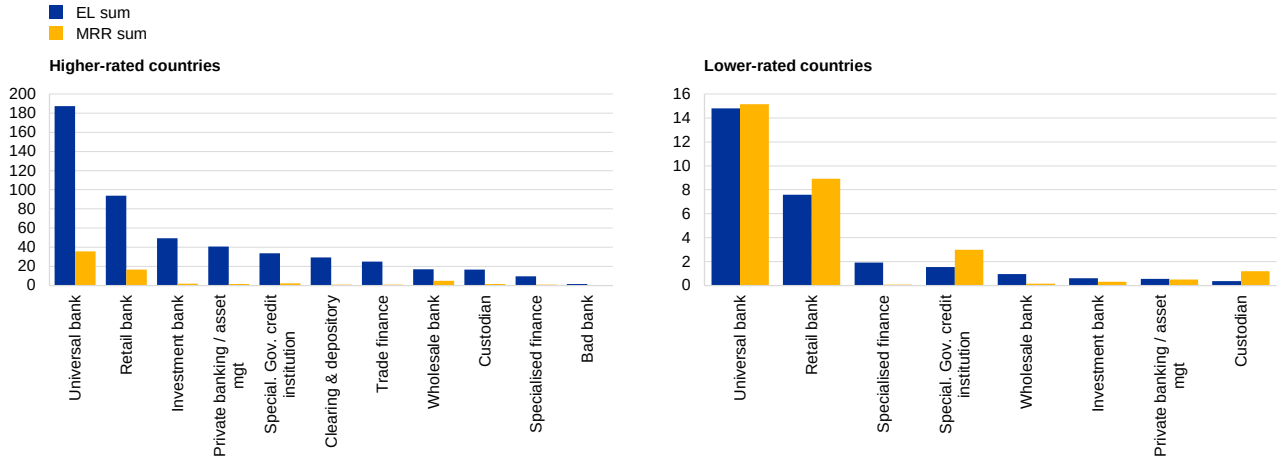
[21] Total asset data for 2015 were taken from Bankscope and were available for 189 banks, from which two outliers were removed. No data were available for Greece.

banks. Overall, the evidence suggests such differences apply broadly across the business models. However, these descriptive statistics say little about the reasons for the difference between the two groups of countries, where the country rating is only a tool to define two groups, and any differences in incentives to hold or avoid excess liquidity as discussed in Section 2 are not taken into account.

Chart 12

Excess liquidity and reserve requirements held by banks in two groups of countries

(EUR billions, business models)



Source: Eurosystem.
Notes: The charts report average excess liquidity holdings and reserve requirements in 2016. Higher-rated countries are Austria, Belgium, Estonia, Finland, France, Germany, Luxembourg, Latvia, Malta, the Netherlands, Slovakia and Slovenia. Lower-rated countries are Cyprus, Greece, Ireland, Italy, Spain and Portugal. The grouping mainly aims to select countries most affected by the global financial and sovereign debt crises.

Liquidity has not necessarily been retained by banks that received it from the Eurosystem via APP sales or refinancing operations. In other words, the excess liquidity of a bank has not been dependent on its involvement in Eurosystem operations. In fact, the weak correlation between excess liquidity changes and amounts of securities sold to the Eurosystem at individual level suggests that the injected liquidity effectively circulates beyond those sellers. As banks often source bonds from clients, high levels of excess liquidity would be explained by liquidity inflows not directly related to the APP. To obtain a more general view of this, Chart 13 classifies banks into four funding model groups depending on the stability of the funding of their business model and presents the take-up in various Eurosystem refinancing operations, APP sales to the Eurosystem and excess liquidity. Retail banks and private banks have been included in Model 1 (as they are funded via a stable deposit base), wholesale banks have been included in Model 2 (as they are funded via stable market instruments), investment banks, custodian banks, and clearing and depository institutions have been included in Model 3 (as they are funded with less stable market instruments) and universal banks have been included in Model 4 (as they rely on a mix of funding sources). Notice that Model 3, which consists of active APP sellers, is not the only model accumulating excess liquidity and that Model 4 banks, which are active in both the APP and refinancing operations, do not hold all these funds as excess liquidity. Overall, it shows that liquidity circulates beyond the most active Eurosystem counterparties and other factors including the euro area financial structure determine where it tends to persist.

Chart 13

Average excess liquidity, recourse to refinancing operations and APP liquidity inflows by groups of business models

(EUR millions)

Source: Eurosystem.
Notes: Excess liquidity, recourse to refinancing operations and APP inflows for a sample of banks selected according to four models that group business models as defined in Sub-section 3.1. Charts show simple averages across banks belonging to the four groups of business models.

3.1.3 Panel study

Two sets of panel regressions were estimated based on the data presented above.

The first set of regressions considers a random effects specification where the ratio of excess liquidity to total assets (EL/TA) is regressed against balance sheet characteristics, ratings, and other individual bank factors for the period 2011-16.[22] Let

$$EL/TA_{ijt} = \mu_j + \delta_t + \beta \log(TA_{it}) + \gamma(X/TA)_{it} + \varepsilon_{it} \ ,$$

[22] On the one hand, the period under review is the most relevant in terms of excess liquidity developments, as it includes the liquidity injected via three-year LTROs, TLTROs and the APP. On the other hand, due to data limitations, the specifications are not entirely suitable to capture dynamics that might have evolved over time as only seven annual observations are available at most for each bank.

where $\log(TA_{it})$ measures the balance sheet size, $(X/TA)_{it}$ represents certain balance sheet characteristics over assets such as customer deposits (Cust.Depo/TA), total deposits (customer deposits, deposits from banks, other deposits and short-term borrowing – Tot.Depo/TA) and long-term funding (senior debt maturing after one year, subordinated borrowing, other funding including central bank funding – LongTerm/TA) to gauge the influence of the liability structure. In addition, control variables such as the capital ratio (CapRatio), the Tier 1 ratio (T1ratio) and the non-performing loan ratio (NPL/Tot.Loans) are introduced to account for banks' financial soundness. The study also includes other control variables such as jurisdiction indicators (μ_j), the five-year sovereign credit default swap (CDS) spread, return of average equity (ROAE), and bank ratings (eligible senior unsecured bonds issued by banking groups wherever available) to control for credit risk and profitability differences at bank and country level. Time fixed effects (δ_t) are also included. Different sets of regressions with different explanatory variables are included in order to assess the robustness of the results.

The second set of regressions relates changes in EL/TA to changes in the liabilities side of the balance sheet in a fixed-effect specification of the model. Let

$$\Delta EL_{it}/TA_{it-1} = \alpha_i + \delta_t + \gamma \Delta X_{it}/TA_{it-1} + \varepsilon_{it} \ ,$$

where α_i are bank-fixed effects, X_{it} are liability items such as total deposits (Tot.Depo), long-term funding (LongTerm), short-term central bank funding (below one year – Short-CB-Refi) and long-term central bank funding (above one year – Long-CB-Refi) to assess whether there is a relationship between excess liquidity accumulation and changes in funding instruments. Long-term central bank funding and total deposits have been interacted with a dummy for the year 2016. The underlying intuition is that in 2016 a structural change in the way liquidity was accumulated by banks might have occurred. Most of the liquidity injected by the Eurosystem in 2016 was via securities purchases, while before liquidity was mainly provided by means of refinancing operations.

Table 2

Regression of excess liquidity over total assets on balance sheet characteristics

	(1) EL/TA	(2) EL/TA	(3) EL/TA	(4) EL/TA	(5) EL/TA	(6) EL/TA
log(Tot.Assets)	-4.491***	-2.390***	-2.535***	-2.646***	-2.596***	-0.893***
	(0.841)	(0.450)	(0.454)	(0.503)	(0.503)	(0.305)
A	0.713	3.388*	3.136*	2.845	2.889	-0.813
	(3.730)	(1.869)	(1.850)	(1.968)	(1.968)	(1.146)
AA	5.823	12.51***	11.98***	11.83***	11.89***	3.903**
	(4.870)	(2.461)	(2.464)	(2.591)	(2.591)	(1.729)
AAA	6.462	2.989	2.364	1.632	1.572	-1.839
	(11.46)	(4.721)	(4.736)	(4.956)	(4.957)	(2.746)
B	2.769	0.913	1.018	1.229	1.109	-0.962
	(6.221)	(2.573)	(2.573)	(2.741)	(2.742)	(1.499)
BB	2.560	0.381	0.293	0.432	0.516	-0.174
	(4.974)	(2.234)	(2.222)	(2.397)	(2.398)	(1.357)
BBB	2.885	1.843	1.837	1.982	1.950	-0.344
	(4.111)	(1.826)	(1.821)	(1.972)	(1.972)	(1.096)
CCC	2.232	3.461	3.599	0.190	-0.268	-0.00658
	(11.48)	(4.663)	(4.658)	(5.365)	(5.372)	(2.928)
NotRated	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)
CapRatio		0.136**	0.132**			
		(0.0615)	(0.0607)			
Tot.Depo/TA	-0.00825					
		(0.0356)				
LongTerm/TA	0.0316	0.0136	0.0174	0.0212	0.0213	
		(0.0483)	(0.0423)	(0.0474)	(0.0474)	(0.0294)
CustDepo/TA		-0.0427*	-0.0504*	-0.0451*	-0.0281	
			(0.0246)	(0.0269)	(0.0270)	(0.0172)
T1Ratio				0.178**	0.200***	0.168***
				(0.0715)	(0.0725)	(0.0499)
ROAE					-0.00708*	
					(0.00413)	
NPL/Tot.Loans						0.0859***
						(0.0260)
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes
Business model dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country-CDS	Yes	Yes	Yes	Yes	Yes	Yes
Constant	48.42***	24.85***	27.46***	28.82***	27.82***	10.09**
	(10.27)	(6.483)	(5.757)	(6.388)	(6.411)	(3.943)
Observations	825	688	684	627	627	580

Sources: Orbis Bank Focus, Bloomberg and Eurosystem.
Notes: Random-effect panel regression with robust standard errors where the dependent variable is the ratio of excess liquidity to total assets (EL/TA). Lines 2-8 refer to dummies for bank ratings. The sample includes annual observations from 2011 to 2016. Hausman tests have been carried out to test for the consistency of the estimator. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results of the first set of regressions, as presented in Table 2, show that EL/TA (i) is negatively correlated with balance sheet size, (ii) is positively correlated with the capital ratio or Tier 1 ratio even when controlling for credit risk and (iii) is positively correlated with the NPL ratio also when controlling for capital adequacy. An explanation could be that small banks are not used to being net lenders in the money market, which found support from informal talks with bank treasurers. As regards the capital ratios, it appears logical that more resilient banks tend to attract relatively more inflows which will raise their excess liquidity. However, all else being equal, banks with a higher NPL tend to cumulate more excess liquidity, possibly for precautionary motives (as also found by Chang et al. (2014) in the United States).

The second set of regressions, as presented in Table 3, shows that changes in EL/TA are positively correlated with changes in long-term funding and particularly with longer-term central bank refinancing before 2016. In 2016, developments in EL/TA are related to deposit inflows instead. Chart 14 confirms the results in Table 3, showing that the correlation between changes in long-term refinancing and excess liquidity is positive for higher-rated countries, while banks in lower-rated countries do not seem to keep higher excess liquidity even after recourse to longer-term central bank refinancing, also when controlling for credit risk differences. A reason for the correlation could be that those banks retain a portion of the longer-term central bank refinancing (three-year LTROs and TLTROs) and do not deploy the whole amount obtained via these operations immediately. Furthermore, it may suggest regulatory effects are at play, because taking up longer-term refinancing while pledging lower-quality collateral with the Eurosystem supports the net stable funding ratio (NSFR)[23] of these banks. Such banks could then be both excess liquidity holders and participants in operations. The results in Table 3 also suggest that the accumulation of excess liquidity on bank accounts is not that independent of the way liquidity is provided as Charts 1-4 may suggest. In 2016, banks in the euro area appear to have experienced substantial deposit inflows in the presence of large-scale asset purchases, while previously (own) participation in longer-term refinancing operations was associated with rising excess liquidity holdings. As the sample of banks experiencing these two different effects is likely to differ, the findings may also help to explain why the top-50 banks change somewhat over time in Chart 4.

[23] The NSFR is an international standard agreed by the Basel Committee. It requires banks to maintain a stable funding profile in relation to their on- and off-balance-sheet activities, thus reducing the likelihood that disruptions to a bank's regular sources of funding will erode its liquidity position in a way that could increase the risk of its failure. See Section 3.2 for further details.

Table 3

Regression of changes in excess liquidity over total assets on changes in balance sheet indicators

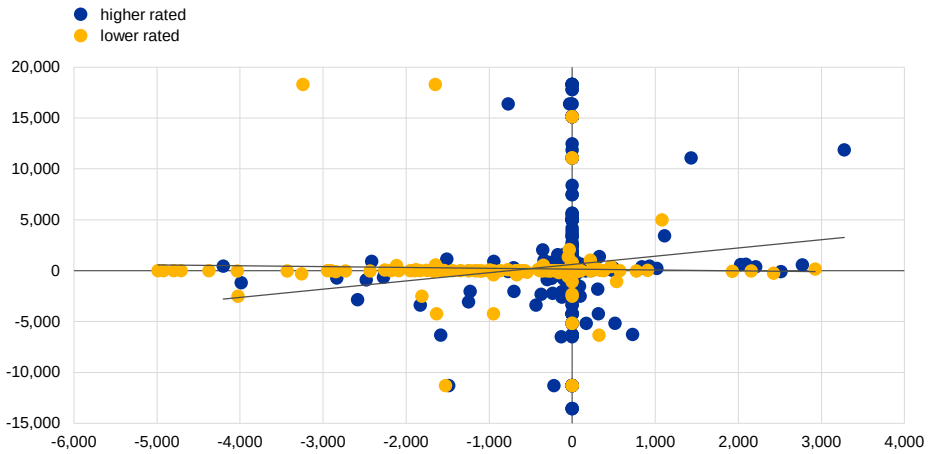
	(1) ΔEL/TA t-1	(2) ΔEL/TA t-1	(3) ΔEL/TA t-1	(4) ΔEL/TA t-1
ΔTA/TAt-1	0.145***	-0.0169	0.0354	0.0647
	(0.0431)	(0.0293)	(0.0454)	(0.0469)
ΔTot.Depo/TA t-1		0.0949**	0.140**	
		(0.0480)	(0.0656)	
ΔLongTerm/TA t-1		0.0579		
		(0.0499)		
ΔShort-CB-Refi/TA t-1			-0.0657*	-0.0440
			(0.0384)	(0.0372)
ΔLong-CB-Refi/TA t-1			-0.0197	
			(0.0572)	
ΔTot.Depo/TA t-1 * D2016=0				-0.0419
				(0.0732)
ΔTot.Depo/TA t-1 * D2016=1				0.186***
				(0.0503)
ΔLong-CB-Refi/TA t-1 * D2016=0				0.128**
				(0.0613)
ΔLong-CB-Refi/TA t-1 * D2016=1				-0.0250
				(0.207)
Country-CDS	Yes	Yes	Yes	Yes
Rating change	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes
Constant	1.204***	0.706***	1.139***	1.368***
	(0.112)	(0.0686)	(0.108)	(0.101)
Observations	623	561	623	623

Sources: Orbis Bank Focus, Bloomberg and Eurosystem.
Notes: Fixed-effect panel regression with robust standard errors where the dependent variable is the change of EL from one year to another vis-à-vis total assets. The sample includes annual observations from 2011 to 2016. Standard errors in parentheses.
* p < 0.1, ** p < 0.05, *** p < 0.01.

Chart 14

Relationship between longer-term central bank refinancing and excess liquidity

(EUR millions)



Source: Eurosystem calculations.
Note: Change in excess liquidity holdings against changes in the recourse to refinancing operations for banks belonging to lower-rated (blue) and higher-rated (orange) countries.

3.1.4 Liquidity management of banking groups

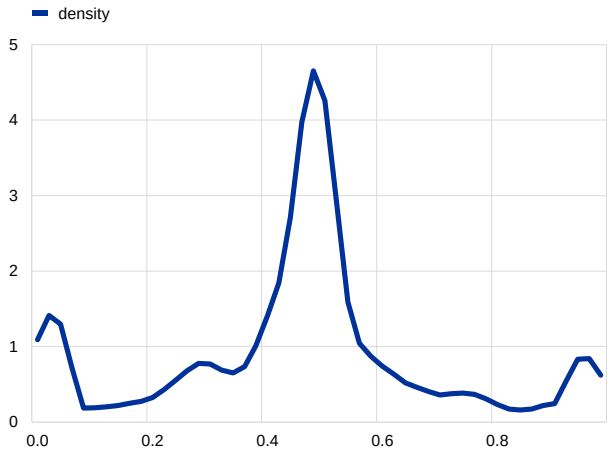
The way banking groups distribute liquidity among members has implications for the distribution of excess liquidity at the individual bank level. To study this, a unique dataset of banking group liquidity flows are analysed using TARGET2 transaction data for the period from January 2013 to March 2016. Monthly net positions are derived for all head entities vis-à-vis each of their subsidiaries. The sample consists of 98 banking groups.

Although banking group liquidity management strategies exhibit substantial heterogeneity across groups, a dominant share of transactions originates from the head institution, indicating centralised liquidity management practices. This would make the distribution of excess liquidity more concentrated at the bank level. Restricting the sample to euro area-headquartered groups, on average 46.6% of intra-group transfers are initiated by the group's head institution, with a standard deviation of 24% (Chart 15). At the country level, on average there is little heterogeneity, suggesting that similar liquidity management practices hold across countries, and centralised management is a common feature. Chart 16 plots the average share of total volumes originating from the head entities on a net basis in each country (country names are not shown for confidentiality reasons).

Chart 15

Density of the share of transactions within banking groups that were initiated by the group's head institution

(x-axis: share of transfers in group sent from head (EMU only))

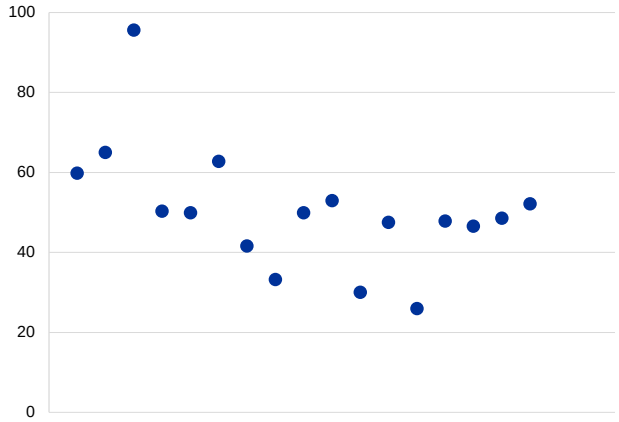


Sources: Eurosystem and TARGET2.
Note: Based on transactions within 98 banking groups as observed in TARGET2.

Chart 16

Average share of transactions within banking groups that were initiated by the group's head institution, per country

(x-axis: country of head; y-axis: total volume initiated by head (percentages))



Sources: Eurosystem and TARGET2.
Notes: Based on transactions within 98 banking groups as observed in TARGET2.
Country names are not shown for confidentiality reasons.

Higher excess liquidity at the bank group level is correlated with more centrally concentrated liquidity. To come to this finding, annual data are studied, noting that due to data limitations only 52 groups out of a total of 98 in our previous analysis were left. It turns out that the raw correlation between EL/TA and:

- the share of flows from the head institution over total flows is -12%;
- the share of flows to the head institution over total flows is 19%;
- the share of net flows to the head institution over total flows is 16%; and
- the share of aggregate flows to and from the head institution over total flows is 10%.

Thus, banking groups with higher excess liquidity over total assets tend to concentrate more funds at the group's head institution. This is both because the head institution collects liquidity from subsidiaries and because subsidiaries receive less liquidity from the head institution.

3.2 The incentives created by regulation

The survey among bank treasurers discussed in Section 3.1 suggests that regulatory factors are the second most important driver of holdings of excess liquidity. The comments collected in the survey suggest that holdings of excess liquidity are particularly influenced by regulatory requirements of Basel III, especially the new

liquidity regime with the liquidity coverage ratio (LCR) and the net stable funding ratio (NFSR), but also by the leverage ratio (LR)[24] and the regulatory capital framework.[25] This sub-section discusses the impact those regulations can have on incentives to hold or not to distribute excess liquidity and closes with a few observations about supervisory practices with respect to liquidity waivers for banking groups that could affect the distribution of liquidity.

3.2.1 Incentives to hold excess liquidity

Liquidity regulation (e.g. the LCR and the NSFR) treats excess liquidity more favourably than other asset classes (except for euro area government bonds) as it is a claim on the central bank, i.e. without credit risk, and can be used as a means of final settlement, and thus is the most liquid asset possible.[26] This incentivises banks to hold excess liquidity as it is considered a Level 1 HQLA in the fulfilment of the LCR and does not require stable funding for the fulfilment of the NSFR. Moreover, holding excess liquidity does not consume any capital according to the risk-based capital framework. By contrast, the LR introduces a balance sheet cost for central bank reserves, so it sets the incentive to hold as little excess liquidity as possible.

Excess liquidity forms a substantial part of HQLA holdings in most euro area jurisdictions, but typically in higher-rated countries (Chart 17). Government bonds, on the other hand, make up an important share across banks. Covered bond holdings are important in Germany, Spain, Finland, Ireland and Portugal. Asset-backed securities (ABS) are important for Belgium, France, Ireland and the Netherlands. By comparison, corporate bond holdings are small. Smaller jurisdictions seem to hold predominantly excess liquidity and government bonds. As highlighted in Section 2, the share of excess liquidity versus securities in HQLA is importantly determined by the return on domestic investments in relation to the rate on the deposit facility.

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24 The leverage ratio is an international standard agreed by the Basel Committee. It is a simple, non-risk-based "backstop" measure that restricts the build-up of excessive leverage in the banking sector to avoid destabilising deleveraging processes that can damage the broader financial system.

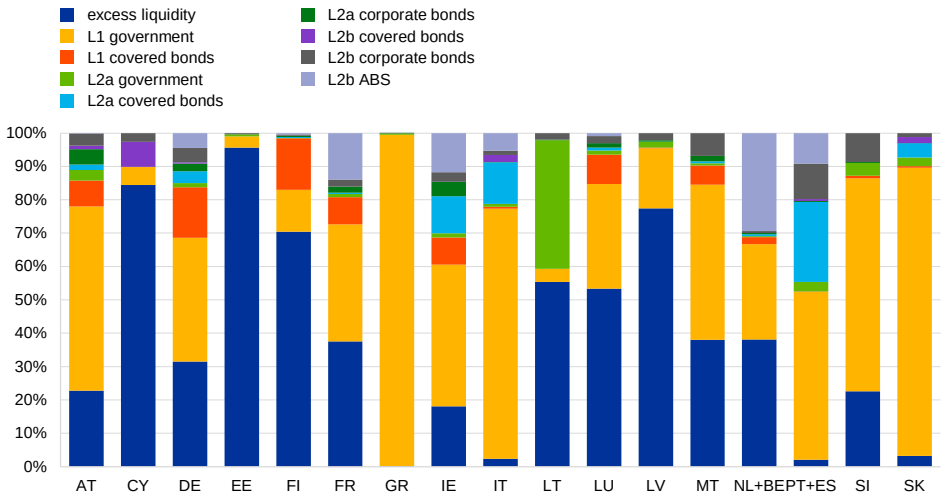
25 The LCR is implemented in the European Union via the Capital Requirements Regulation and more specifically the Commission Delegated Regulation 2015/61 of 10 October 2014. The implementation of the NSFR and the LR has been included in the Commission proposal to amend the Capital Requirements Regulation (CRR) and Directive (CRD). The LCR has been effective in the EU since October 2015, while the effective date of application of the NSFR and the LR is not yet clear and the proposal by the Commission is subject to possible changes.

26 This preferential treatment applies to all central bank liquidity, except minimum reserve requirements. This is because most banks are required to hold such reserves according to ECB rules (some banks have a zero requirement) and the regulatory treatment is only a distinguishing factor for excess reserves.

Chart 17

Holdings of high-quality liquid asset categories

(percentages, Q3 2016)



Sources: Eurosystem and ECB Securities Holdings Statistics.[27]
Notes: L1 and L2 stand for Level 1 and Level 2 HQLA. The composition is a proxy of the LCR definition of HQLA for various reasons. First, it lacks information on the encumbrance of those assets. Second, it uses the ECB's Eligible Assets Database to characterise the individual ISINs in securities holdings data. This does not allow the distinction required by the LCR between some specific characteristics of covered bonds and ABS to be made. Also, listed equities, which to some extent are eligible for the LCR, are not included. The analysis cannot apply the limits for holdings of certain types of assets either as these limits apply on an institution basis, while the data are at country level. Finally, the haircuts in the LCR were not applied. Excess liquidity is calculated as the average for the MP from 14 September 2016 to 25 October 2016. NL and BE, as well as PT and ES, were combined for confidentiality reasons.

Banks whose LCR approaches the minimum requirement may find it beneficial to pledge in particular non-HQLA collateral with the Eurosystem, in exchange for central bank reserves, as this improves the LCR compared with financing non-HQLA collateral in the market. The advantage of using central bank facilities to obtain reserves is that the regulation assumes those operations to be rolled over and assigns therefore a run-off rate[28] of 0% to that bank liability for the LCR.[29] The 0% run-off rate on central bank liquidity makes such operations attractive to the borrowing bank relative to unsecured interbank funding, which receives a 100% run-off rate in the LCR if the transaction matures within 30 days. This type of regulatory effect may help to explain the fact that longer-term refinancing with the Eurosystem is found to be significant in the panel study of Section 3.1.

The NSFR also incentivises holding excess liquidity rather than other categories of assets (excluding Level 1 securities) as its required stable funding (RSF) factor is zero.[30] A further potential incentive for holding excess liquidity exists for those banks that collect short-term funding, for instance from non-financial corporate customers,

27 The ECB collects security-by-security data on securities held by euro area resident sectors, broken down by instrument type and selected issuer country. For more information, see the ECB's website.

28 The run-off rate is essentially a weighting factor that is used to calculate the net cash outflows for the purpose of the LCR ratio.

29 However, central bank operations with a maturity below 30 days are subject to an unwind mechanism, which renders MROs in some cases less beneficial for the LCR-upgrade purpose than long-term operations with a remaining maturity above 30 days. Therefore, TLTROs are particularly useful to fund non-HQLA.

30 The Commission proposal deviates from the Basel III framework for government bonds as it proposes a 0% RSF factor for them as opposed to 5% in Basel III to avoid negative impacts on the liquidity of sovereign bond markets.

which is assigned an available stable funding (ASF) factor of 50% or below, i.e. what counts for the numerator of the NSFR. In order to preserve a balanced NSFR ratio, these funds have to remain on Eurosystem accounts or have to be invested in assets with a low RSF factor such as Level 1 assets. This could explain why investment banks are keener to hold excess liquidity.

Because excess liquidity is an asset on bank balance sheets, it is included in the exposure measure of the LR. Whether the LR is the binding constraint compared with risk-based capital requirements depends on the balance sheet structure.[31] If it is, banks have to consider how to decrease their exposure measure, presuming there is limited scope for additional capital increases. Therefore, the LR could incentivise banks to reduce demand for refinancing operations or to ultimately redeem other sources of funding (i.e. to deleverage).

3.2.2 Incentives not to invest excess liquidity

The investment of excess liquidity might be constrained also by risk-based capital requirements for secured and unsecured funding, since, whenever a bank lends money on the interbank market, it builds up an exposure towards its counterparty, which is subject to a capital charge with varying degrees of risk weights, while excess liquidity is not. Following this rationale, capital requirements might also be a reason for the concentration of excess liquidity at a country level as the environment of low interest rates makes the expected return from some kinds of investments (e.g. unsecured overnight lending) not worth the capital cost attached.

The NSFR creates a disincentive to short-term interbank lending. Lending with a maturity of less than six months is assigned a 5% RSF factor if it is secured with Level 1 (excluding extremely high-quality covered bonds) HQLA collateral, and a 10% RSF if not.[32] In principle, this could hamper the circulation of excess liquidity as it increases the RSF compared with keeping excess liquidity. In order to gauge the impact of a substitution of excess liquidity with other asset classes, a simulation based on European banks' balance sheets was conducted (Table 4). The results suggest that, unless they hold a very large proportion of excess liquidity over total assets, such exchanges on the assets side would not have a considerable impact on their NSFR if the RSF factor of the alternative assets is low. Indeed, according to Table 1 (Section 3.1), the average excess liquidity to total assets ratio is 9.8 across banks operating in higher-rated countries. If an "average" bank invested all its excess liquidity in reverse repos (secured lending), its NSFR would only decrease by 0.81 percentage point.

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31 The LR is binding if the risk-weighted asset (RWA) "density" is low. The threshold depends on each bank's individual minimum capital requirements as determined by the Single Supervisory Mechanism (SSM).

32 The Commission proposal deviates from the Basel III framework for reverse repos and unsecured lending. In the Basel III framework, the RSF factors are 10% (for reverse repos backed by L1 assets) and 15% (for reverse repos backed by other asset classes and unsecured lending). These adjustments to the Basel III RSF factors are intended to mitigate the impact on the liquidity of interbank funding markets, on the liquidity of the securities and on market-making activities.

Table 4

Projected effect on banks' NSFR if excess liquidity is substituted with Level 1 assets, secured lending, unsecured lending and assets with a 100% RSF factor by EL/TA

		Asset substitutes			
		L1 assets	Secured lending	Unsecured lending	Assets with 100% RSF factor
EL / TA	0.5%	0.00	0.04	0.08	0.68
	1.0%	0.00	0.08	0.16	1.37
	2.0%	0.00	0.16	0.32	2.73
	3.0%	0.00	0.24	0.48	4.10
	5.0%	0.00	0.41	0.80	6.83
	7.5%	0.00	0.61	1.20	10.25
	10.0%	0.00	0.81	1.61	13.67
	15.0%	0.00	1.22	2.41	20.50

Sources: Bankscope, Eurosystem data and own calculations.
Notes: The projected effect on banks' NSFR that would be obtained if EL is substituted with asset classes reported in the columns. The relationship between EL/TA and changes in the NSFR is derived by means of a simple ordinary least squares (OLS) regression based on a sample of euro area banks. The figures in the table are reported in percentage points.

The LR is not affected by lending out excess liquidity, but can still hinder circulation as receiving secured funding decreases the LR if it is the binding requirement (banks with a low RWA density). This is because posted collateral remains in the cash receiver's exposure measure which lengthens the balance sheet and thus lowers the LR. Thus, as the LR limits the overall size of the balance sheet, it might significantly constrain high-volume, low-margin (low-risk) repo business, reducing the overall volume in repo markets and thereby hampering the distribution of excess liquidity via those markets. Only under certain conditions can cash receivables and cash payables with the same counterparty be netted in the calculation of the exposure measure, resulting in a mitigated detrimental effect of the LR on the circulation of excess liquidity. As for the interaction between the LR and the implementation of monetary policy, the APP creates reserves in the banking system that could lead to an expansion of banks' balance sheets.[33] Commercial bank balance sheets are also extended when additional central bank funding that creates excess liquidity is needed at a time of interbank market disruptions.

In order for the LR not to interfere with the objectives of monetary policy, the Bank of England decided on 4 August 2016 to exclude central bank reserves from the exposure measure in the United Kingdom's LR framework. However, in the Basel III framework or in the Commission proposal, such an exemption is currently not provided. Indeed, the exclusion of central bank reserves from the exposure measure, according to the Committee on the Global Financial System (2017) report on repo market functioning, might have two opposite effects. On the one hand, it is expected to hinder the circulation of excess liquidity as it would then favour excess liquidity holdings over reverse repos or other assets. On the other hand, it would encourage

[33] If the ultimate sellers of securities purchased by the central bank are not banks, banks would experience an increase on the assets side given by the increase in central bank reserves and on the liabilities side given by a corresponding increase in deposits.

repo financing if the proceeds were deposited at the central bank as they would be exempted from the calculation of the exposure measure.

The LCR per se does not penalise the circulation of liquidity as substituting central bank reserves with secured or unsecured lending with a maturity below one month, in general, does not affect the LCR.

3.2.3 Liquidity waivers for banking groups

Supervisory options and discretions (O&Ds) that are available to national competent authorities and Member States may have affected the free flow of funds within the euro area according to counterparty feedback.[34] The O&Ds relevant to the distribution of excess liquidity are the possibility to waive liquidity requirements, on an individual or sub-consolidated basis, and intra-group large exposure limits.[35] The non-application of those O&Ds can create constraints on liquidity flows similar to some regulations mentioned above, thereby potentially creating inefficiencies that could imply higher concentration and accumulation of excess liquidity. Fragmented liquidity management across euro area countries can also increase recourse to Eurosystem liquidity-providing and liquidity-absorbing operations at the country level. However, quantifying the impact of such practices on the excess liquidity distribution is difficult as the waivers merely facilitate centralisation and efficiency of liquidity management, but the impact on the distribution of excess liquidity depends on the direction of the actual liquidity flows.

The ECB (in its supervisory capacity) has adopted a policy of granting waivers for liquidity requirements on a cross-border basis, subject to certain limitations with regard to a few important subsidiaries of banking groups. It also intends to fully exempt intra-group exposures from the large exposure requirements. The ECB policy on granting liquidity waivers and exempting large exposures reduces the locking-up of liquidity at an individual level. Thus, it is expected to facilitate the free flow of funds among entities belonging to cross-border groups. This is significant as cross-border intra-group bank lending accounts for a significant share of total cross-border lending to banks in the euro area.[36]

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34 See also European Commission (2017) and ECB (2016c).

35 Normally exposures are capped at either 25% of the bank's eligible capital or €150 million, whichever is higher.

36 The ECB has announced its intention to harmonise the aforementioned practices for significant institutions for which the SSM is the responsible supervisor and has issued a guideline (ECB/2017/9) for the exercise of options and discretions by national competent authorities in relation to less significant institutions. The application will, however, take time and must also allow for sufficient transitional phases.

4 Conclusion

This paper has studied the drivers of the distribution of excess liquidity across euro area countries and across banks. The excess liquidity holdings were found to be concentrated in specific countries and banks in a persistent way over time. The results suggest that the concentration of excess liquidity is determined by a combination of factors, while their individual relevance has changed over time.

The high level of excess liquidity and its concentration in specific jurisdictions observed around 2012 can be largely attributed to the high level of perceived risk and risk aversion at the height of the sovereign debt crisis. This observation is consistent with the literature on the rise in TARGET2 balances observed around that period. Risk aversion has declined significantly since then and plays a much smaller role. Its effect lingers to the extent that banks maintain internal risk limits for the redeployment of excess liquidity. In this context, excess liquidity persists in higher-rated countries because potential investments with higher yields (e.g. in securities issuance in lower-rated jurisdictions) are either not attractive on a risk-adjusted basis or exceed risk limits. At the same time, low-risk (domestic) investments are not considered to be worthwhile in terms of returns and in view of the regulatory costs for those banks. For example, for significant periods of time, the yield on domestic government bonds stood below the rate on the deposit facility, which is the remuneration on excess liquidity. By contrast, banks in lower-rated countries invest in products (e.g. domestic bonds and foreign assets) that yield above the rate on the deposit facility, where the home bias in government bond investments appears to dampen risk considerations. Additionally, the sovereign-bank nexus might create a bias in the risk/return considerations of banks in lower-rated countries that favours investing in domestic sovereign bonds rather than excess liquidity. In such a setting, to the extent that the liquidity reaches higher-rated countries it tends to stay there.

Since 2015, the rise of excess liquidity has been mainly due to the APP, but the distribution of liquidity does not reflect the share of central bank asset purchases by jurisdiction. Instead, excess liquidity has tended to accumulate in specific countries such as Germany, the Netherlands, France, Finland and Luxembourg. One explanation is that the majority of the purchases have been carried out with counterparties whose head institution is situated outside the euro area and who typically hold their TARGET2 account in countries such as Germany, which is indicative of where their money holdings are typically managed. And a significant share of APP purchases took place with counterparties located in countries such as France and Germany. In addition, many original sellers appear to be non-euro area investors who are likely to manage their euro holdings in financial centres that are typically located in specific euro area countries. This leads to the initial concentration of excess liquidity in these specific euro area countries. In addition, the excess liquidity appears to flow between these financial centres.

Jurisdictions that retain higher levels of excess liquidity also have a high concentration of credit institutions whose business models attract larger shares of

excess liquidity on their balance sheet. On the other hand, the same business models attract little excess liquidity in lower-rated jurisdictions, showing that the mere geographical distribution of business models is not the only factor determining the distribution of excess liquidity.

The concentration of excess liquidity at the country level is mirrored by the increase of TARGET2 balances as both in the period 2012-13 and in 2015-16 the rising excess liquidity crossed borders on a net basis.

As regards the concentration of excess liquidity at the institution level, the results of a survey conducted among bank treasurers suggest that many factors influence liquidity management practices. The most important is deemed to be the business model and the related liquidity management strategy, followed by regulatory requirements and risk management policies. However, other potential drivers put forward in the questionnaire were also considered to be relevant.

The analysis of bank balance sheet characteristics suggests that banks with specific business models (investment banks, clearing institutions, etc.) tend to hold more excess liquidity relative to their size than other business models (such as retail and wholesale banks). Moreover, when controlling for banks' capital, non-performing loans, credit risk and profitability, smaller banks tend to cumulate relatively more excess liquidity, most likely because they are less equipped to reinvest funds in the money market, while better-capitalised banks are also found to hold more excess liquidity. Ceteris paribus, banks with higher non-performing loan ratios also tend to cumulate relatively more excess liquidity.

However, the evidence also suggests that liquidity circulates among banks of the higher-rated countries as APP sellers from these countries typically have excess liquidity levels that differ from the liquidity obtained through bond sales to the Eurosystem. Indeed, retail and wholesale banks also experienced a sizeable increase in excess liquidity holdings while not directly selling assets to the Eurosystem. As for the sources of the accumulation of excess liquidity, developments in long-term funding (in particular longer-term central bank refinancing) are positively correlated with changes in excess liquidity. With respect to the role of the liquidity management of banking groups, groups with higher liquidity holdings tend to concentrate excess liquidity at group head offices.

Finally, liquidity regulation (e.g. the liquidity coverage ratio and the net stable funding ratio) and capital regulation treat liquidity holdings favourably, creating incentives to hold or not to distribute excess liquidity. On the other hand, the leverage ratio penalises the accumulation of liquidity as it imposes a balance sheet cost on central bank reserves. Moreover, the liquidity coverage ratio, the net stable funding ratio and capital requirements might hinder the circulation of excess liquidity as they discourage activity in the money market. The liquidity coverage ratio does not penalise short-term lending in the money market. However, banks in higher-rated countries are incentivised to hold excess liquidity for the fulfilment of the ratio rather than domestic government bonds as the latter partly yield less than the remuneration of excess liquidity. Supervisory options and discretions available to national competent authorities have been reported in counterparty feedback as being factors

that limit the free (cross-border) flow of funds. However, the intensity of this phenomenon should be mitigated in the future as the Single Supervisory Mechanism plans to remove obstacles to intra-group liquidity flows.

Identifying the drivers of concentrated excess liquidity holdings is a first step in understanding the economic roles played by the distribution of excess liquidity in the euro area. If driven by risk aversion, concentration tends to reflect a lack of market access for certain banks, and may imply that monetary policy transmission is hampered, as was the case during the financial and sovereign debt crises. Instead, if concentration is largely determined by financial structure, bank business models and financial regulation, when only a few banks experience funding stress, concentrated excess liquidity holdings are not an indication that the transmission of monetary policy is being hampered. For example, the more recent situation in which certain banks have no excess liquidity but have access to market-based funding cannot be seen as a sign of stress or as hampering monetary policy transmission as was the case in 2010-13. In fact, if those banks chose to, they could use their market access to accumulate excess liquidity, which would lead to a less-concentrated distribution. Looking ahead, this may start to happen if interest rate differentials between euro area countries decline further in 2017, making investment incentives more equal, although in the post-crisis period credit risk may be treated more rigorously than before the crisis making it more difficult for certain flows to occur.

Taking these observations as a starting point, the effects on monetary policy implementation and the effectiveness of non-standard monetary policy measures (e.g. portfolio rebalancing) stemming from a concentration of excess liquidity holdings would deserve attention in future research. In this context, one would also need to better understand under which circumstances holding reserves is a way for banks to store deposits that could eventually be used to finance lending when the economic cycle improves.

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Authors

Luca Baldo
Banca d'Italia, Rome, Italy; email: luca.baldo@bancaditalia.it

Benoît Hallinger
Banque de France, Paris, France; email: benoit.hallinger@banque-france.fr

Caspar Helmus
Deutsche Bundesbank, Frankfurt am Main, Germany; email: caspar.helmus@bundesbank.de

Niko Herrala
European Central Bank, Frankfurt am Main, Germany; email: niko.herrala@ecb.europa.eu

Débora Martins
Banco de Portugal, Lisbon, Portugal; email: drmartins@bportugal.pt

Felix Mohing
Deutsche Bundesbank, Frankfurt am Main, Germany; email: felix.mohing@bundesbank.de

Filippos Petroulakis
European Central Bank, Frankfurt am Main, Germany; email: filippos.petroulakis@ecb.europa.eu

Marc Resinek
Deutsche Bundesbank, Frankfurt am Main, Germany; email: marc.resinek@bundesbank.de

Olivier Vergote
European Central Bank, Frankfurt am Main, Germany; email: olivier.vergote@ecb.europa.eu

Benoît Usciati
Banque de France, Paris, France; email: benoit.usciati@banque-france.fr

Yizhou Wang
Banque centrale du Luxembourg, Luxembourg City, Luxembourg; email: yizhou.wang@bcl.lu

Members of the MOC Task Force

Stephanie Broks
Deutsche Bundesbank

Alexander Klippenstein
Deutsche Bundesbank

Oliver Loch
Deutsche Bundesbank

Elisa Sánchez
Banco de España

Annette Kamps
ECB

Béatrice Amaladasse
Banque de France

Christophe Hemous
Banque de France

Elvira Fioretto
Banca d'Italia

Salvatore Nasti
Banca d'Italia

Tiziana Rosolin
Banca d'Italia

Christina Rivellini
Banque centrale du Luxembourg

Cristina Coutinho
Banco de Portugal

Judith Kilp
Deutsche Bundesbank

Daniel Krause
Deutsche Bundesbank

Kersti Harkmann
Eesti Pank

Yamina Santalla
Banco de España

Aleksi Paavola
Suomen Pankki – Finlands Bank

Geneviève Deanaz
Banque de France

Michail Sfakianakis
Bank of Greece

Michelina Lo Russo
Banca d'Italia

Filippo Pasqualone
Banca d'Italia

Immanuel Lorang
Banque centrale du Luxembourg

Christina Strobach
De Nederlandsche Bank

Roman Kostelny
Národná banka Slovenska

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Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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