

# RECENT DEVELOPMENTS IN EXCESS LIQUIDITY AND MONEY MARKET RATES

## ARTICLES

Recent developments  
in excess liquidity and  
money market rates

*Since the introduction of tender operations with fixed rate full allotments in October 2008, euro area banks have been operating in an environment of excess liquidity, which reached a peak in March 2012, following the allotment of the two three-year long-term refinancing operations (LTROs). As of early 2013, banks have had the option of repaying the three-year LTROs funds on a weekly basis, which, in turn, has led to a substantial decline in the level of excess liquidity. The purpose of this article is to explore the reasons behind the trend in excess liquidity and assess its impact on money market rates. Several conclusions can be drawn from this analysis. First, the progressive decline in excess liquidity stemming from the voluntary repayment of the three-year LTROs was mainly the result of improved market access for euro area banks. The fall in demand for excess liquidity is expected to continue throughout 2014, ceteris paribus, as the residual maturity of the three-year refinancing operations shrinks to below one year and autonomous liquidity factors continue to increase banks' liquidity needs. Second, at the current level of excess liquidity, money market rates have largely remained stable, although autonomous liquidity factors and calendar effects have caused short-term volatility. Third, the anticipation of future money market rates becomes more challenging in an environment in which the stock of excess liquidity may become too low to anchor overnight market rates to the deposit facility rate but not low enough for the rates to draw closer to the Eurosystem's main refinancing rate.*

## I INTRODUCTION

The liquidity management framework of the Eurosystem was developed around the concept of neutral liquidity allotments, which endeavoured to create balanced liquidity conditions in the money market and allowed the ECB to steer very short-term interest rates close to the minimum bid rate of its main refinancing operations. However, after introducing tender operations with fixed rate full allotments in October 2008 and, in particular, following the two three-year operations in December 2011 and February 2012, the euro area banking system experienced very ample liquidity conditions. On 5 March 2012, excess liquidity (defined as deposits at the deposit facility net of the recourse to the marginal lending facility, plus current account holdings in excess of those contributing to the minimum reserve requirements) reached a peak of €812 billion. Since January 2013, however, the banking system has experienced a progressive decline in excess liquidity, as banks have been increasingly exercising the early repayment option embedded in these operations.

This article examines money market rates and expectations about future short-term rates in the context of declining excess liquidity and changing market conditions. As a result, it provides important insight into the challenges that could arise were there to be a further decline in excess liquidity. This article reviews liquidity and market developments up to 10 December 2013, which is the last day of the 11th maintenance period in 2013. More specifically, Section 2 of this article describes recent liquidity trends, analysing the main changes to the Eurosystem's liquidity provision framework that were introduced during the financial crisis. Further, it elaborates on the factors associated with the overall decline in the outstanding amount of the Eurosystem's refinancing operations. Section 3 explores a number of factors determining banks' potential demand for excess liquidity in the future, explaining the behaviour of autonomous factors based on both historical trends and seasonal patterns. Section 4 analyses the impact of developments in excess liquidity on money market rates. It reviews the transmission mechanism of excess liquidity to money markets based on the historical relationship between overnight interest rates and excess liquidity. Following this, it investigates the impact of excess liquidity and volatility in short-term rates on expectations about future money market rates. Section 5 concludes by discussing some of the anticipated challenges associated with a gradual normalisation of money markets and the resulting decline in excess liquidity.

## 2 TRENDS IN EXCESS LIQUIDITY

Excess liquidity has been on a declining trend since the record high reached in March 2012. Most of this decline can be attributed to improving market conditions and abating risk aversion, which have allowed banks to reduce their precautionary liquidity buffers. Nevertheless, excess liquidity may still persist owing to market segmentation and prudential regulatory constraints. In that respect, a significant drop in banks' demand for excess reserves is expected to take place later in 2014, mainly as a result of an acceleration in the pace of repayments of the two three-year LTROs as the residual maturity on outstanding loans declines to below one year.

### 2.1 CHANGES TO THE EUROSISTEM'S LIQUIDITY PROVISION FRAMEWORK

In the pre-crisis monetary policy implementation framework,<sup>1</sup> the Eurosystem's overall supply of liquidity was determined on the basis of an estimate of the banking sector's aggregate liquidity needs, which primarily depended on the minimum reserve requirements imposed by the Eurosystem as well as on developments in autonomous liquidity factors<sup>2</sup> (i.e. the neutral liquidity allotments). The Eurosystem targeted the aggregated market liquidity needs rather than individual banks' needs. The targeted amount was allotted on a weekly basis via a variable rate tender – known as the main refinancing operation (MRO) – with a minimum bid rate determined by the Governing Council of the ECB. This was sufficient to steer short-term money market rates, as long as the money market was able to redistribute liquidity from banks with a liquidity surplus to banks with a liquidity deficit. Excess liquidity was very low, as it was remunerated below market rates, and banks had no incentive to hold substantial amounts of excess reserves as insurance against liquidity risk since the private liquidity supply was readily available.

The financial crisis, however, had a profound impact on the functioning of euro area money markets which, in turn, brought significant changes in the way liquidity management was traditionally implemented by the Eurosystem. During the crisis, credit was rationed in the interbank market, as banks with a liquidity surplus became reluctant to lend to banks with a liquidity deficit, particularly on a cross-border basis, thus impairing efficient liquidity provision by money markets. Under these conditions, the demand for the Eurosystem's refinancing operations became volatile and difficult to forecast. As a result, in October 2008, the Governing Council decided to fully satisfy (at a fixed rate) individual banks' demand in its refinancing operations, including the main refinancing operations and refinancing operations with more than a seven-day maturity, typically known as longer-term refinancing operations (LTROs). In November 2013, the fixed rate full allotment procedure was prolonged for as long as necessary and, at least, until July 2015.

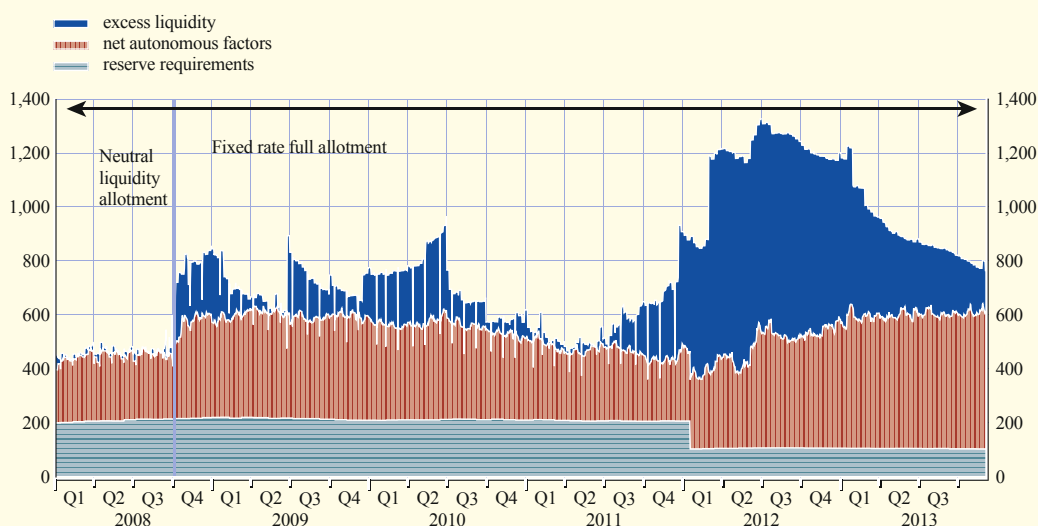
The fixed rate full allotment procedure triggered a shift in liquidity provision by the Eurosystem. In fact, liquidity provision using the fixed rate full allotment procedure is determined by individual banks' overall demand, while previously, it was determined by the Eurosystem based on its estimation of the banking system's aggregate liquidity needs. The new operating regime generated excess liquidity, as banks' demand for refinancing (and the Eurosystem's allotments) exceeded aggregate liquidity needs arising from autonomous liquidity factors and minimum

<sup>1</sup> The standard Eurosystem operational framework is described in greater detail in the ECB publication entitled "The implementation of monetary policy in the euro area – General documentation on Eurosystem monetary policy instruments and procedures."

<sup>2</sup> Autonomous liquidity factors are defined as the items in the consolidated balance sheet of the Eurosystem, apart from monetary policy operations, that provide or withdraw liquidity and thus affect the current accounts which credit institutions hold with the Eurosystem (see Box 2, *Monthly Bulletin*, ECB, July 2001). Typical autonomous factors are banknotes in circulation, government deposits with the Eurosystem and net foreign assets.

Chart 1 Liquidity needs and excess liquidity since 2008

(EUR billions)



Source: ECB.

reserve requirements. Banks voluntarily requested more liquidity than necessary as insurance against possible difficulties in accessing the money market at a reasonable cost. Chart 1 shows the liquidity needs arising from autonomous factors and minimum reserve requirements as well as excess liquidity. Excess liquidity was low under the neutral liquidity allotment procedure and increased once the fixed rate full allotment procedure was introduced. The largest increase in the amount of excess liquidity, however, took place after the allotment of the two three-year LTROs in December 2011 and February 2012. The high demand in the two three-year operations was driven, on the one hand, by genuine funding needs (see Box 1) and, on the other, by the intention to accumulate precautionary liquidity buffers, which resulted in a surge in the amount of excess liquidity to exceptionally high levels.

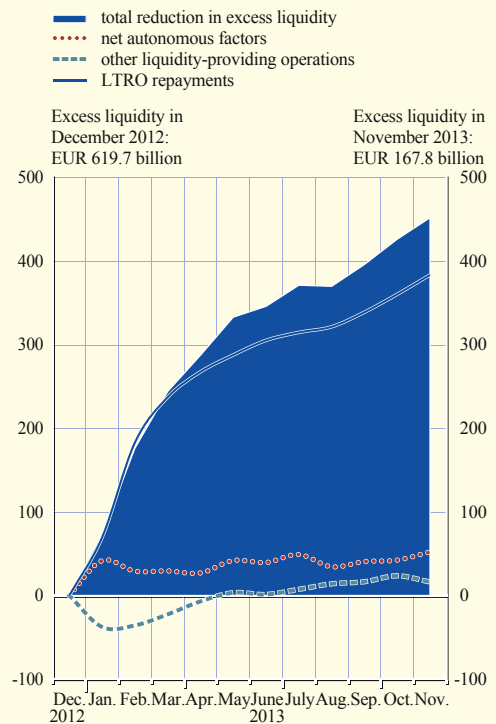
## 2.2 RECENT TRENDS IN EXCESS LIQUIDITY

Banks' demands for refinancing declined soon after excess liquidity reached its historical peak in March 2012 in several ways. First, the demand for regular refinancing operations declined, while the liquidity needs, on account of autonomous liquidity factors, continued to increase. Second, since January 2013, banks have actively used the opportunity offered in the terms of the three-year LTROs to repay the funds allotted early. From December 2012 to November 2013, excess liquidity, on a maintenance-period average, declined by €452 billion to €168 billion. Approximately 89% of this reduction, or €400 billion, is due to a decline in the recourse to the Eurosystem's refinancing operations, including €384 billion for three-year LTRO repayments. The remaining decline is due to an increase in autonomous liquidity factors by €52.3 billion (see Chart 2). The excess liquidity provided by other Eurosystem operations and facilities has also dropped by €16.3 billion since December 2012.

By November 2013, banks had repaid about 40% of their initial borrowing. Based on ECB staff analyses of financial statements from participating banks, funding conditions and refinancing considerations, primarily over the short and medium term, were important determinants of participation in the three-year LTROs (see Box 1). In line with this, the largest repayments were made by those three-year LTRO participants that had increased their deposit base and market access to the greatest degree. This, in turn, translated into a notable improvement in the cash position of the aforementioned banks in late 2012, as they prepared for their first repayments in January and February 2013. Based also on a survey conducted among repaying banks, two of the most important factors explaining initial repayments were the ability to obtain market financing at competitive rates and a willingness to reduce liquidity buffers as capital market conditions gradually improved and market fragmentation began to recede. Some banks kept on their accounts with the Eurosystem an amount of excess reserves equivalent to their initial borrowing, which reflected a precautionary stance. These banks repaid 82% of their three-year loans at the first opportunity, while other banks repaid 28% as of November 2013.

**Chart 2 Breakdown of excess liquidity absorption**

(cumulative changes since December 2012; EUR billions)



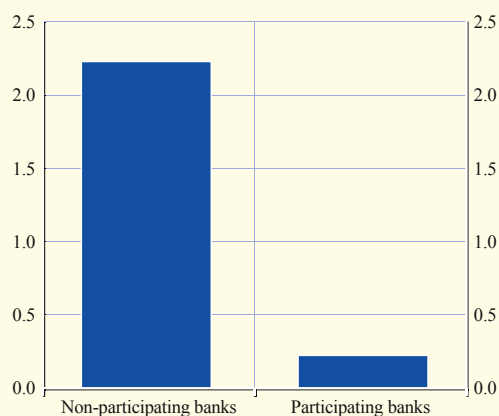
Source: ECB.  
Note: This is based on maintenance period averages.

**Box 1**

**FACTORS DRIVING THE REPAYMENTS OF THE TWO THREE-YEAR LTROs: EMPIRICAL EVIDENCE BASED ON BANKS' BALANCE SHEETS**

This box provides information on the main determinants of banks' participation in the two three-year long-term refinancing operations (LTROs) conducted in December 2011 and February 2012 and the possible reasons for the early repayment of those funds. The information used is based on publicly available annual financial statements for 393 banks and on non-public monthly balance sheet information for 238 banks. The two datasets cover 220 and 131 of the banks that participated in at least one of the two three-year refinancing operations, accounting for 78% and 80% of the total allotted amount of €1018.7 billion, respectively.<sup>1</sup>

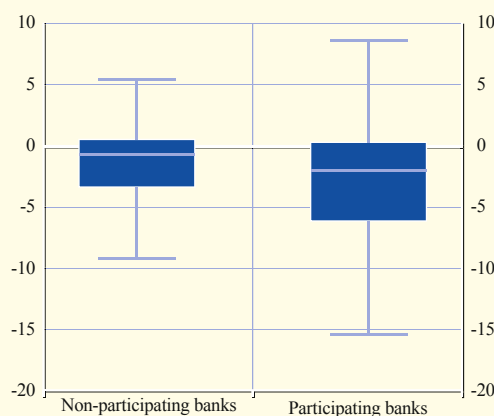
<sup>1</sup> See the article entitled "Early repayment of funds raised through three-year longer-term refinancing operations: economic rationale and impact on the money market", *Monthly Bulletin*, ECB, February 2013 and the article entitled "Early repayments of funds raised through three-year longer-term refinancing operations: developments since February 2013", *Monthly Bulletin*, ECB, July 2013.

**Chart A Cumulative flows of deposits  
by the non-financial private sector  
between January 2011 and March 2012**(mean of cumulative flows; as a percentage of main assets in  
January 2011)

Sources: ECB and ECB calculations.

**Chart B Change in the ratio of senior debt  
maturing after one year-to-total liabilities  
between December 2011 and December 2012**

(percentage points)



Sources: Fitch and ECB calculations.

Note: The lower blue band represents the 25th percentile of the distribution. The upper blue band represents the 75th percentile. The blue line in the middle is the median. The highest and lowest values represent the maximum and minimum of distribution.

### Factors driving participation in the two three-year LTROs

A comparison of relevant balance sheet characteristics between banks that participated in the two three-year LTROs and those that did not take recourse suggests that funding considerations played a major role in the decision to participate in the aforementioned operations. This is consistent with existing data on the factors driving participation in these operations, which are based on information regarding the refinancing needs of banks and the spreads of bank bonds.<sup>2</sup>

Chart A shows that in the 15 months prior to March 2012, which is when the second three-year LTRO was settled, banks that had participated in at least one of the two three-year LTROs recorded, on average, much lower deposit inflows from the non-financial private sector than banks that did not bid for any funds in these operations. This indicates that participation in these operations was partially driven by the funding situation of the particular bank. Moreover, Chart B shows that the ratio of senior unsecured debt (maturing after one year) to total liabilities decreased more for participating banks than for non-participating banks between December 2011 and December 2012. This shows that demand for the three-year operations was, to some extent, driven by looming short to medium-term refinancing needs. Evidently, banks participating in at least one of these operations were buffering some of the anticipated decline both in the maturity and, potentially, in the outstanding amount of senior unsecured debt, which allowed these banks to wait for an improvement in issuance conditions.

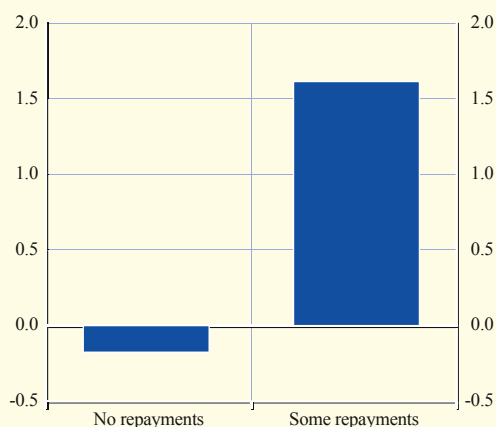
### Characteristics of banks that have started to repay their three-year LTRO funds

Evidence based on banks' balance sheets identifies better financing conditions and the need for lower liquidity buffers as important factors driving the repayment decisions of banks.

<sup>2</sup> See the article entitled "The impact of the first three-year longer-term refinancing operation", *Monthly Bulletin*, ECB, January 2012; and the article entitled "The impact of the two three-year longer-term refinancing operations", *Monthly Bulletin*, ECB, March 2012.

**Chart C Cumulative flows of deposits by the non-financial private sector between March 2012 and June 2013**

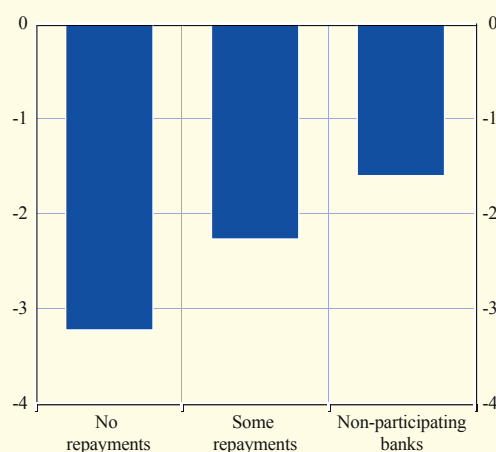
(mean of cumulative flows; as a percentage of main assets in March 2012)



Sources: ECB and ECB calculations.

**Chart D Cumulative flows of issued debt securities between March 2012 and June 2013**

(mean of cumulative flows; as a percentage of main assets in March 2012)



Sources: ECB and ECB calculations.

Chart C shows that, on average, repaying banks have witnessed much higher deposit inflows since the conduct of the second three-year LTRO in February 2012 compared to banks that did not repay any funds, which instead experienced, on average, some outflows of deposits by the non-financial private sector. Improved deposit funding, therefore, appears to be an important factor behind repayment decisions. Repaying banks have recorded around €150 billion of deposit inflows since March 2012, which is a significant amount in relation to the aggregate repayments of around €380 billion. In addition, repaying banks have seen, on average, only a small decline in the stock of debt securities since the conduct of the second LTRO. This decline was similar in magnitude to that of banks that chose not to participate in the three-year LTRO operations. By contrast, non-repaying banks experienced a larger decline in issued debt securities, on average, as can be seen in Chart D. These developments in the stock of issued securities indicate that market-based funding conditions are an important factor driving repayment decisions for three-year LTRO funds.

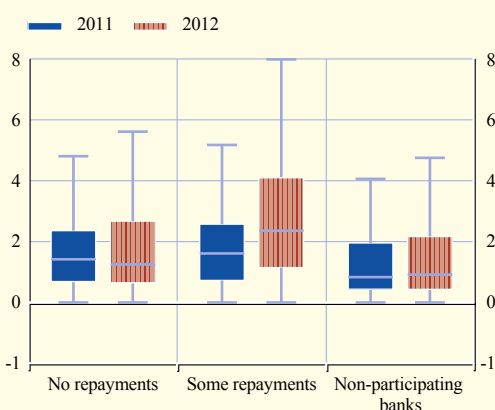
The median repaying bank also held a larger share of cash over total assets at the end of 2012 compared to non-repaying banks and banks that did not participate in any of the operations (see Chart E). Some banks strategically accumulated cash buffers by end-2012 to prepare for repayments by January 2013. Moreover, the median repaying bank saw a larger improvement in the core Tier 1 capital ratio between 2011 and 2012 compared to non-repaying banks and banks that did not take any funds in the two three-year LTROs (See Chart F). This implies that improvements in the balance sheet of banks are of high importance in relation to repayment decisions.

### Improvements in aggregate funding conditions and repayment patterns

Aggregate information on deposit and unsecured market-based funding conditions for banks largely corroborate the findings based on banks' balance sheet data. Since the conduct of the first three-year LTRO in December 2011, the bank cost of debt financing has decreased significantly. The improvement in aggregate bank funding conditions was particularly strong up

**Chart E Ratio of cash-to-total assets  
in December 2011 and December 2012**

(percentages)

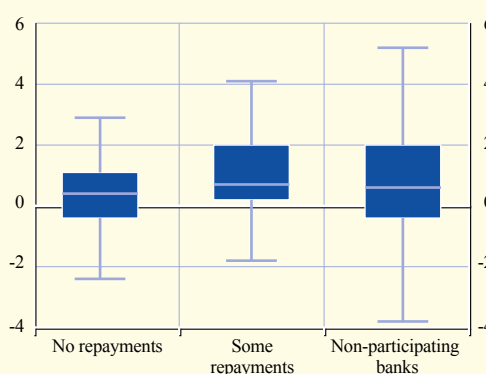


Sources: Fitch and ECB calculations.

Note: The lower blue band represents the 25th percentile of the distribution. The upper blue band represents the 75th percentile. The blue line in the middle is the median. The highest and lowest values represent the maximum and minimum of distribution.

**Chart F Changes in the regulatory Tier I  
capital ratios between December 2011 and  
December 2012**

(percentages)



Sources: Fitch and ECB calculations.

Note: The lower blue band represents the 25th percentile of the distribution. The upper blue band represents the 75th percentile. The blue line in the middle is the median. The highest and lowest values represent the maximum and minimum of distribution.

until the beginning of 2013 and was most likely a major driver of the large repayments that took place in the initial period when the option of repayments was first made possible. Bank funding conditions have continued to improve since the start of 2013, albeit at a slower pace, which is fully consistent with the tailing-off of repayment flows.

The aforementioned findings complement existing evidence showing that improved deposit funding and bond market access are important determinants of early repayment decisions by banks. Repayments, therefore, reflect, to a large extent, an improvement in the financial market environment in the euro area with receding fragmentation since the summer of 2012. At the same time, banks' access to unlimited liquidity provision is being guaranteed by the extension of the fixed rate full allotment procedure for as long as necessary and at least until July 2015, a decision taken on 7 November 2013.

### 3 POTENTIAL FACTORS INFLUENCING THE PATH OF EXCESS LIQUIDITY

Some sources of demand for excess liquidity are likely to wane in the future, while others are expected to persist. Among these sources, some are under the direct control of banks as a result of the liquidity allocation framework adopted since the introduction of the fixed rate full allotment procedure in 2008 and since repayments became possible in 2013. Others, however, relate to autonomous liquidity factors which typically lie outside banks' direct control.

Prudential liquidity regulations could lead to an increase in demand for central bank refinancing. This relates to the fact that collateral eligibility under the Eurosystem's operations is broader compared to the high-quality collateral requirements under the liquidity coverage ratio. At the same time, repayments in the three-year LTROs may increase once the remaining maturity decreases to below one year (i.e. starting from early 2014), because central bank funding of less than one year does not improve banks' maturity profile from a regulatory point of view.

The demand for Eurosystem funding and, therefore, excess liquidity crucially depends on developments in market sentiment. While increasing levels of market turmoil could lead to a higher demand for Eurosystem refinancing, excess liquidity could wane once market confidence improves and market segmentation recedes. Eventually, the decline in the demand for the Eurosystem's refinancing operations could continue if credit conditions and country risks continue to decline and hence banks with a liquidity surplus become more confident about lending to banks with a liquidity deficit. Moreover, the level of money market rates relative to the interest rate of the LTRO can influence the path of repayments and thereby the level of excess liquidity: a higher cost of private funding would, *ceteris paribus*, lead to lower repayments, and vice versa. At the same time, the level of money market rates is endogenous, as the extent of repayments influences the stock of excess liquidity and may, therefore, have an impact on the level of money market rates.

Under the fixed rate and full allotment procedures, temporary increases in the MRO allotment were noted in June, July and November 2013 when banks turned to the Eurosystem to compensate for a temporary deterioration in national money market funding conditions. Since this additional demand was not fully met by the intra-Eurosystem money market transactions owing to market segmentation, recourse to the Eurosystem's operations was necessary to absorb the temporary liquidity shocks. As long as the fixed rate tender procedure with full allotment is in place, excess liquidity conditions might be further prolonged, assuming that banks continue to take recourse to the Eurosystem's refinancing operations to offset temporary liquidity shocks.

In the short term, variations in autonomous factors are the main source of volatility in excess liquidity. Government deposits, in particular, tend to extract large amounts of liquidity from the market (i.e. from banks' current accounts in the Eurosystem) during the tax collection periods. This liquidity is then only released to the market when the national treasuries make payments, such as

**Chart 3 Seasonal patterns of selected autonomous liquidity factors (2008-12)**

(EUR billions)



Source ECB.

Note: The chart shows the deviations from the average outstanding banknotes and government deposits throughout the year.



salary payments or debt redemption.<sup>3</sup> As a result, changes in government deposits do not alter the overall excess liquidity, on average, but can introduce volatility in the short term (see Chart 3). In that respect, banknotes follow a regular seasonal pattern related to the holiday periods during which the demand for physical cash is typically high.

Volatility in excess liquidity triggered by autonomous liquidity factors is not a new phenomenon. However, given the downward trend in excess liquidity, volatility relative to the amount of excess liquidity has risen over recent months, thus increasing the potential to influence money market activity. Moreover, with market segmentation prevailing, intra-euro area flows do not smooth out these domestic shocks as effectively as they did in the past.

#### 4 IMPACT OF EXCESS LIQUIDITY ON EURO AREA MONEY MARKET RATES

Excess liquidity remained high enough to keep very short-term money market rates stable, on average, until about June 2013. Around that time, less abundant liquidity conditions resulted in somewhat more volatile short-term interest rates, especially towards the end of each month. Increased volatility in short-term rates, in turn, complicates the signal extraction process and makes it more complex for market participants to form their expectations about the course of future money market rates.

##### 4.1 MECHANISM OF EXCESS LIQUIDITY TRANSMISSION TO THE MONEY MARKET

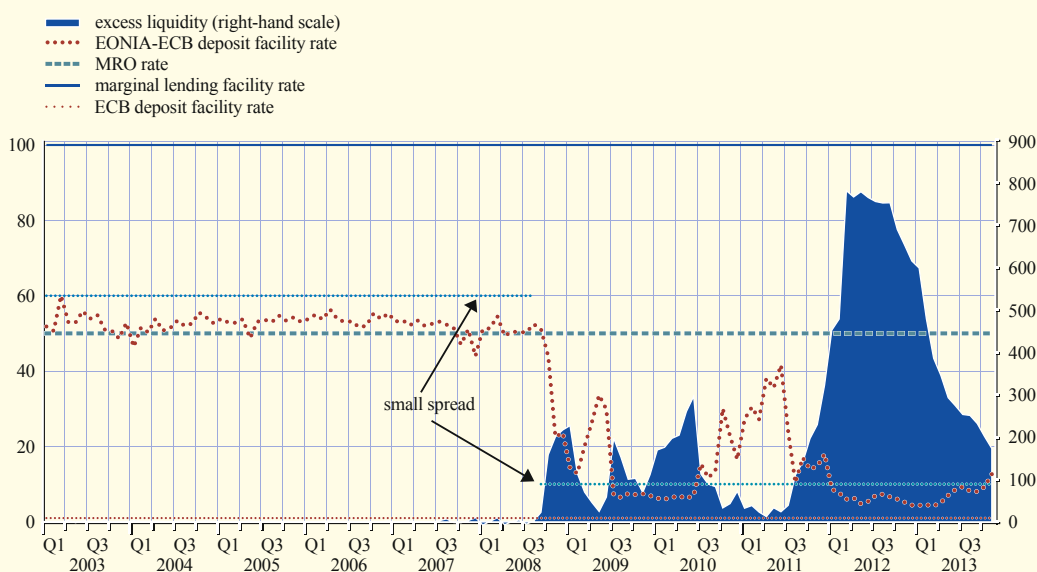
The Eurosystem's monetary policy implementation framework aims to steer very short-term interest rates in line with the policy rate decision of the Governing Council. In the years before the onset of the financial crisis, the achievement of this objective was underpinned by three main elements. First, the level of very short-term rates was steered to a level close to its minimum bid rate through the weekly provision of liquidity in the MRO.<sup>4</sup> Second, the ECB's marginal lending and deposit facilities ensured that short-term money market rates – typically overnight interbank rates – remained in a certain corridor (see Chart 4). Finally, the averaging provision in the fulfilment of the minimum reserve requirements served as a tool to limit fluctuations in short-term rates.

Market participants usually try to anticipate changes in the policy rate in order to determine the rates of other money market maturities. In the euro area, overnight indexed swaps (OIS) are the main instruments used by market participants in order to take a stance on expected central bank decisions. EONIA<sup>5</sup> interest rate swaps indicate the average level at which market participants expect the EONIA to be during one maintenance period – which lasts approximately one month – in the future. For instance, a one-maintenance period EONIA swap for a sixth-month horizon priced in at end-November 2013 indicates the expected average of prevailing EONIA rates six months later. Funding rates, such as the euro interbank offered rate (EURIBOR), typically follow the OIS rates, with a spread reflecting term premia and counterparty risk, as they provide an indication of the short-term cost of funding in the future.

- 3 Some national treasuries actively managed their cash flows by temporarily reinvesting some of their liquidity surplus in the market, which reduces the impact of their operations on excess liquidity. However, this strategy has not yet succeeded in smoothing out the impact of their operations to the full extent.
- 4 The MRO weekly liquidity provision was based on a variable rate tender until October 2008, with a minimum bid rate. The latter is the interest rate below which the Eurosystem would not accept any bids. Thereafter, a fixed rate tender procedure was introduced and the minimum bid rate became the rate at which all bids were allotted.
- 5 The euro overnight index average (EONIA) is the effective overnight reference rate for the euro. It is computed as a weighted average of all of the overnight unsecured lending transactions in the interbank market undertaken in the European Union and the European Free Trade Association countries by a panel of banks.

**Chart 4 EONIA, normalised ECB interest rate corridor and excess liquidity**

(basis points; monthly average in EUR billions)



Source: ECB.

Notes: The EONIA rate is normalised for a constant 100-basis point interest rate corridor. The small spread represents the interval in which the EONIA usually stood compared with the MRO rate up to the third quarter of 2008 and with the ECB deposit facility rate since the third quarter of 2008.

In the pre-crisis period, up to October 2008, the Eurosystem's monetary policy implementation framework was able to steer overnight rates to levels close to the MRO minimum bid rate. Previous estimates have shown that a small spread tends to persist between the EONIA and the MRO rate during that time (see Chart 4), because the EONIA is an unsecured transaction, while the Eurosystem's refinancing operations are collateralised. This spread has been attributed to the credit risk of dealing in the market on an overnight basis and to a degree of uncertainty regarding the distribution of the allotment.

The financial crisis changed the overnight interest rate position in the interest rate corridor when the Eurosystem departed from neutral liquidity conditions (see Chart 4). As a result of excess liquidity, the EONIA was no longer tied to the MRO rate and it decreased to its lowest possible level, a few basis points above the ECB deposit facility rate. This rate provides a lower bound for interest rates in the interbank money market, as banks with access to the deposit facility are unlikely to lend on the money market at a less favourable rate than the deposit facility rate at which they could invest an infinite amount of their excess liquidity. Given the high level of excess liquidity prevailing in 2012, the spread between the EONIA and the ECB deposit facility rate remained in a narrow range between three to ten basis points. This spread could be attributed to the credit risk of dealing with the market compared to depositing liquidity with the Eurosystem.

#### 4.2 HISTORICAL RELATIONSHIP BETWEEN THE EONIA AND EXCESS LIQUIDITY

The EONIA rate increased, on a maintenance-period average basis, to 11.8 basis points as excess liquidity declined to around €168.4 billion on 20 November 2013 in the 11th maintenance period.

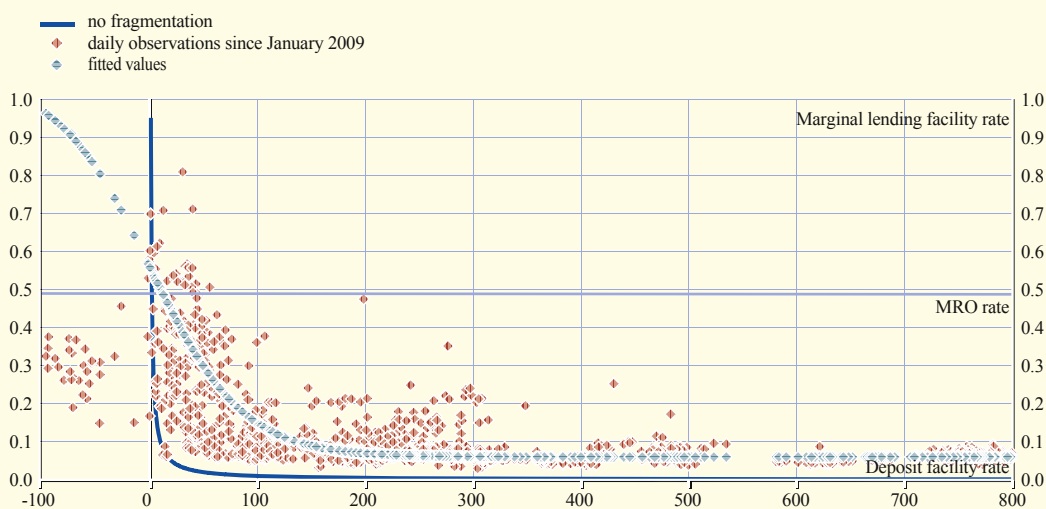
To put the aforementioned changes into perspective but also in order to obtain some guidance on the potential trajectory of the EONIA in an environment of receding excess liquidity, it is useful to resort to empirical evidence on the historical relationship of the two. Chart 5 provides an in-sample fit of a logistic function of the EONIA rate on excess liquidity. The relationship is estimated for the period starting from January 2009 until November 2013. This period was characterised by the fixed rate and full liquidity allotment procedures and a high level of excess liquidity. It also covers a period of pronounced stress in the interbank market and substantial financial turmoil.

Under the assumption of well-functioning money markets, the relationship between very short-term interest rates and excess liquidity should be characterised by a very high degree of sensitivity. In such an environment, relatively low levels of excess liquidity are sufficient to anchor short-term interest rates close to the deposit facility rate. This is because banks with a liquidity surplus have little incentive to hoard liquidity beyond a relatively small cushion, typically held for precautionary reasons, and thus, prefer to lend the remaining part to banks with a liquidity deficit.

However, the responsiveness of money market rates to excess liquidity is also determined by prevailing market conditions and, most importantly, by the extent of fragmentation in the interbank market. An increase in the degree of market fragmentation is typically associated with an increase in the demand for liquidity buffers. Banks accumulate additional liquidity buffers, because they are less confident in the market's ability to absorb liquidity shocks. Hence, during periods of market turmoil and economic distress, banks' insurance demands will rise disproportionately which, in turn, is expected to reduce the share of tradable excess liquidity readily available in the interbank market. Under these circumstances, the sensitivity of very short-term interest rates to excess liquidity declines, rendering the slope of the respective curve less steep compared to normal market conditions.

Chart 5 Historical relationship between the EONIA rate and excess liquidity (2009-13)

(percentage points; EUR billions)



Source: ECB.

Note: The EONIA rate is normalised for a constant 100-basis point corridor.

### 4.3 THE ANCHORING OF SHORT-TERM INTEREST RATES AND VOLATILITY IN RATES

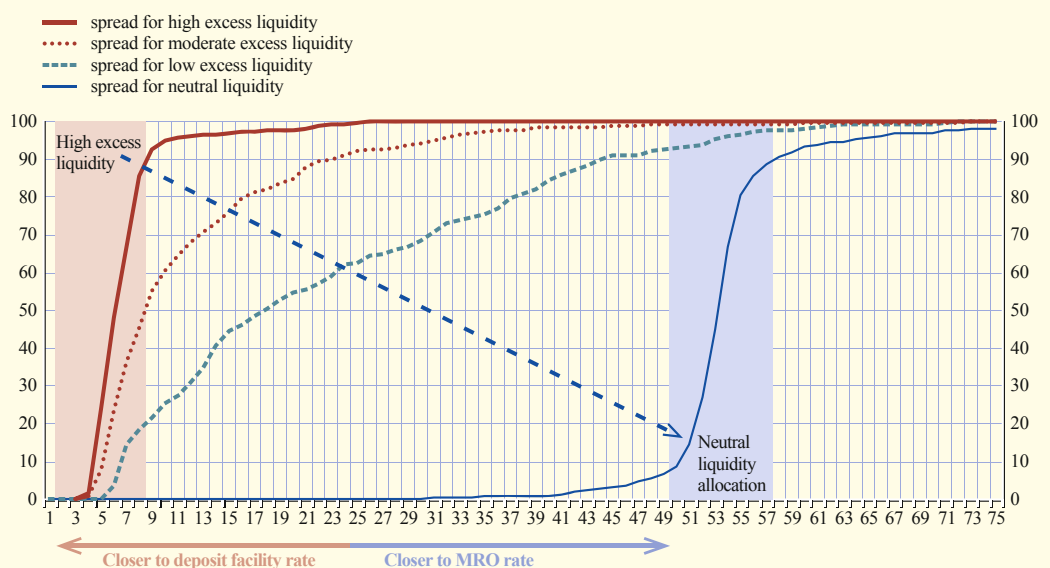
As described above, the anchoring of money market rates works well in environments of neutral liquidity conditions (anchoring to the MRO minimum bid rate) and also in situations with ample excess liquidity (anchoring to the ECB deposit facility rate). Nevertheless, during periods when the stock of excess liquidity is too high to keep overnight market rates close to the MRO rate, but not high enough to keep them close to the deposit facility rate, the formation of expectations about future short-term interest rates becomes more complex.

Chart 6 shows the cumulative distribution of the spread between the EONIA rate and the ECB deposit facility rate for different levels of excess liquidity. Each curve represents the same number of observations in terms of EONIA spreads for declining excess liquidity brackets. The blue curve represents the cumulative distribution of the spread during the entire period during which the neutral liquidity allotment was in place, i.e. until the introduction of the fixed rate full allotment procedure in October 2008. The spread between the EONIA rate and the ECB deposit facility rate is larger than seven basis points more frequently as excess liquidity declines, thereby weakening the link between the ECB deposit facility rate and very short-term money market rates. When excess liquidity reached low levels but liquidity conditions were not yet neutral, this spread tended to be widely – even randomly – distributed within the corridor.

Several factors can make the EONIA deviate from the ECB deposit facility rate in the context of lower excess liquidity. For example, banks prefer not to deal on the market at month-ends and at quarter-ends. In particular, retaining cash around those dates helps banks to present a stronger liquidity position in their financial statements. This leads to a spike in EONIA and repo rates.

**Chart 6 Cumulative distribution of the spread between the EONIA and the ECB deposit facility rate for different levels of excess liquidity (2003-13)**

(basis points; percentages)



Source: ECB.

Note: The EONIA rate is normalised for a constant 100-basis point interest rate corridor.

An aggravating factor is that the size of the end-of-the month spikes depends on the liquidity needs on the market, thus on the stock of excess liquidity, which is difficult to forecast accurately.

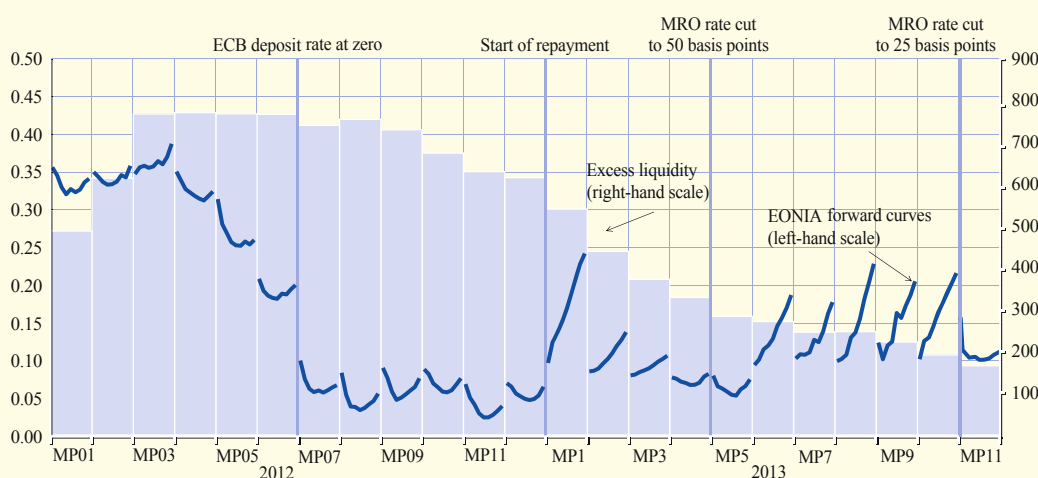
Government deposits can have an impact on money markets, because they create a liquidity cycle that is not fully smoothed out by intra-Eurosystem flows. This tax-induced liquidity cycle is well-known by market participants, but its impact on rates in a segmented market, as well as the exact size of the corresponding liquidity swings, are difficult to forecast. The liquidity impact of tax collections in May, June and July 2013 was particularly pronounced, representing more than 30% of excess liquidity in June 2013. During these months, some of the national treasuries experienced relatively large tax cycles, which resulted in noticeable increases in overnight unsecured and repo rates across local markets. The local impact had spillover effects on the rest of the euro area money market.

#### 4.4 TRANSMISSION OF EXCESS LIQUIDITY DEVELOPMENTS TO MONEY MARKET EXPECTATIONS

If short-term rates were less closely related to the ECB deposit facility rate, market participants would have more difficulties predicting these rates. As a result, expected money market rates are likely to reflect a degree of uncertainty. Day-to-day excess liquidity fluctuations are difficult to forecast accurately, because they remain largely under the banks' direct control and may reflect idiosyncratic liquidity conditions. As a result of the non-linearity in the relationship between excess liquidity and short-term rates, a decline in excess liquidity can lead to a relatively large increase in market rates, while an increase in excess liquidity can have a smaller, dampening effect on rates. This uncertainty should lead to expected rates that are somewhat higher, on average, than the actual or spot rate, as market participants need to be compensated for the risks associated with less predictable overnight rates. For each maintenance period since 2012, Chart 7 presents the curve of average one-maintenance period EONIA swaps up to the ninth maintenance period. The history of this curve illustrates this shift in market focus.

Chart 7 EONIA forward curves and excess liquidity

(percentages; EUR billions)



Sources: ECB and Bloomberg.  
Note: MP stands for maintenance period.

From the ECB deposit facility rate cut in July 2012 to the start of the repayment period in January 2013, the EONIA forward curve was flat, with a slight downward slope for short-dated maturities, which reflected the tendency of the EONIA rate to decline slowly in the context of very high excess liquidity. The December 2012 maintenance-period curve retained the same shape, despite imminent repayments, in part, because of negative rate discussions among policy-makers.

From January to May 2013, higher than expected repayments significantly switched the market focus towards liquidity developments compared to December 2012, as illustrated by the sharp steepening of the curve. However, despite large repayments, the liquidity stock remained large enough to keep overnight rates close to the ECB deposit facility rate, triggering a rapid repricing of the curve in line with stable spot rates in the following two maintenance periods. The flattening process culminated in May 2013 against the backdrop of renewed discussions about negative rates. Since June 2013, improved economic data led the market to price out further rate cuts or liquidity enhancing measures. As a result, the balance of factors that could influence market expectations tilted in favour of higher rates, resulting in a steeper EONIA forward curve. The steepening may also reflect market uncertainty about the path of excess liquidity – although it is still expected to continue to decline over time — and the volatility of excess liquidity. Moreover, contrary to the period from January to May 2013, volatility in rates actually began increasing in June and July and overnight rates could be seen to be less dependent on the ECB deposit facility than previously. Finally, the curve flattened in November 2013 as a consequence of the cut in the ECB's MRO rate to 25 basis points and to the narrowing of the interest rate corridor.

In summary, expectations about future liquidity conditions are an important factor in influencing expectations about money market rates, but they are not the only deciding factor.

## 5 CONCLUSION

Excess liquidity provision by the Eurosystem reached its peak in March 2012. More recently, the improving market conditions have reduced the demand for precautionary liquidity buffers, while reopening access to the wholesale funding market to counterparties that had experienced impairments in market access during 2011. This is reflected in a lower demand for excess liquidity in the Eurosystem's refinancing operations and in the substitution of Eurosystem funding with market funding. As a consequence, euro area banks have been actively using the opportunity for early repayments of the amount borrowed in the three-year LTROs. Demand for liquidity in the other Eurosystem refinancing operations also declined.

Should excess liquidity remain abundant, money market rates would continue to be anchored at levels close to the ECB deposit facility rates. If, however, excess liquidity were to decline towards more neutral conditions, money market rates would tend to be anchored to the MRO rate. Any transition period, as the liquidity provision normalises, would lead to greater volatility, which could imply that short-term rates could become less closely anchored to the ECB deposit facility rate. This would make expectations about future money market rates more complex to interpret, as several factors, such as future liquidity developments and uncertainty, would be priced in overnight index swaps, in addition to expectations about the future path of policy rates.