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### The liquidity management of the ECB

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Alexander Wojt

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# The liquidity management of the ECB

An explanatory note

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March 2014

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# 1. Introduction – ECB’s monetary policy operations

■ The ECB has three main pillars in its operational framework that allows the central bank to steer monetary policy.

- Open market operations
- Standing facilities
- Reserve requirement

■ These tools are key in order to steer interest rates, manage liquidity and signal the monetary policy stance.

**Fig 1. Key operational tools of the ECB**

Monetary policy operation	Type of transaction		Maturity	Frequency	Procedure
	Provision of liquidity	Absorption of liquidity			
<b>Open market operations</b>					
Main refinancing operation	Reverse transactions	--	1 week	Weekly	Standard tenders
Long term refinancing operation	Reverse transactions	--	1 mth, 3 mth, 6 mth, 12 mth, 3 year	Monthly (irregularly)	Standard tenders
Fine tuning operations	Reverse transactions/FX swaps	Reverse transactions/Collection of fixed-term deposits/FX swaps	Non-standardised	Non-standardised	Quick tenders and bilateral procedures
Structural operation	Reverse transactions	Issuance of ECB debt certificates	Standard / non-standard	Regular and non-regular	Standard tenders
	Outright purchases	Outright sales	--	Non-regular	Bilateral procedures
<b>Standing facilities</b>					
Marginal lending facility	Reverse transactions	--	Overnight	Access at the discretion of counterparties	
Deposit facility	--	Deposits	Overnight	Access at the discretion of counterparties	

Source: ECB

# 1. Introduction – liquidity supply and demand

■ The liquidity supply and demand situation in the euro area can be illustrated by looking at a simplified version of the ECB’s balance sheet (Fig 2).

■ On the asset side, the key liquidity providing items can be found, the main refinancing operations (MROs) and the long-term refinancing operations (LTROs).

■ On the liability side, the key liquidity absorbing item is required reserves.

■ The item autonomous liquidity factors can be found both on the asset and the liability side, and consists of a range of items that are normally beyond the ECB’s direct control. They tend to be net liquidity absorbing, and together with the reserve requirement creates a liquidity demand (Fig 3).

■ Under normal circumstances, the ECB offers banks just enough liquidity to meet their demand. During the crisis, when the banking sector became “fragmented”, the ECB gave up some control of money market rates by providing unlimited liquidity provisions.

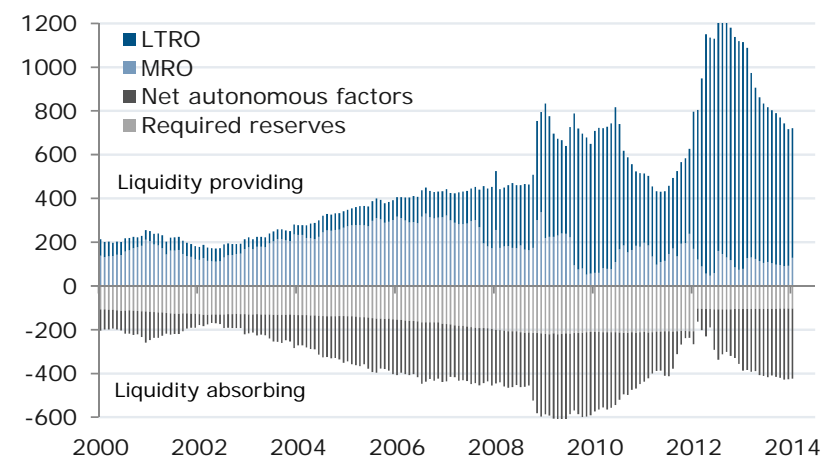
■ This created “excess liquidity” in the banking sector. As banks repay LTROs and excess liquidity gradually declines, the ECB should eventually regain control of money market rates.

**Fig 2. Simplified balance sheet of the ECB**

Assets	Liabilities
<b>Autonomous liquidity factors</b> Net foreign assets	<b>Autonomous liquidity factors</b> Banknotes in circulation Government deposits Other autonomous factors
<b>Monetary policy instruments</b> Main refinancing operation Long-term refinancing operation Marginal lending facility	<b>Current account holdings</b> Required reserves Excess reserves
	<b>Monetary policy instruments</b> Deposit facility

Source: ECB

**Fig 3. Main liquidity components**



Source: Nordea & Ecwin

## 2. Liquidity demand – reserve requirement

- Credit institutions in the euro area are obliged to hold deposits on accounts with their national central banks (called "*minimum reserves*" or "*required reserves*").
- The reserve requirement is calculated as the reserve ratio times the reserve base (Fig 4), where the reserve base is defined in relation to elements on each institution's balance sheet.
- The reserve ratio was originally set to 2% but was cut to 1% in early 2012 (reducing the reserve stock from around EUR 200bn to EUR 100bn, Fig 5).
- The remuneration of reserves is set to the average of the marginal rate of allotment (over the maintenance period) of the MROs.
- The penalty rate for deficiencies is set to the remuneration rate plus 3%-units.
- The reserve requirement has constituted of about 50% of the total liquidity need in the euro system since the introduction of the euro.
- Banks can still put money in the current account after having fulfilled the reserve requirement. This is called excess reserves and is not remunerated.
- Thus, the current account equals required reserves plus excess reserves.

Fig 4. Euro area reserve base

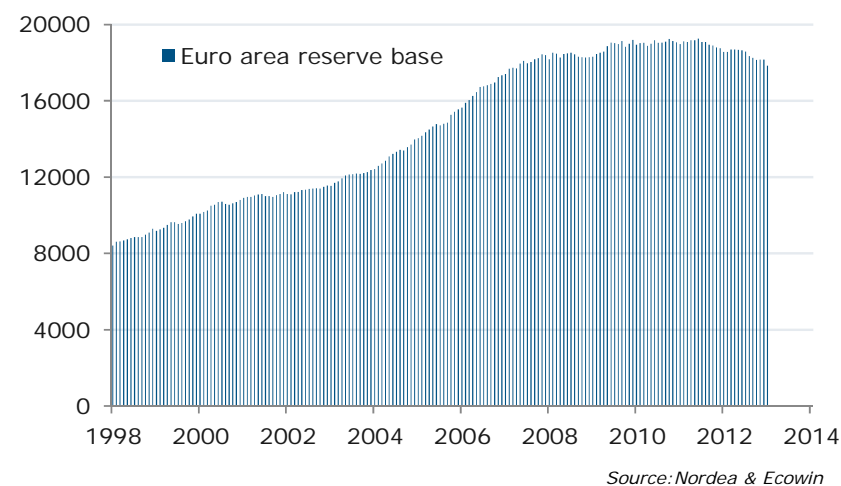
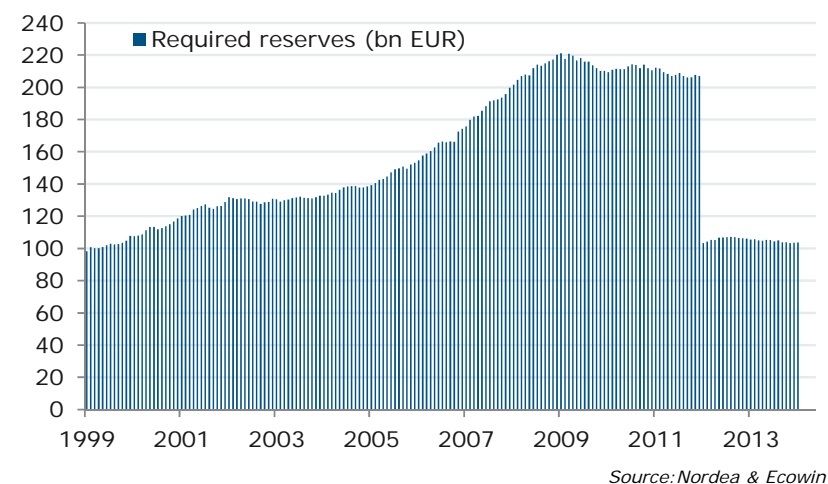


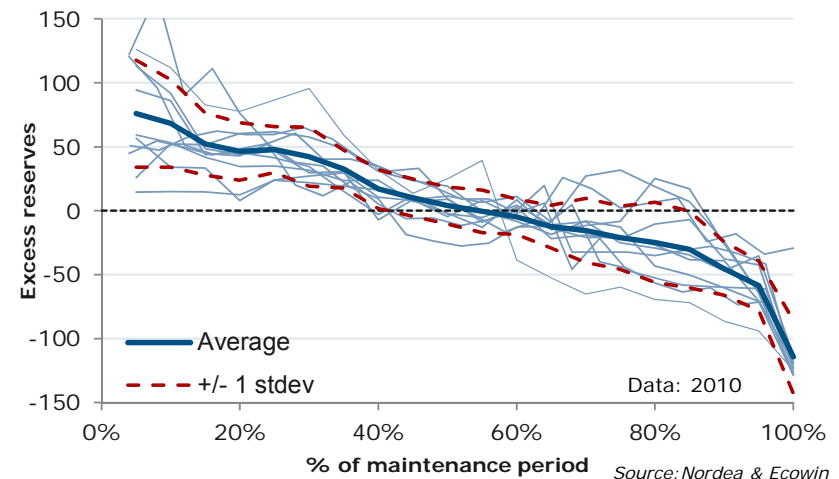
Fig 5. Aggregate euro area reserve requirement



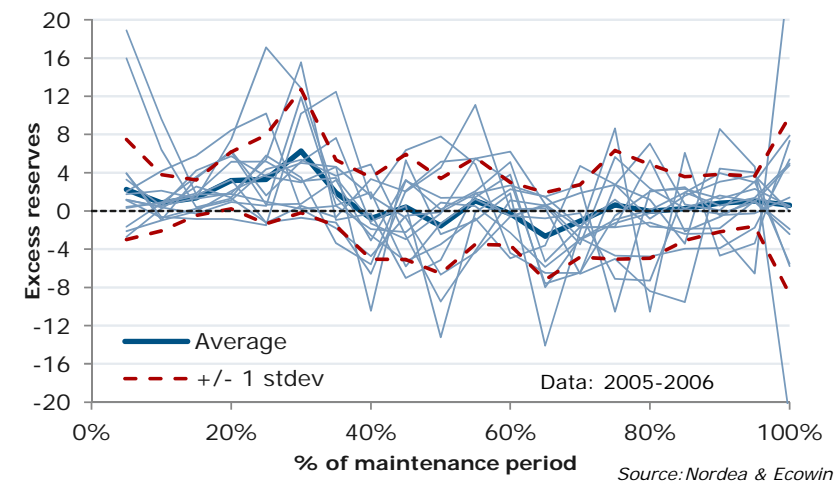
## 2. Liquidity demand – reserve requirement: averaging provision

- The averaging mechanism allows credit institutions to fulfill the reserve requirement on average over the maintenance period (one month period in-between ECB meetings), and not necessarily on each day.
- This aims to make sure that temporary liquidity shocks don't necessarily lead to significant changes in the overnight rate.
- After the financial crisis struck, banks had a tendency to front-load reserve payments in order to fulfill the requirement early in the maintenance period (Fig 6).
- The ECB could then absorb the excess liquidity in the end of the maintenance period through fine tuning draining operations, which caused a heart-beat EONIA pattern.
- This stands out to the behavior of banks before the financial crisis (Fig 7), when front loading was neither possible in the same way nor needed.
- In fact, in 2007, the ECB started assisting this front loading process by offering more liquidity early in the maintenance period and less in the end, in order to allow banks to fulfill their reserve requirements early. The net liquidity balance would however remain at zero.

**Fig 6. Reserve requirement front loading in 2010**



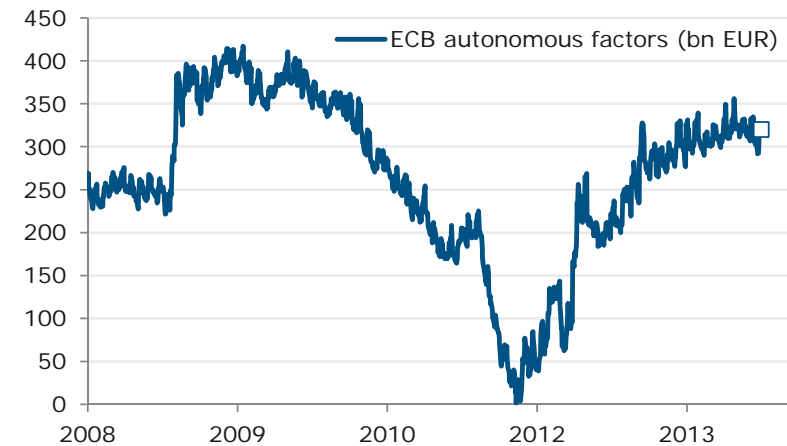
**Fig 7. No chance (or need) to front load before 2007**



## 2. Liquidity demand – autonomous factors

- The autonomous factors (Fig 8) are items on the ECB's balance sheet that are not in the direct control of the central bank.
- These tend to be the most important drivers of short term liquidity changes.
- The ECB publishes weekly estimates of the average amount of autonomous factors. Before the policy of fixed rate full allotment in the MROs/LTROs started, these estimates were important in order to assess how much liquidity the banking system was in need of each week.
- There are many components of autonomous factors, but the ECB singles out two, banknotes in circulation and government deposits as particularly important due to their volume, volatility and evolution over time.
- For more details of the autonomous factors, please see the Appendix.

**Fig 8. Development of autonomous factors**



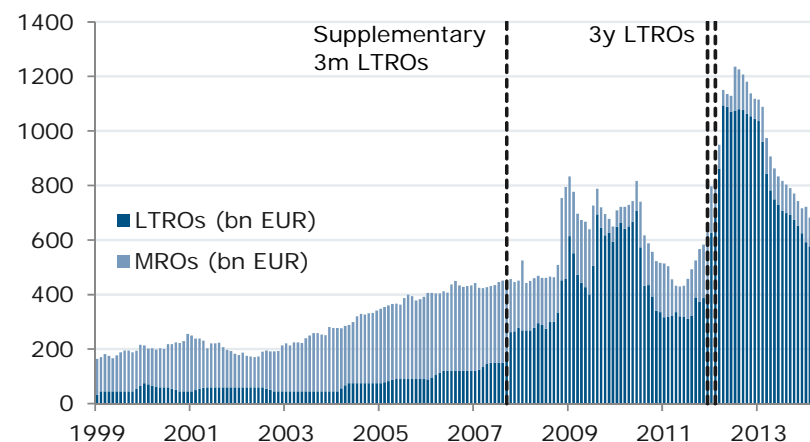
Source: Nordea & Ecowin



### 3. Liquidity supply – main refinancing operations

- Originally, the main refinancing operations (MROs) were intended to be the main liquidity supply source of euro area financial institutions (Fig 9).
- Before the financial crisis, the ECB allotted a specific amount of money in the MROs to meet the liquidity need of the banking system each week (reason why forecasts of the autonomous factors were needed).
- This was among the most important monetary policy signaling instruments, as the minimum bid rate in these weekly reverse operations was set to the refi rate.
- During the financial crisis, it got harder to estimate the liquidity need of the banking system and the variable rate (fixed amount) procedure was changed to a fixed rate full allotment procedure (Fig 10), where the liquidity demand in the MROs was always met.

**Fig 9. MRO and LTRO development**



Source: Nordea & Ecwin

**Fig 10. Different open market operation policies**

Period	Policy
Jan 1999 - June 2000	Fixed rate (without full allotment)
Jul 2000 - Oct 2008*	Variable rate
Oct 2008 -	Fixed rate (with full allotment)

\* Two changes to the operational framework in 2004

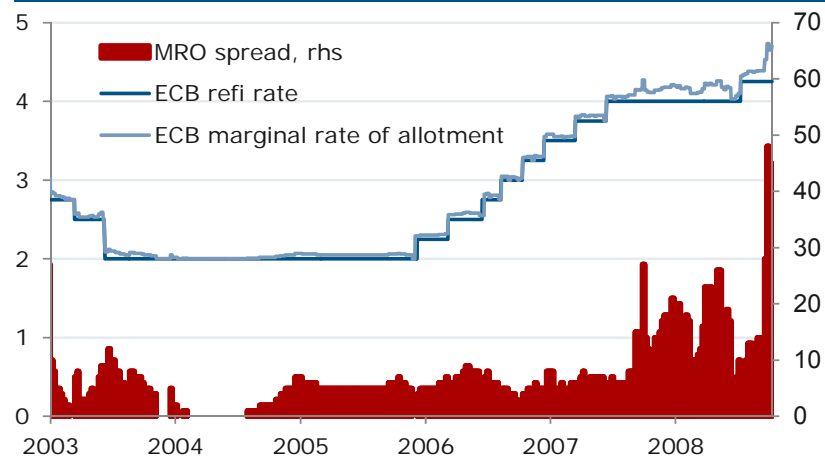
i) Tenor of MROs reduced from two weeks to one week

ii) Commitment that rate changes would not occur during maintenance periods

### 3. Liquidity supply – MROs: fixed vs variable rate

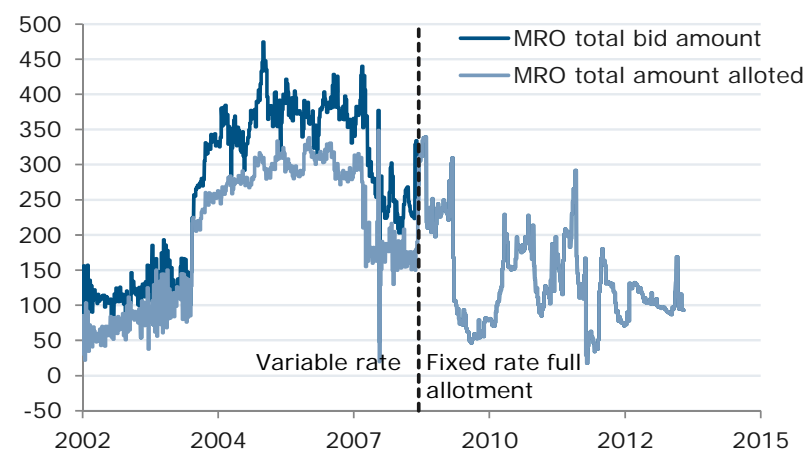
- Two MRO (and LTRO) policies have been conducted over the past decade, variable rate and fixed rate full allotment.
- Before the crisis, banks could bid for a specific amount of money on offer each week (the amount the ECB estimated was needed).
- The minimum bid rate was set to the refi rate but the highest bid rate was often a couple of bps above this rate.
- This gave rise to a spread between the refi rate and the marginal rate of allotment in the MROs.
- During the crisis, it got increasingly difficult for the ECB to estimate the liquidity need of the banking system, and this MRO spread got higher and more volatile (Fig 11).
- As a result, the ECB decided to switch from a variable rate procedure to a fixed rate full allotment procedure, where all the bids of banks were satisfied (Fig 12).

**Fig 11. MRO spread picking up during the financial crisis**



Source: Nordea & Ecowin

**Fig 12. All bids accepted during fixed rate full allotment**

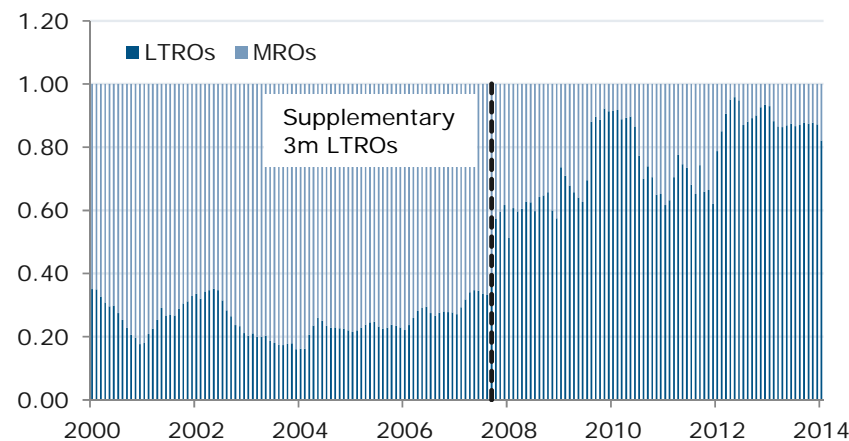


Source: Nordea & Ecowin

### 3. Liquidity supply – LTROs

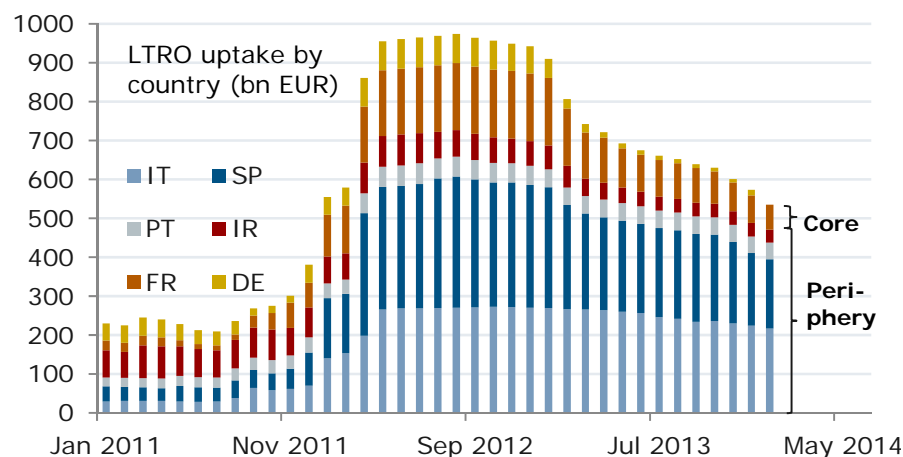
- Since the beginning of the financial crisis, the importance of long-term refinancing operations (LTROs) has grown.
- Before the crisis, they corresponded to about 20-30% of all the liquidity supply, but this number has increased to about 70-90% during the past years (Fig 13).
- Originally, the ECB offered three month operations each month (similar to the MROs).
- This changed after the onset of the financial crisis and LTROs with different maturities were introduced (1 month, 6 month, 1 year and 3 year).
- The 3 year LTROs, initiated in 2012, were of particular importance to the banking system, as the amount of excess liquidity was drastically increased.
- The main users of the 3 year LTROs were Italian and Spanish banks (Fig 14).

**Fig 13. Fraction of MROs and LTROs**



Source: Nordea & Ecwin

**Fig 14. LTRO by country**

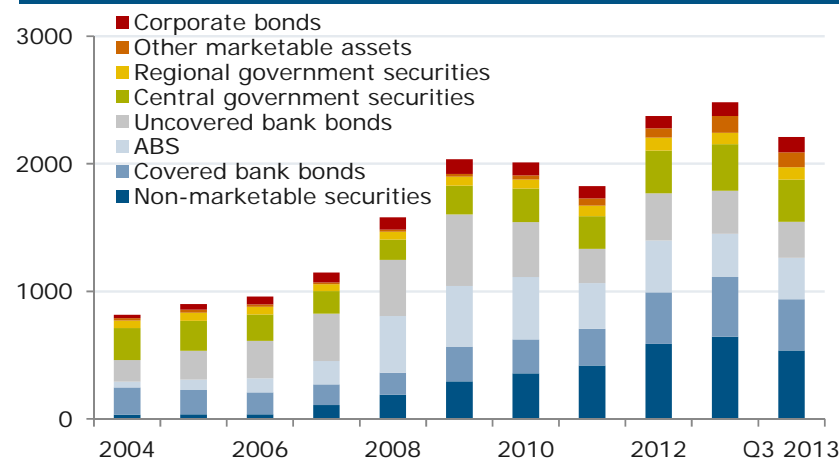


Source: Nordea, Ecwin & Bloomberg

### 3. Liquidity supply – collateral usage in open market operations

- The ECB provides liquidity through the MROs and LTROs on a collateralized basis.
- The range of securities allowed in its operations have been widened all through the crisis, partly in an attempt to boost lending.
- During the past decade, the use of non-marketable securities in particular has increased as collateral used in ECB operations (Fig 15). The ECB doesn't provide a list of eligible non-marketable assets, but instead leaves it up to the national central banks to assess the eligibility of these assets.
- Non-marketable assets are usually less liquid, and could for example be fixed term deposits or retail mortgage-backed debt instruments.
- In its latest collateral review, the ECB lowered the rating requirement on ABSes and also reduced the haircut. Draghi said that the overall effect would be neutral though, as the haircut on "own use" covered bonds would be raised.
- The ECB conducts a collateral review on a bi-annual basis.

Fig 15. Collateral used in ECB operations



Source: Nordea & Macrobond

## 4. Standing facilities – lending and deposit facility

- The ECB offers two standing facilities, the deposit facility and the marginal lending facility, creating the rate corridor around the refi rate.
- Banks can borrow money overnight at the marginal lending facility (at 0.75%) and lend money overnight through the deposit facility (at 0%).
- The introduction of the 3 year LTROs significantly increased the supply of money in the banking system and resulted in increased usage of the deposit facility.
- The marginal lending facility has historically been used infrequently (Fig 16).
- When the ECB cut the deposit rate to zero, there was no need for banks to move money from the current account (required reserves + excess reserves) to the deposit facility, as money yielded zero percent no matter on what account it was put. That increased the amount of excess reserves and reduced the amount of money in the deposit facility (Fig 17).

Fig 16. Deposit and lending facility usage

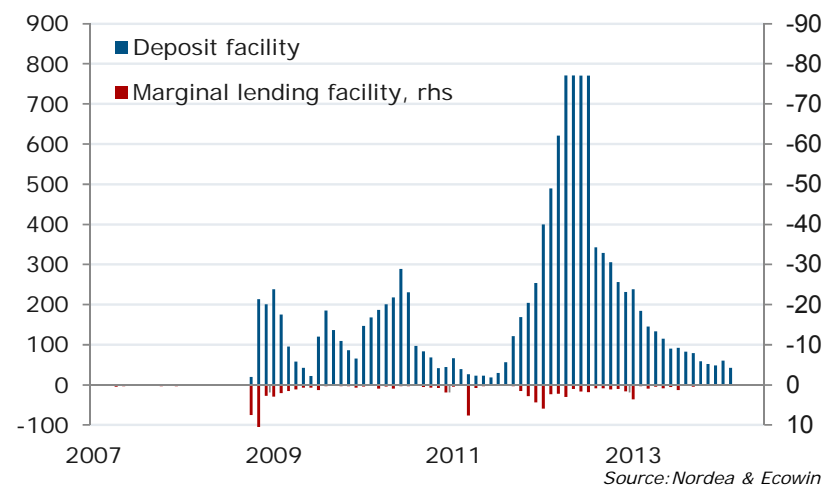
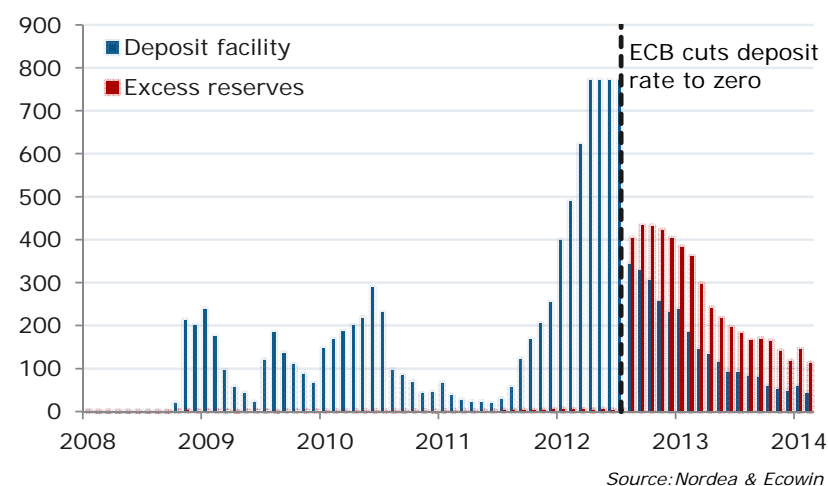


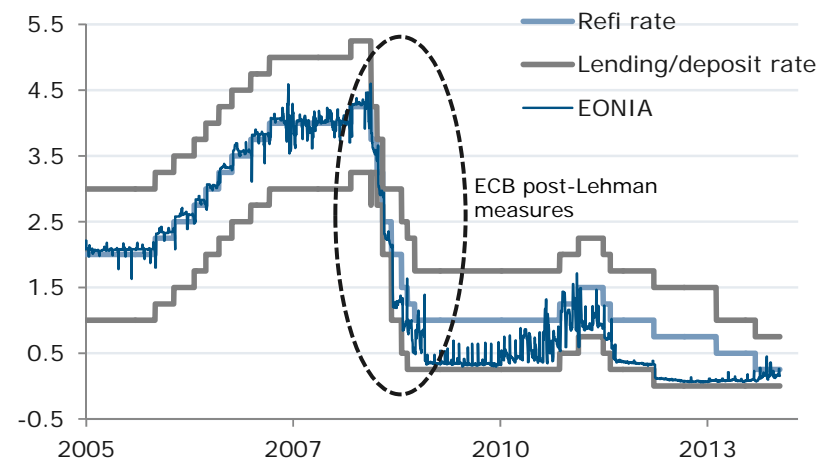
Fig 17. Shift from deposit facility to current account



## 5. Liquidity management and short rates – the EONIA/refi rate decoupling

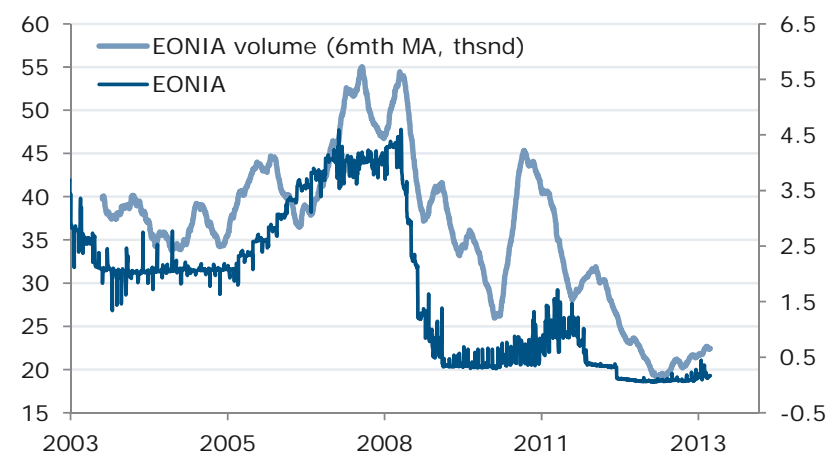
- The anchor of the term structure of euro interest rates is the EONIA index (Euro OverNight Index Average).
- EONIA is “an effective overnight rate computed as a weighted average of all overnight unsecured lending transactions in the interbank market in euro”.
- Before the onset of the financial crisis, EONIA traded on average a couple of bps above the refi rate.
- When Lehman went bankrupt, the ECB used a range of conventional and unconventional measures in order to calm liquidity tensions, including cutting the refi rate by 325bps, fulfilling all the liquidity needs in the open market operations, introducing additional LTROs as well as new dollar operations.
- The sudden increase in liquidity supply made the EONIA decouple from the refi rate (Fig 18).
- EONIA volume also decreased (Fig 19), partly because central bank financing got cheaper, but also due to fragmentation in the euro area banking system.

Fig 18. EONIA decoupling from refi rate in 2008



Source: Nordea & Bloomberg

Fig 19. EONIA volume at low levels



Source: Nordea & Bloomberg

## 5. Liquidity management and short rates – excess liquidity

- Excess liquidity is defined as the liquidity supply minus the liquidity need for euro area banks. In essence, it can be calculated as excess reserves plus money in the deposit facility minus money borrowed in the marginal lending facility.
- Thus, when banks have taken what they can in the MROs and LTROs and paid what they have to for the reserve requirement and the autonomous factors, what is left is the excess liquidity.
- The increase in excess liquidity has been one of the main reasons why EONIA is trading below the refi rate.
- The relation between excess liquidity and EONIA is rather vague, but over the last decade there has been somewhat of a negative relation between the two (Fig 20).
- As parts of the 3y LTROs are each week being repaid, excess liquidity has been on a declining trend for the past year (Fig 21).
- Short term however, changes in excess liquidity are rather due to changes in autonomous factors.
- Looking ahead, if the ECB gradually normalizes monetary policy during the years to come, excess liquidity should keep declining and EONIA should recouple with the refi rate.

Fig 20. Relation between excess liquidity and EONIA

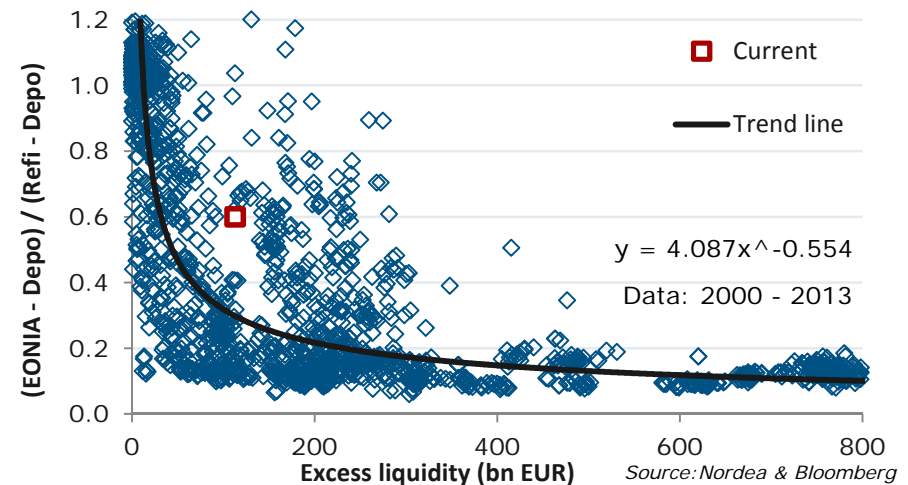
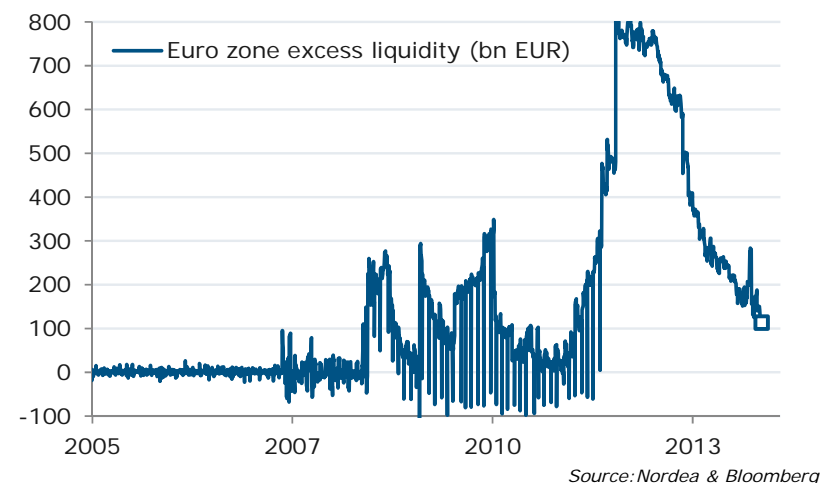


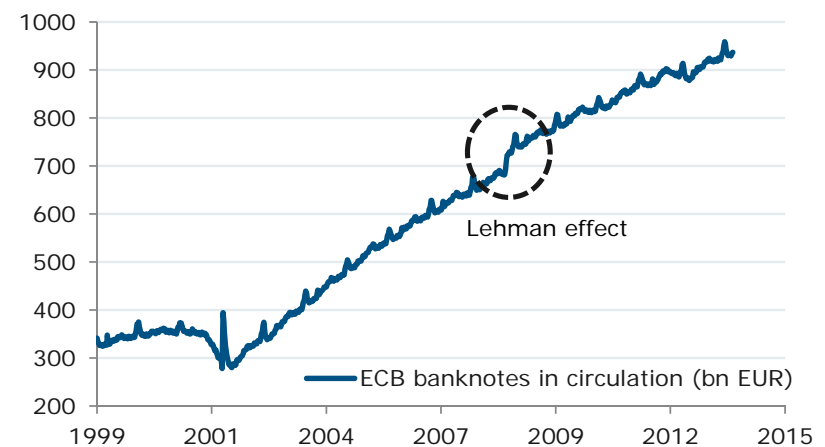
Fig 21. Excess liquidity



## 6. Appendix – autonomous factors (constituents – banknotes in circulation)

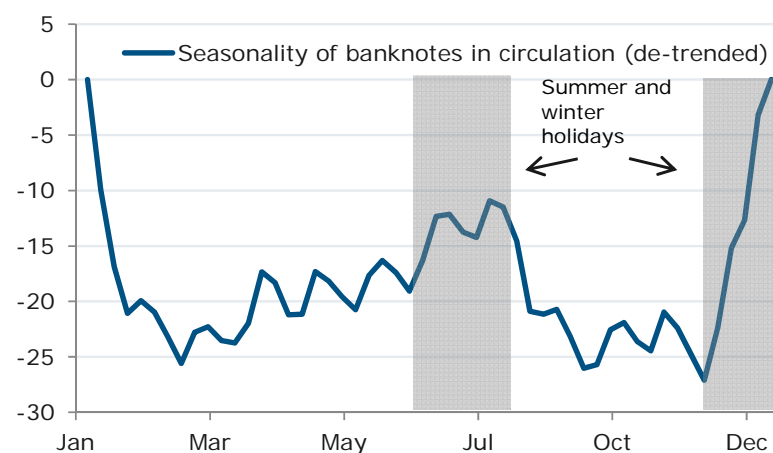
- There are several items included under the balance sheet item autonomous factors, but the ECB highlights two, banknotes in circulation and government deposits, as particularly important. On this slide we focus on the first, banknotes in circulation.
- The euro currency was virtually born in 1999 and the first physical series was circulated in 2002.
- The value of euro banknotes and coins in circulation has steadily been rising since, with a notable pick-up in 2008, after Lehman went bankrupt (Fig 22).
- The notable growth trend tends to be explained by (i) the increasing usage of euro banknotes abroad (compared to the euro area legacy currencies) and (ii) the low interest rates that reduces the opportunity cost of holding cash.
- Banknotes in circulation also exhibits a strong seasonal pattern, where people tend to withdraw money during holiday periods, in particular during the Christmas season (Fig 23). This seasonality pattern however tends to be volatile and difficult to predict.

**Fig 22. Steady growth of banknotes in circulation**



Source: Nordea & Bloomberg

**Fig 23. Seasonality of banknotes in circulation**



Data: 2005-2013

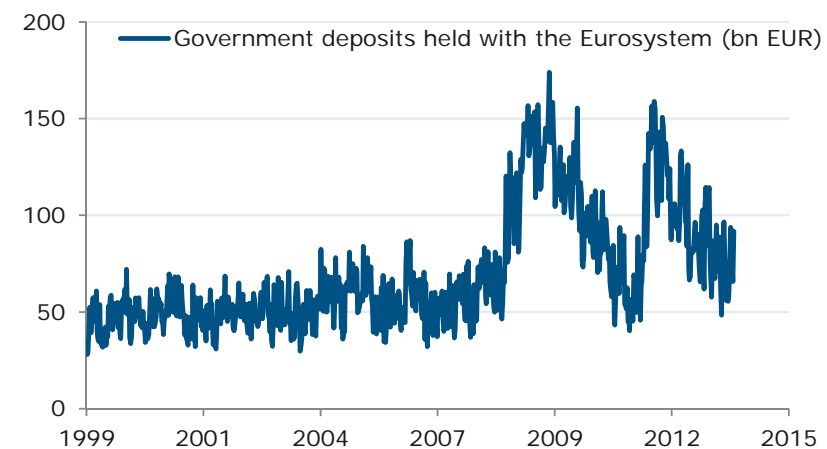
Source: Nordea & Bloomberg



## 6. Appendix – autonomous factors (constituents – government deposits)

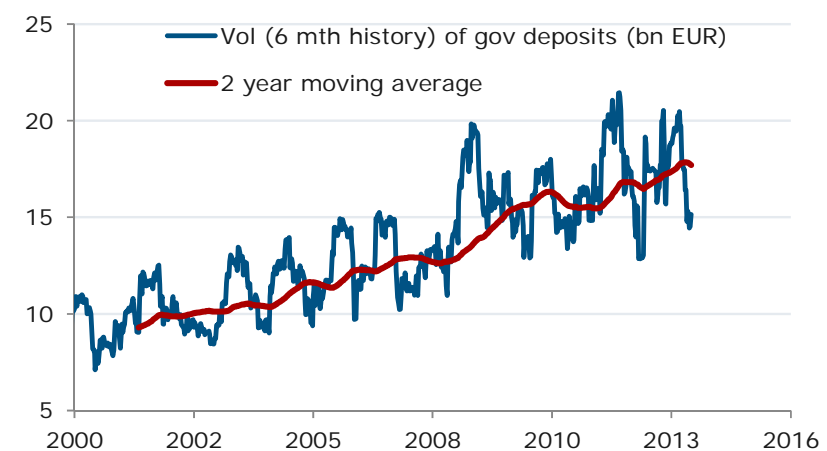
- According to the ECB, a large part of the forecast error of the autonomous factors are caused by volatility in government deposits held with the euro system (Fig 24).
- The highest volatility of government deposits is traditionally seen in Italy, followed by Spain and Ireland. This is due to each country's institutional framework.
- Changes in government deposits usually occur when tax is transferred from banks to the government's account with the national central bank. It also tends to be related to bond issuance.
- The volatility of government deposits tends to be large and has been increasing during the past decade (Fig 25).
- Forecasts of changes in government deposits are notoriously difficult to make, and may also be affected by social security and pension payments.
- In Italy, banks transfer tax payments to the government's account around the 19-23 each month, and liquidity consequently has a tendency to be scarcer during this period. Tax payments are usually larger during June and July (personal income tax) and during August and December (corporate tax).
- Pension and interest rate payments occur on the first business day each month and liquidity conditions thereby tends to ease.

**Fig 24. Development of government deposits**



Source: Nordea & Bloomberg

**Fig 25. Increasing volatility of government deposits**

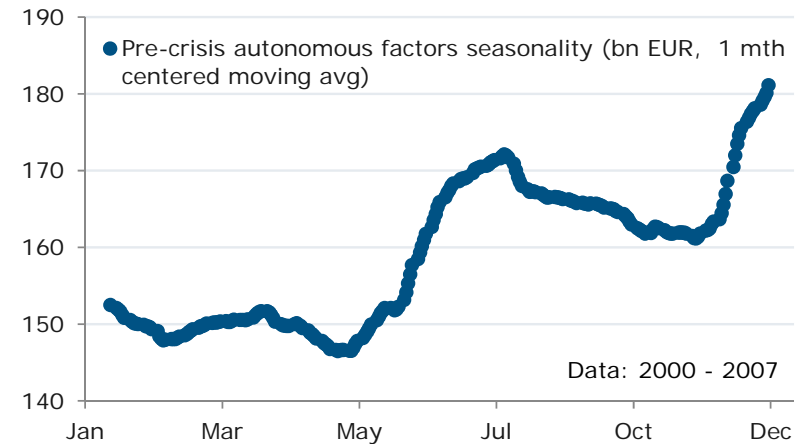


Source: Nordea & Bloomberg

## 6. Appendix – autonomous factors (seasonality)

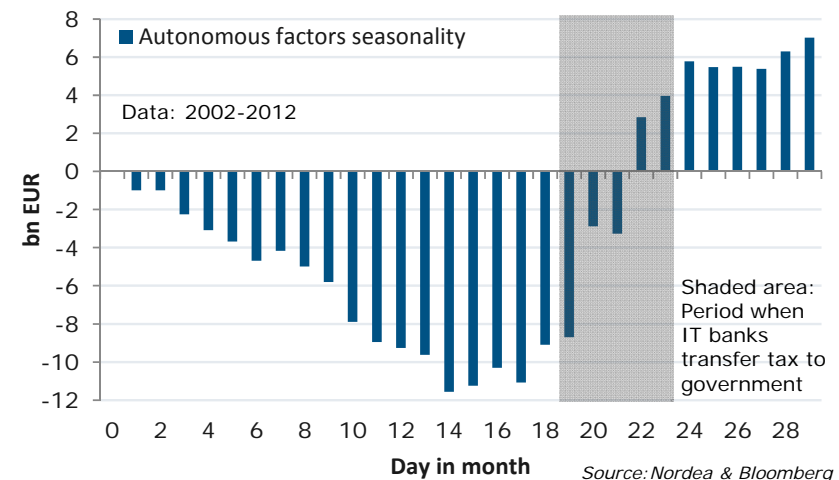
- The seasonality in both banknotes in circulation and government deposits described on previous pages give rise to seasonality in autonomous factors.
- On a yearly basis, autonomous factors tend to increase during the summer and in the end of the year (and the liquidity need thereby increases, Fig 26).
- Intra-month seasonality can also be observed, and during the days when Italian banks transfer tax to the government liquidity usually tightens (Fig 27).

**Fig 26. Autonomous factors yearly seasonality**



Source: Nordea & Bloomberg

**Fig 27. Autonomous factors intra-month seasonality**

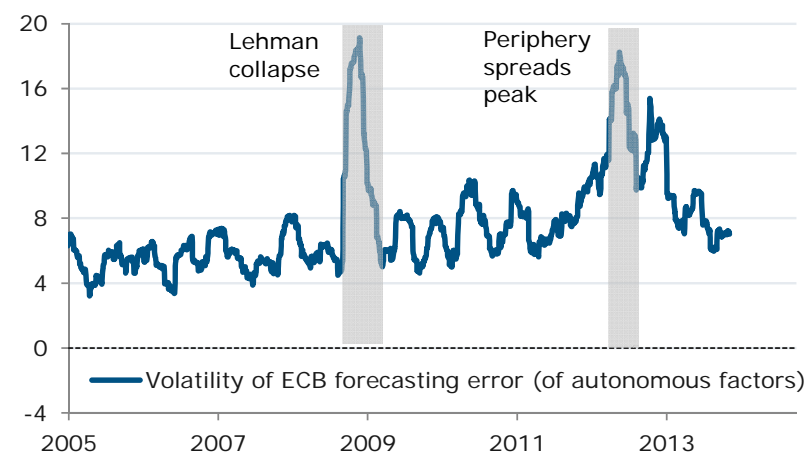


Source: Nordea & Bloomberg

## 6. Appendix – autonomous factors (ECB forecasts)

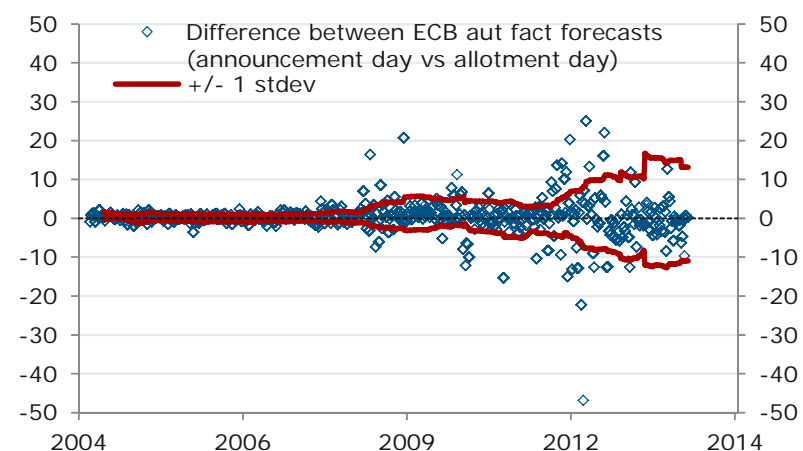
- Internally, the ECB makes forecasts for all components of the autonomous factors, using data provided by the national central banks. However, only an aggregate number covering all autonomous factors is presented to the public.
- The ECB published two sets of forecasts of autonomous factors, usually one on Mondays and a second one on Tuesdays. The forecasts run to the day before the settlement of the next MRO.
- The ECB has been quite successful in forecasting autonomous factors. However, during the Lehman crash in 2008 and during the euro zone crisis forecast errors turned more volatile (Fig 28).
- In addition, the changes between the first and the second autonomous factor forecast have grown over the last couple of years, suggesting it is harder to assess the liquidity need of the euro system (Fig 29).
- The difficulty of forecasting autonomous factors is likely one of the reasons why the variable rate policy in the open market operations was replaced by the fixed rate full allotment policy as liquidity need got more difficult to estimate during turbulent times.

**Fig 28. Volatility of aut. fact. forecasting error**



Source: Nordea & Ecwin

**Fig 29. Difference between 1st and 2nd aut. fact. fcast**

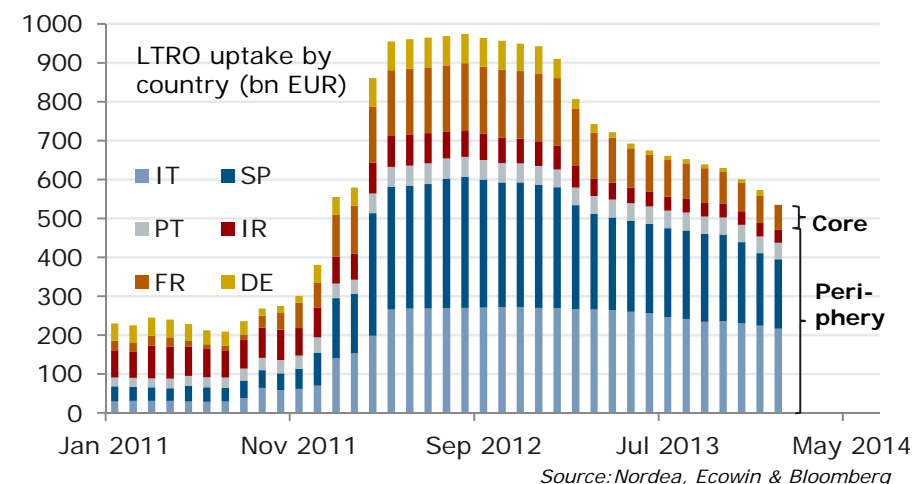


Source: Nordea & Ecwin

## 6. Appendix – 3y LTRO

- The 3 year LTROs have gotten particular attention due to the large uptake (around EUR 1bn gross), resulting in a significant increase in excess liquidity.
- Usage was dominated by peripheral banks, in particular from Spain and Italy (Fig 30).
- Two years ahead of maturity, banks had the option to repay money in the 3y LTROs early. At the moment, around half the gross amount has been repaid (Fig 31).

**Fig 30. LTRO by country**

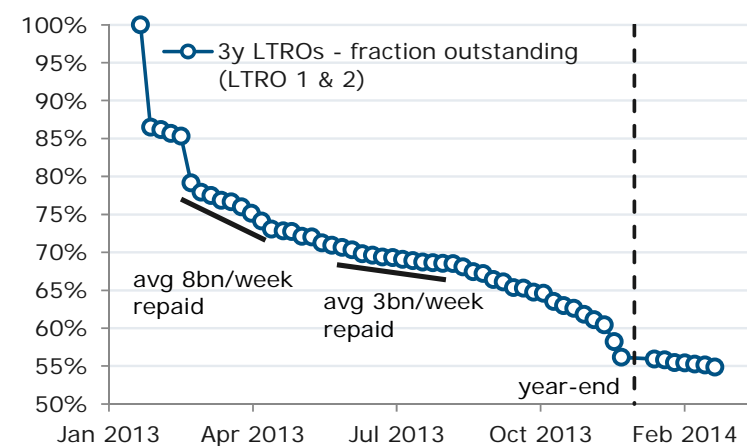


**Fig 32. Details of 3y LTROs**

	LTRO 1	LTRO 2
Announcement date	20 Dec 2011	28 Feb 2012
1st repayment date	30 Jan 2013	27 Feb 2013
Maturity	29 Jan 2015	26 Feb 2015
Participating banks	523	800
Gross amt	489 bn	530 bn
Net amt*	200 bn	300 bn
Rate	Avg refi rate over period	
Core uptake*	30%	20%
Periphery uptake*	70%	80%

\* estimate

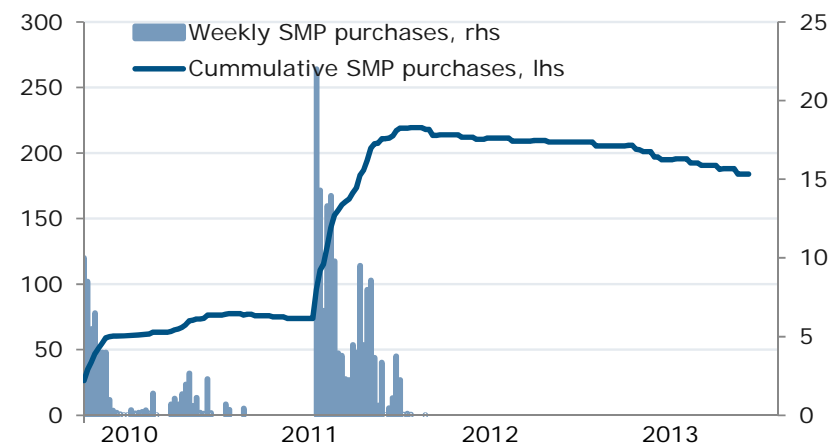
**Fig 31. 3y LTRO repayment pattern**



## 6. Appendix – SMP draining auctions

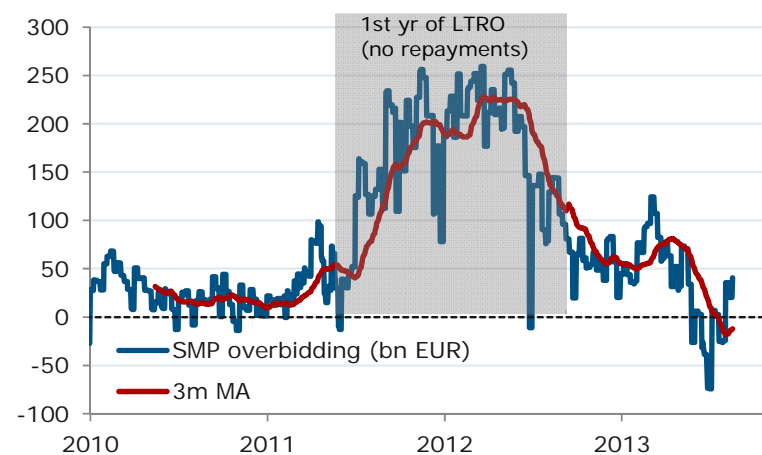
- Under the Securities Market Program, the ECB bought peripheral bonds in order to address tensions in certain market segments that hindered the transmission mechanism.
- In order not to make the program an outright quantitative easing tool, the ECB decided to carry out weekly draining auctions in order not to influence money supply.
- Each week, the ECB aims to drain the same amount of money that is still outstanding in the SMP program (around EUR 180bn at the moment).
- This has gotten increasing attention lately as a number of sterilization auctions around year-end failed (Fig 34) and there has been speculation that a suspension of SMP sterilization would ease money market conditions.

**Fig 33. SMP purchases and total volume**



Source: Nordea & Bloomberg

**Fig 34. SMP overbidding**



Source: Nordea & Ecowin

## 6. Appendix – Bloomberg <ECB> GO 18 (Liquidity)

13:46 **ECB LIQUIDITY POSITION** Page 1 / 2

SECURITY	TICKER	Last Pri	DATE	PREVIOUS	DATE	PCT CHNG	FREQ
<b>Liquidity Conditions</b>							
3) Res. Requirement	ECBLRERE	102833	03/03/14	102833	02/28/14	.00	Intraday
4) Curr Acc Holding	ECBLCAHO	208332	03/03/14	187393	02/28/14	11.17	Intraday
5) MLF Recourse	ECBLMARG	673	03/03/14	776	02/28/14	-13.27	Intraday
6) DEF Recourse	ECBLDEPO	29748	03/03/14	29371	02/28/14	1.28	Intraday
7) Liquid aut fact	ECBLALIQ	304408	03/03/14	325828	02/28/14	-6.57	Intraday
<b>Liquidity Providing</b>							
11) Net Assets	EULPNA	532.7	01/31/14	550.8	12/31/13	-3.3	Monthly
<b>Policy Operations</b>							
13) Main Operations	EULPMRO	129.3	01/31/14	91.6	12/31/13	41.2	Monthly
14) Long Term Ops	EULPLTRO	592.1	01/31/14	625.3	12/31/13	-5.3	Monthly
15) Marginal Lending	EULPMLF	.3	01/31/14	.1	12/31/13	200.0	Monthly
16) Other Operation	EULPOLPO	236.8	01/31/14	241.5	12/31/13	-1.9	Monthly
17) Deposit Facility	EULPDF	60.1	01/31/14	48.3	12/31/13	24.4	Monthly

Reserve requirement, [p. 5-6](#) →

Excess + required reserves, [p. 5](#) →

Marginal lending facility & deposit facility, [p. 12](#) →

Autonomous factors, [p. 7](#) & [Appendix](#) →

See \* below →

MRO, [p. 8-9](#) →

LTRO, [p. 10](#) →

Marginal lending facility (monthly data), [p. 12](#) →

Deposit facility (monthly data), [p. 12](#) →

SMP + Covered bond program, [p. 20](#)

\* Net foreign assets is defined "as the difference between the stock of foreign assets held by domestic residents and the stock of domestic liabilities held by foreign residents"

## 6. Appendix – Bloomberg <ECB> GO 18 (Liquidity)

	<b>Liquidity Absorbing</b>								
Notes in circulation, <a href="#">p. 15</a> →	19)Notes in Circ.	EULPBNIC	947.9	01/31/14	925.9	12/31/13	2.4	Monthly	
Government deposits, <a href="#">p. 16</a> →	20)Govt Deposits	EULPCGDE	61.2	01/31/14	80.2	12/31/13	-23.7	Monthly	
Includes liquidity absorbed as a result of the Eurosystem's FX swap operations →	1)Other Factors	EULPOF	24.7	01/31/14	57.2	12/31/13	-56.8	Monthly	
	2)Other Operations	EULPOLAO	149.3	01/31/14	177.4	12/31/13	-15.8	Monthly	
	<b>Credit Institutions</b>								
Excess + required reserves, (monthly data) <a href="#">p. 5</a> →	5)Current Account	EULPCICA	248.1	01/31/14	220.2	12/31/13	12.7	Monthly	
	<b>Base Money</b>								
Currency in circulation plus the reserve requirement plus any excess reserves in the current account or in the deposit facility →	7)Base Money	EULPBM	1256.0	01/31/14	1194.4	12/31/13	5.2	Monthly	
One of the components within autonomous factors ( <a href="#">p. 7</a> & <a href="#">Appendix</a> ) that is not specified in detail									

## 6. Appendix – sources and recommended reading

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- *" The implementation of monetary policy in the euro area: General Documentation on Eurosystem monetary policy instruments and procedures"*
- *" The monetary policy of the ECB"*
- *" The Liquidity Management of the ECB"*
- *" The ECB 's operations amid the financial turmoil: experience and policy lessons"*
- *" Liquidity management under market turmoil: experience of the European central bank in the first year of the 2007-2008 financial market crisis"*
- *" The liquidity management of the Eurosystem during the period of financial turmoil"*
- *" The Euro Overnight Interbank Market and ECB 's Liquidity Management Policy During Tranquil and Turbulent Times"*



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