

The Eurosystem operational framework, use of collateral and liquidity distribution in the euro area: towards a single interbank market?*

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1. Introduction

The aim of this paper is to study the effects of single monetary policy in the euro area on the structure of European interbank markets and bank treasury management. Accordingly, I have analysed monetary policy instruments in the Eurosystem operational framework, focusing on 'repo auctions', minimum reserves and the use of standing facilities. After more than five years of single monetary policy, it can be said that the Economic and Monetary Union (EMU) successfully engineered the path from conception to realisation of uniform liquidity conditions in the euro area, as a prerequisite for correct implementation of the European System of Central Banks (ESCB) monetary policy. Nevertheless, both the way certain monetary policy operations were managed by the European Central Bank (ECB) – above all the 'main refinancing operations' – and the difficulties in gaining access to cross border interbank markets for the small and medium European banks led to various anomalies in treasury management choices. These apparent inefficiencies are extensively investigated in this paper.

My research then goes on to point out the use of collateral in Eurosystem operations, describing the differences in tier 1 and 2 lists

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and highlighting the cross border differences in tier 2 lists. These differences have a significant impact on the treasury management of commercial banks given the different opportunity cost of using certain assets as collateral in the open market operations. The existing differences in the structure of the domestic segment of interbank market in the euro area are also analysed; the fact that in one country the interbank market is based on an electronic platform, whereas in other countries it is an over-the-counter (OTC) market, has interesting effects on bank treasury management.

Following a description of the most controversial differences across the euro area in the use of collateral for the monetary policy operations and in the functioning of interbank markets, a dataset showing how reserve requirements have been absolved by Italian and European banks is used, in order to determine whether an interbank market having certain characteristics – combined with the Eurosystem operational framework – can lead to more efficient liquidity management for banks. To this end correlation between the use of reserve accounts and the EONIA¹ rate is also analysed, as evidence that in a country where the interbank market is very liquid and efficient, such as in Italy, banks can optimise their liquidity management by using their reserves when the EONIA is higher than the rate of remuneration of reserves, and *vice versa*.

Finally, analysis turns to the proposal to reform the lists of collateral to be used in open market operations, creating a single list that also includes bank loans and equities. In particular, assessment is made of the effect of having a single list of assets for the euro area on the ability of counterparties located in different countries to obtain liquidity from the Eurosystem, examining the implications this reform holds for strategy in eligible asset portfolio composition.

The paper is organised as follows. In section 2 I describe the evolution of the Eurosystem operational framework as from the beginning of the third stage of EMU from a banks' point of view. Section 3 analyses some anomalies in Eurosystem operations, while section 4 is devoted to the study of the use of collateral in open market operations. Section 5 extends analysis to the structures of interbank markets in Europe and the distribution of liquidity in the euro area. Section 6

¹ EONIA (euro overnight index average) is an effective overnight rate computed as a weighted average of all overnight unsecured lending transactions in the interbank market, initiated within the euro area by the contributing panel of 57 banks.

focuses on the proposal to enlarge the tier 2 lists, examining its effects on bank treasury management. Finally, section 7 offers some concluding remarks on the proposal to reform the interbank markets and the collateral list in the euro area, pointing out the implications of these reforms for the European banking system.

2. The evolution of the eurosystem operational framework

The functioning of Eurosystem monetary policy is based on the ability of the ECB to influence short term interbank interest rates; the supply of liquidity to the banking system, and consequently the evolution of interbank interest rates, can be controlled by the Eurosystem using three instruments: open market operations, minimum reserves and standing facilities. In January 2003 the first two underwent technical revision as follows.

2.1. *Open market operations*

Open market operations

“play an important role in the monetary policy of the Eurosystem for the purpose of steering interest rates, managing the liquidity situation in the market, and signalling the stance of monetary policy” (ECB 2002c, p. 4).

In order to achieve these objectives four kinds of operations have been designed, namely main refinancing operations (MROs), longer-term refinancing operations (LTROs), fine-tuning reverse operations and structural reverse operations. As far as structural reverse operations are concerned, the first five years of single monetary policy show no evidence of their occurrence, fine-tuning reverse operations having been used only a few times in particular circumstances that could have led to liquidity crises. Therefore, for the purposes of this research we shall focus only on the operations regularly performed: main refinancing operations and longer-term refinancing operations.

Main refinancing operations are the most important liquidity-providing operations conducted by the ECB, carried out regularly

each week by means of repurchase agreements (repo) or collateralised loans (depending on the central bank of the country in which the operation is performed). Since single monetary policy was launched, MROs have undergone a number of technical changes. Initially these operations were performed using weekly fixed rate tenders with two-week maturity. However, such tenders produced certain inefficiencies, namely overbidding, implying the risk of market failure.² In such tenders, the ECB establishes the interest rate of the MROs and the amount to be offered; to this end, the Eurosystem calculates a so-called 'benchmark allotment', on the basis of the system's liquidity needs, which constitutes a baseline for the ECB's actual allotment decision. The banks obtaining liquidity with the tender then distribute their excess of liquidity to other banks via the interbank market.

In the first semester of 2000 market expectations of interest rate hikes contributed to widespread overbidding and the allotment ratio fell very low; thus the banks were unable to estimate the actual amount of liquidity that they could obtain by participating in MROs. Therefore, in order to limit these phenomena, the Governing Council of the ECB decided that, as from the last operation in June 2000, the MROs should be performed using multiple rate tenders (American auctions). With this procedure the ECB fixes a minimum rate, which continues to represent a signal for the trends in monetary policy, and the banks can present a maximum of 10 bids; after the adoption of variable rate tenders, the ECB began to publish estimation of the total amount of liquidity needed by the system in order to help banks formulate their bids.

More recently, in order to mitigate the effects of expectations regarding interest rate changes on the bidding behaviour of counterparties and reduce the likelihood of underbidding, it was decided as from the first quarter of 2004 to shorten the maturity of main refinancing operations to one week. This reduction in maturity is complementary to the change in the duration of the reserve maintenance period as described below (Table 1).

Longer-term refinancing operations consist of three-month maturity refinancing operations performed monthly, with which the

² According to Bindseil (2002), 'overbidding' refers to extremely high bid volumes submitted to fixed rate tenders, implying, *ceteris paribus*, extremely low allotment ratios. Overbidding and other anomalies in the auctions are extensively addressed in section 3.

Eurosystem provides only a limited part of the global liquidity needs. In these operations "the Eurosystem does not, as a rule, intend to send signals to the market" (ECB 2002c, p. 15) and therefore it normally acts as a rate taker by pre-announcing allotment volumes, whereas the tenders do not have a minimum rate. In the first three months of single monetary policy these operations were carried out with marginal tenders, in which all the counterparties gaining access to liquidity obtained it at the minimum of the rates offered. Transition from marginal tenders to American auctions implied transference of the interest rate risk to the banks.

TABLE 1

TENDER PROCEDURES IN MAIN REFINANCING OPERATIONS

	Tender procedures	Allotment system	Effects on banking system
Fixed rate tenders	Tender rate is fixed by the ECB; counterparties may submit a tender bid at that rate.	On quantity: if aggregated bids exceed the liquidity to be allotted, bids are accepted <i>pro quota</i> .	Overbidding and low allotment ratio in case of expectations of an increase of interest rates; underbidding when interest rates are expected to decrease.
Variable rate tenders	The ECB fixes a minimum rate and counterparties may forward up to 10 bids at different rates.	On bid rate: bids at higher rates are executed firstly, until all the liquidity is allotted.	Underbidding when interest rates are expected to decrease.

Source: own processing.

In the original conception of these operations, LTROs were to provide "a good opportunity for smaller counterparties, which have limited or no access to the interbank market, to receive liquidity for a longer period" (ECB 2002a, p. 5). However, the trend decline in the number of banks participating in LTROs led the Eurosystem to consider whether these operations did indeed play the role for which they were originally intended; if not, they should be suspended. After consultation with the European banking and financial market associations these operations remained unchanged, above all because they enable the banks' treasuries to diversify the maturity of their liabilities, and play an important role in the credit institutions' liquidity contingency plans.

2.2. *Minimum reserves*

With minimum reserves the Eurosystem stabilises the money market interest rates and creates or increases the structural liquidity shortage in the financial system. The stabilisation of interest rates is helped by the opportunity offered to counterparties to make use of averaging provisions. In fact, compliance with reserve requirements is determined on the basis of the average of the end-of-calendar-day balances on the counterparties' reserve accounts over a lagged maintenance period (from the 24th of one month to the 23rd of the subsequent month until the end of 2003). Thus, having the opportunity to make use of the reserves during the maintenance period, the banking system has additional liquid resources to address unexpected liquidity shortages and for arbitrages on the interbank market.

The creation of a structural liquidity shortage in order to deal with minimum reserves improves the effectiveness of monetary policy, given that the Eurosystem provides a large part of the liquidity needed for the minimum reserve system by open market operations. Banks holdings of required reserves are remunerated at the marginal rate on the Eurosystem's main refinancing operations.

As from the first quarter of 2004 the timing of the reserve maintenance period has been modified. Given that the Governing Council established that it would assess ECB monetary policy stance and change interest rates only at its first meeting of each month, there has so far been no link between these meetings and the starting date of the reserve maintenance period. In the new framework, the impact of interest rate expectations on the behaviour of banks bidding in the MROs is reduced, as is the likelihood of underbidding when expectations are for interest rates reductions.

The opportunity to make use of reserves during the maintenance period tends to blur the distinction between the reserves held for the Eurosystem and the free reserves, maintained for precautional reasons. Each institution can hold more or less reserves than the daily amount due, according to the return of the other alternative investments within the maintenance period. The alternative investments closer to the deposit on reserve accounts are those in the unsecured interbank market. In fact, bank treasuries keep a steady watch on the interbank market rates and, if a counterparty has expectations of an increase in interest rates exceeding the MRO interest rates (at which minimum

reserves are remunerated) for operations having maturity within the maintenance period, it can hold more reserves in the first part of the maintenance period in order to have more liquidity to invest later in the interbank market. The contrary strategy can be adopted when expectations are for a reduction in interbank rates.³ In the Eurosystem minimum reserve regime framework the divergence between the daily required volume of reserves and those actually held is a function of the differential between the current and expected rates on the interbank market, of the differential between marginal rate in the last MRO and interbank rates of the current maintenance period, of the standing facilities rates and of the risk aversion of the single counterparty.

3. Some anomalies in Eurosystem operations

Since January 1999 Eurosystem monetary policy operations have worked fairly efficiently, providing an adequate amount of liquidity for the smooth functioning of financial markets and, ultimately, for the main goal of the ECB, which is price stability. For instance, the ECB allocated more than 3 trillion per year through its regular open market operations (Bindseil 2002). However, in an early stage of single monetary policy the typology of tenders chosen by the ECB for the MROs was a contributory factor in overbidding phenomena and, later, in a lack of bids in tenders, or in other words underbidding.

3.1. *Overbidding*

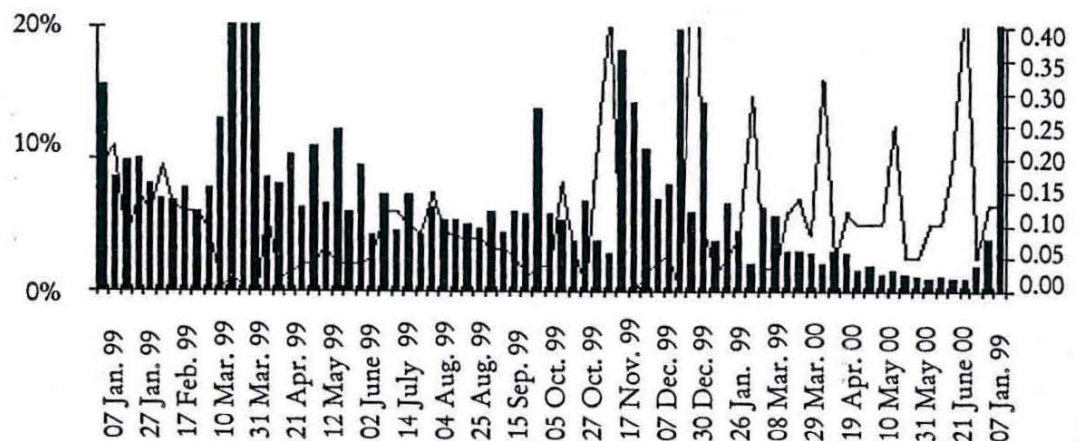
As mentioned before, until June 2000 the main refinancing operations were run using fixed rate tenders. In such tenders, should the bids be in excess of the allotment amount, the liquidity provided by the ECB is divided among the bidders, proportionally to the volume of their bids. Due to expectations of interest rates hikes, and short term

³ The above-mentioned strategies can also prove more complex if the bank assumes various different positions during the maintenance period. Nevertheless, the opportunity to perform intertemporal arbitrages making use of the reserves was not greatly exploited by banks. The reason for this, according to ECB (1999), may lie in a generic risk aversion of banks that want to absolve their minimum reserves quickly.

money market rates being significantly above the main refinancing rate, the counterparties used to forward bids in MROs that were oversized compared to their liquidity needs, in order to use the possible excess of liquidity on the interbank market. Some studies (e.g. Ayuso and Repullo 2000) verified that bank overbidding resulted from expectations of a future tightening of monetary policy or from the existence of a positive spread between short term money market rates and the main refinancing rate that resulted from a contemporaneous restriction in the supply of liquidity. This phenomenon can readily be seen in Chart 1, where a negative correlation is to be observed between allotment ratios on the one hand and the differential between the market and tender rate on the other.

CHART 1

ALLOTMENT RATIOS (LEFT HAND SCALE, BAR CHART) AND EONIA-MRO SPREAD (RIGHT HAND SCALE, LINE CHART) DURING THE USE OF FIXED RATE TENDER PROCEDURE BY THE ECB



Source: Bindseil (2002).

In the spring of 2000 such behaviour, exhibited by almost all the institutions, led to allotment ratios under 1% of the amount demanded,⁴ and the banks, therefore, had not only to guess the amount of liquidity offered by the ECB, but also the level of aggregate bids, in order to increase their bids to obtain an amount as close as possible to

⁴ The allotment ratio for the euro area in the first half of 2000 was on average 2.7%; in the second part of the year, after the adoption of variable rate tenders, it increased to 58% (Banca d'Italia 2002, p. 218).

their actual needs.⁵ This behaviour made the allotment ratios not only considerably undersized, but also very unstable and uncertain. As a corollary, fixed rate tenders led some institutions into riskier behaviours, submitting bids for amounts larger than the value of collateral owned by them.⁶ The Eurosystem did not, however, impose penalties on those counterparties unable to transfer a sufficient amount of eligible assets to settle the amount allotted in tender operations. At the same time, due to the difficulties in guessing allotment ratios, other institutions preferred to limit the use of MROs as much as possible, revealing the risk of real market failure.

As pointed out in the most significant literature on the ECB operational framework, the original Eurosystem choice to adopt fixed rate tenders for key monetary policy operations proved questionable in several different ways. First, Nautz and Oechssler (1999) demonstrated that fixed rate tenders induce overbidding even though the central bank's allotment policy accommodates the actual liquidity needs of the banking sector. Assuming that banks follow a myopic best reply process *à la Cournot*, they show that fixed rate auctions specify a game without equilibrium, where bids increase indefinitely and, as a result, the allotment quota converges to zero. Subsequently, Ayuso and Repullo (2000) constructed a model where overbidding in the ECB fixed rate tenders was produced by an asymmetric preference function of the ECB. According to them, the central bank offers an amount of liquidity to the market that will, on average, keep the overnight rate above the tender rate, given that it has a loss function that penalizes interbank rates below the target more heavily than those above it. Nevertheless, their paper does not consider the rationale for the Eurosystem to have such an asymmetric loss function. More recently, Välimäki (2002a) provided cogent evidence of the convenience for banks to bid in excess in fixed rate MROs even if the central bank has symmetric preferences over the interest rate variations in the interbank market. The underlying hypothesis of this

⁵ Given the formula $all\% = A / \sum_{i=1}^n a_i$, where *all%* is the allotment ratio, a_i is the bid of each counterparty and A is the amount of liquidity offered by the ECB in a tender, institutions had to guess both A and the sum bids by other counterparties, and then had to multiply their optimal liquidity need by the reciprocal of the estimated allotment ratio.

⁶ In the last fixed rate tenders the value of all eligible assets composing tier 1 and 2 was not sufficient to guarantee the volume of aggregate bids.

model is that the ECB is a liquidity-oriented central bank and pays attention to the deviations of liquidity from the level indicated by the reserve requirement; in other words, the ECB is assumed to limit the above-mentioned intertemporal arbitrage within the reserve maintenance period. In fact, as often stated by the ECB (see also 2002b), the Eurosystem sets out to provide the market with liquidity that will on average equal the amount needed to fulfil the reserve requirement, having addressed the autonomous factors, and is as stable as possible within the maintenance period. Välimäki's model partially disagrees with models such as Bindseil's (2002), in which fixed rate tenders tend to have some specific disadvantages which are related to variable rate tenders only in the case of strong rate change expectations. In conclusion, as long as the ECB adopted fixed rate tenders, overbidding produced

“a special type of allocation of funds through queuing, instead of an allocation through a pure price mechanism. Queuing is known to be a less efficient allocation mechanism, compared to price mechanism, since it works through the using up of resources in the form of transaction costs” (Bindseil 2002, p. 11).

Therefore, in June 2000 the ECB decided to adopt multiple rate tenders, while still maintaining a minimum rate as a signal for the money markets.

3.2. *Underbidding*

The second anomaly analysed in this section is underbidding. This phenomenon can be seen as a free-riding problem, since, due to lack of liquidity demanded by counterparties, the banking sector in aggregate is forced to make use of marginal lending facilities, therefore paying a higher rate. Thus, those institutions that believe they can obtain liquidity on the market on better conditions do not participate in MRO tenders, nor do they reduce the amounts bidden, being confident that other banks will get excess of liquidity for their reserve requirements and will then distribute it on the interbank market. Underbidding in MROs has occurred nine times from the beginning of single monetary policy, eight of which after the adoption of variable rate tenders (Table 2). In these tenders, the banks in the euro area demanded less than they needed to fulfil the reserve requirements.

TABLE 2

THE NINE CASES OF UNDERBIDDING (ALL AMOUNTS IN EURO BILLIONS)

Date of allotment of MRO	Bid volume (= actual allotment)	Allotment volume that should have allowed a smooth fulfilment of reserve requirements	Underbidding amount	Spread between two-week swap rate and tender rate (in basis point)
06/04/99	67	96	29	
13/02/01	65	88	23	-1
10/04/01	25	53	28	-7
09/10/01	61	79	18	-3
06/11/01	38	66	28	-9
03/12/02	112	116	4	-14
17/12/02	104	118	14	22
03/03/03	54	97	43	-4
03/06/03	72	92	20	-12

Sources: Bindseil (2002) and ECB (2003b).

According to Nyborg, Binseil and Strebulaev (2002), underbidding is the result of a combination of falling rate expectations and the inability of banks to bid below the minimum bid rate. In fact, in almost all underbidding cases the swap spread on the interbank market for operations with two-week maturity was negative. Thus the banks could obtain cheaper funding, shortening the swap by paying fixed, and borrowing on an overnight basis for two weeks rather than borrowing in the MRO tenders. Moreover, these authors verified that underbidding in the above-mentioned tenders was caused by the large banks cutting back demand rather than the small banks free-riding on the larger banks.

Due to a lack of liquidity for the minimum reserves in consequence of underbidding in the MROs, some treasurers experienced problems in fulfilling reserve requirements. However, subsequent to episodes of underbidding, the ECB did not maintain a neutral allotment policy in order to bring the overnight rate closer to the minimum bid rate. In the subsequent auction the ECB increased the amount to be distributed, yet not to the extent of achieving neutral liquidity, in order to dissuade the banking system from systematically bidding less than its needs, being confident that the ECB would increase the liquidity offered in the next tender. As a consequence, after

the first two underbidding cases in 2001, banks used the marginal lending facility, net of the deposit facility, for a total amount above 60 billion euros (Nyborg, Binseil and Strebulaev 2002). More recently, a similar policy was adopted by the ECB in December 2002, during another case of underbidding.

The free-riding phenomenon here described arises, once again, from the way that MROs are arranged, and in particular from the tender typology chosen. Fixed rate tenders used to encourage overbidding, particularly when a rate increase was expected within the maintenance period, whereas they did not prevent underbidding in the case of strong rate-cut expectations; on the other hand, price discriminating auctions with a minimum rate also contribute to underbidding when interest rates are expected to fall, considering that banks cannot bid below the minimum bid rate. Thus, it can be said that both kinds of auctions intrinsically contain some elements that induce inefficient behaviours. Nevertheless, it is important to point out the differences between the inefficiencies due to fixed rate tenders (overbidding when interest rates are expected to increase, but also underbidding when counterparties are betting on a rate cut) and those deriving from variable rate tenders with minimum rate (underbidding).

With regard to the ECB, which supervises the efficient functioning of the money market in order to steer short-term interest rates, its hypothetical loss function is not deeply affected by widespread overbidding since, although funds are allocated by queuing instead of applying the pure price mechanism, liquidity is in any case introduced into the system and distributed by the interbank market. Consequently, the main problem for the ECB in fixed rate tenders was that, given the very high bids by banks and very low allotment ratios, the Eurosystem could not build a solid reputation for liquidity control.⁷ On the other hand, with variable rate tenders, the lack of liquidity due to underbidding can produce severe tensions on the interbank market, which can only be solved with massive resort to standing facilities. The original fixed rate tenders can therefore be said to have been better suited to the ECB goals; this could be confirmed also by the reluctance that the ECB showed before changing the MRO proce-

⁷ Furthermore, according to some authors (e.g. Nautz and Oechssler 1999), the severe reduction in allotment ratios experienced during fixed rate tenders made bank bids useless as a monetary indicator; consequently, bank bids were not used as an actual liquidity needs indicator.

dures, although the information given by the aggregate bids was already useless and the sum of aggregate bids was higher than the value of all the available collateral.

In contrast, analysing the impact of the two different kinds of auctions on the single bank, with fixed rate tenders and high overbidding, the allotment ratios were virtually unforeseeable and, on the other hand, there seemed to be a real risk, which ultimately proved only theoretical, of incurring penalties in the case of lack of collateral. On the contrary, in a variable rate tender framework, a bank can always obtain the liquidity it needs from the Eurosystem by presenting a bid at a higher rate; the possible shortage of liquidity is mainly due to speculative behaviour (free-riding), which can be affected by the banks.

Finally, a third hypothesis – to abandon a minimum rate in variable rate tenders – is not considered wholly practicable for two reasons. First, such a decision would cancel the MRO's role as signal for longer term financial markets; second, the absence of a minimum rate could imply excessively high volatility on the interbank market, which probably would lead to a less efficient market equilibrium as compared with the two experienced during the third stage of EMU.⁸ We may thus conclude that there are no optimal auction models in the ECB operational framework. However, the model currently adopted seems to allow a higher level of freedom for the ECB and the banking sector in addressing the potential inefficiencies, and, leaving the determination of prices and quantities to the market forces, it seems more coherent with the logical scheme of open market operations.

The recent shortening of MRO maturity, combined with the new maintenance period calendar, will forestall the impact of interest rate change speculation within a single maintenance period, therefore

⁸ The rationale behind pure variable rate tenders is that with this kind of auctions the likelihood of underbidding is very low. Between 1988 and 1996 the Bundesbank conducted more than 300 pure variable rate tenders with no cases of underbidding ever occurring (Bindseil 2002). However, Manna (2002), analysing the German interbank rates between 1989 and 1998 (during that period the Deutsche Bundesbank alternatively applied fixed rate and variable rate tenders in its weekly open market operations), demonstrated that the average variability of interbank rates is not statistically different under the two tenders procedures. Besides, for Linzert, Nautz and Breitung (2003) the minimum bid rate could reduce the efficiency of ECB money market management due to its effect on underbidding in the case of interest rate decrease expectations.

reducing the likelihood of underbidding;⁹ however, the reduction in the main refinancing operation maturity implies a double amount of liquidity to be provided to the banking system by the ECB each week. Therefore, the variability in allotment ratios could produce a higher impact on the liquidity amount actually obtained by bank treasurers. Finally, the credit institutions will face a higher weekly turnover of collateral that could impose optimisation in its use.

3.3. *The use of standing facilities*

A third hitch in the ECB's operational framework can be seen in the current excessive use of both the standing facilities. In theory, if the interbank markets are efficient, the banks in the euro area should partially offset the respective excesses and shortages of liquidity on the market instead of resorting to marginal lending facilities and deposit facilities at the same time. However, liquidity shocks, especially after the last MRO of the maintenance period, may force the banking system to make use of standing facilities (Chart 2).

According to the ECB (2002b, p. 50), there are two different kinds of recourses to standing facilities. First, in the case of actual or expected liquidity imbalances regarding the whole euro area, such as differences between the liquidity needs of the banking system and the liquidity offered by the ECB within a given maintenance period, there is a so-called 'aggregate recourse'. It can derive either from a liquidity forecast error or a deliberate deviation from the benchmark allotment by the ECB. Such recourse to standing facilities is mainly seen towards the end of the maintenance period, when the banks have no other alternatives for financing their deficit or for lending with overnight maturity.

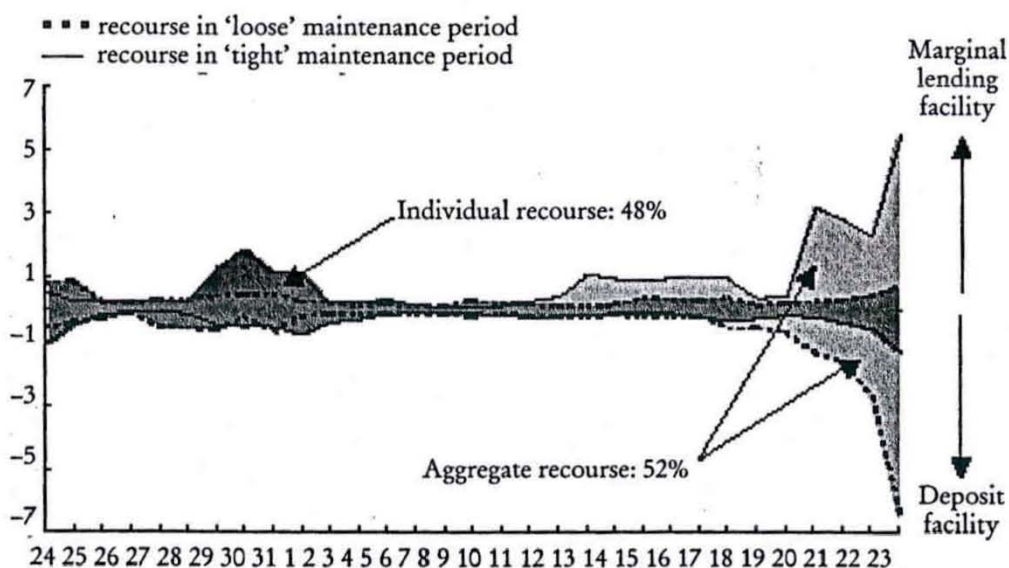
Moreover, the banks can also have recourse to standing facilities individually; in this case the ECB calls it "individual recourse". This is caused only by an insufficient distribution of liquidity across credit institutions, especially at the end of the day, when the money market is no longer liquid. As it is shown in Chart 2, all recourses to the standing facilities in the first part of each maintenance period, as well as the use of deposit facilities in the second half of 'restrictive' mainte-

⁹ See ECB (2003b).

nance periods, and recourse to the marginal lending facility in the second half of 'unrestrictive' maintenance periods must be a sign of an individual liquidity imbalance. On the contrary, the average recourse to standing facilities exceeding the individual recourse is considered as aggregate.

CHART 2

AVERAGE RECOURSE TO THE STANDING FACILITIES IN THE COURSE OF A MAINTENANCE PERIOD (AVERAGES PER CALENDAR DAY CALCULATED OVER THE PERIOD FROM 24 FEBRUARY 1999 TO 31 DECEMBER 2001; EURO BILLIONS)*



* The lines show the average recourse in 'tight' and 'loose' maintenance periods, while the shaded areas illustrate how the aggregate and the individual recourse can be measured, as explained in the text. 'Tight' and 'loose' maintenance periods are distinguished here via the accumulated net recourse after the settlement of the last MRO.

Source: ECB (2002b).

In the first three years of single monetary policy, aggregate and individual recourses counted almost equal on average. Therefore, whilst

“half of the 0.3% of the overall liquidity supply/demand stemming from the use of standing facilities reflected aggregate recourse, and thus a euro area-wide liquidity need or surplus” (ECB 2002b, p. 51),

the second half is to be attributed to the difficulties that single institutions experienced in using the interbank market.

4. The use of collateral in Eurosystem operations

In order to limit counterparty risk, all Eurosystem liquidity-providing operations are based on underlying assets offered by banks either in the form of transfer of ownership of assets, in those countries where the domestic law imposes management of monetary policy operations using outright transaction or repurchase agreements, or in the form of a pledge granted over relevant assets in those countries where collateralised loans are used. Furthermore, for the purpose of ensuring equal treatment of counterparties and improving efficiency, underlying assets have to fulfil certain criteria so as to be eligible for use in guaranteeing monetary policy operations. Thus, two categories of eligible assets are distinguished: tier 1 and tier 2 assets.

Tier 1 consists of marketable debt instruments that respect euro-area-wide eligibility criteria specified by the ECB; they must have a predefined principal amount and a coupon that cannot result in a negative cash flow: zero, fixed rate or floated rate coupons linked to an interest rate reference are admitted. These assets have to meet high credit standards, also assessed by the ratings of market agencies; they must be guaranteed and deposited or registered in the European Economic Area (EEA) with a central bank or a central securities depository, and must be denominated in euro and issued by bodies established in the EEA. Finally, tier 1 assets must be listed or quoted on a regulated market as defined in the Investment Services Directive or on non-regulated markets as specified by the ECB.¹⁰ The tier 1 list is updated weekly by the ECB. Recently, the ECB reallocated eligible tier 1 assets in four categories of decreasing liquidity (Table 3); this amendment takes effect from the first quarter of 2004.¹¹

Besides the tier 1 list, single central banks identify a list of tier 2 assets that are particularly important for the domestic banking and financial market. These assets can be used in the Eurosystem monetary policy operations. Tier 2 assets also have to match up to some minimum criteria in order to be included in the lists by the central banks. They must be debt instruments (marketable or not-marketable), or equities issued by bodies located in the euro area and considered finan-

¹⁰ For a more detailed picture of tier 1 and 2 eligible assets see ECB (2002c, p. 38).

¹¹ See ECB (2003a).

cially sound by the central bank that includes these assets in the tier 2 list. Tier 2 assets must be easily accessible to the central bank which has included them in the list, must be deposited in the euro area and denominated in euro.

TABLE 3

LIQUIDITY CATEGORIES FOR TIER 1 ASSETS

Category I	Category II	Category III	Category IV
Central government securities	Local and regional government securities	Traditional <i>Pfandbrief</i> -style instrument	Asset-backed securities
Debt securities issued by central banks	Jumbo <i>Pfandbrief</i> -style instruments	Credit institution securities	
	Supranational securities	Corporate securities	
	Agencies securities		

Source: ECB (2003a).

In order to avoid situations in which counterparties are, at the same time, guarantors and beneficiaries of financial operations, central banks cannot accept eligible assets issued or guaranteed by the counterparty itself or by any other body with which the counterparty has close links, even if these assets are included in tier 1 or 2 lists. Moreover, the single central banks can decide not to accept as eligible collateral debt instruments falling due for repayment before the maturity date of the monetary policy operation for which they are offered, instruments generating an income flow, i.e. coupon payment, during the period before the maturity date of monetary policy operation and equities with payment of any kind or with any other right attached to them which may affect their suitability as underlying asset (Table 4). Since July 2003, tier 2 assets have also been reclassified according to a criterion of decreasing liquidity; so that we now have: 1) marketable debt instruments with limited liquidity; 2) debt instruments with restricted liquidity and special features; 3) equities; 4) non-marketable debt instruments, including trade bills, bank loans and mortgage-backed promissory notes.

Comparing the current set of eligible assets in the euro area with the lists of assets used by the single central banks that joined the euro before 1999, it will be seen that the quantity of eligible assets is now

much wider.¹² This provided ample elasticity to bank treasuries in managing the liquidity, because assets included in tier 2 lists, certainly less liquid than other assets previously used in monetary policy operations (i.e. less liquid than the Italian governmental bonds, which are traded on electronic secondary markets for very large volumes), can, once offered as collateral to the Eurosystem, contribute to producing liquidity in the very short run.

TABLE 4

MAIN CATEGORIES OF ELIGIBLE ASSETS
FOR EUROSISTEM CREDIT OPERATIONS

Type of assets	Tier 1 (European Economic Area)	Tier 2 (Euro area)
Marketable	<ul style="list-style-type: none"> - ECB debt certificates (at present not issued) and central bank debt certificates - Debt issued by foreign and supranational institutions - Central, regional and local government securities - Uncovered credit institutions bonds - Asset-backed securities - Corporate bonds 	<ul style="list-style-type: none"> - Central, regional and local government securities - Credit institutions bonds - Corporate bonds - Certificates of deposits - Medium-term notes - Commercial paper - Equities - Marketable private claims
Non-marketable	<ul style="list-style-type: none"> - None 	<ul style="list-style-type: none"> - Bank loans - Mortgage-backed promissory notes - Trade bills

Source: ECB (2001c, p. 69).

However, the above-mentioned opportunity to make use of less liquid assets to obtain liquidity from the Eurosystem is fully exploited especially by counterparties based in those countries where the central bank has included equities or bank loans in the tier 2 lists and the banking regulation models have allowed, or encouraged, the purchase

¹² During 2002 the total amount of marketable assets eligible as collateral for Eurosystem credit operations increased from approximately 6.6 trillion euro to 6.9 trillion euro. About 96% of marketable assets were tier 1 assets, while the remaining 4% were tier 2 assets (ECB 2001c, p. 69).

of equities by banks.¹³ Even if the disaggregated data on the participation in MROs of counterparties located in different countries are not provided by the ECB, the German banks, for instance, are known to be very active in main refinancing operations; during 2002 200 banks out of an average of 307 bidders in the euro area were from Germany while, in the same period, the average number of Italian bidders was 18.¹⁴ Thanks to the wider range of tier 2 assets, the opportunity cost of doing without the collateralised assets during the monetary policy operation was less significant. According to Nautz and Oechsler (1999), during the first months of single monetary policy German banks obtained more than 60% of the global amount of liquidity allocated by the ECB's repo. At the same time, in 1999 the Italian banks only got 13.8% of the liquidity allotted by MROs; this percentage fell to 8.3% in 2001, to 6.1% in 2002 and to 4% in the first four months of 2003 (Banca d'Italia 2003, p. 242). Nevertheless, according to another theory, the wider recourse of German banks to open market operations should not depend on the tier 2 list; rather, it is based on a strategic choice of those banks, which could have some difficulties in obtaining short term loans on the domestic segment of the interbank market.

The actual amount of collateral held by counterparties is a function of their balance sheet structure. This structure depends on the financial configuration of the individual euro area countries, such as the degree of development of private sector securities markets and the legal framework for securitisation. Due to the initial differences in the availability of tier 1 assets inside the countries of the euro area and the existing asymmetries in tier 2 lists, the banking systems of some countries had a different approach to obtaining liquidity from the Eurosystem; the fact of immobilizing more liquid eligible assets in the monetary policy operations represents a significant opportunity cost for those banking systems that, on average, have a smaller amount of less liquid collateral.

The choice to include some kinds of assets such as 'Pfandbriefe', which are mortgage bonds originating in German and Austrian markets and not accepted in interbank repos, in the tier 1 list considerably

¹³ Bank loans are included in tier 2 lists in Spain, France, Germany, Austria, the Netherlands and Ireland, while equities are in the tier 2 lists compiled by Spain, the Netherlands and Portugal.

¹⁴ See Deutsche Bundesbank (2003) and Banca d'Italia (2003).

reduces the implicit cost of using these assets as collateral for those banks that have such bonds in portfolio. On the other hand, some countries allow bank loans and certain equities to be used as collateral in the auction, whereas others do not; although the decision of a central bank to accept a particular collateral implies that it must also be accepted all over the euro area, it is possible to single out certain asymmetries in the use of collateral that have effects on the liquidity distribution in the area.

Finally, the current framework of monetary policy prompts banks in the euro area to diversify their own portfolios by also taking into account the aptitude of an asset to be used as collateral in Eurosystem operations. Furthermore, it would be appropriate for banks to adopt even more closely integrated policies between own investment securities and treasury, in order to obtain extra liquidity from the Eurosystem with no great difficulty, using assets that, alternatively, could not contribute to producing liquidity without the risk of losses. This is particularly true of those countries where the repo market is particularly undersized.

5. Distribution of liquidity in the euro area and interbank markets

The introduction of single monetary policy produced a rapid convergence of interbank unsecured deposit market conditions within the euro area, which rapidly achieved the maximum degree of integration in the money market (ECB 2001b); this phenomenon was considered an indispensable prerequisite for efficient distribution of liquidity across the area. However, there are still some cross border differences in the interbank markets that have a certain impact on liquidity distribution within the countries. The two main features that determine the persistence of a form of segmentation on the unsecured interbank markets are the technical and operational market frameworks chosen in the different countries and the size of the banks.

As for the first point, we can observe the presence of telephone based over-the-counter markets as well as an electronic trading platform. In some countries, such as Germany, the unsecured interbank

market, dominated by four large German commercial banks, works on bilateral and brokered trading via telephone; this implies that any single bank can impose different conditions according to the risk perceived with the counterparty; consequently the market does not offer homogeneous conditions, is not very transparent and is less liquid.¹⁵ Furthermore, due to the absence of central clearing facilities, in such interbank markets the biggest players, considered less risky because too-big-to-fail, not only obtain better market conditions, but are also easily able to hide their activity in the money market, reducing the informative efficiency of the market itself. Other countries, such as France and Spain, still have an unsecured interbank market based on brokers, so that intermediation costs are higher than in the electronic markets. In particular, in France, besides the brokers, treasuries also trade via telephone; in Spain, trading is carried out via four main voice brokers, but prices are also shown on electronic market information systems, such as Reuters, Bloomberg or Telerate. Finally, in the Netherlands the bulk of trading is handled via bilateral communications.

On the other hand, in 1990 the Italian financial system chose to adopt a screen-based unsecured interbank market now called e-MID. This offers several benefits in terms of price transparency, standardisation, speed of deal processing and cost savings.¹⁶ This e-MID is considered the most efficient and liquid interbank market within the area and "is striving to establish a euro area-wide platform for electronic trading in the money market" (ECB 2001b, p. 21). Daily turnover on e-MID averaged euro 15.4 billion in 2001, 17.6 billion in 2002 and 18.2 billion in the first three months of 2003, of which 82% concerned overnight deposits (Banca d'Italia 2003). It has a large-deal segment, on which major players trade bigger sums and it allows for the participation of foreign intermediaries through remote access. The e-MID is a quote-driven market, so once a bid is introduced in the electronic system, the counterparty can conclude the contract by simply accepting the bid, and therefore all counterparties enjoy equal treatment.

¹⁵ For an overview of the main features of interbank markets in Europe see Banco de España (1998) and Hartmann, Manna and Manzanares (2001). For a fuller picture of the Italian market see Patarnello (2000) and Baldinelli and Palombini (2002).

¹⁶ For exhaustive comparison between electronic trading and over-the-counter markets see the Committee on the Global Financial System (2001b).

Finally, the Italian interbank market is more secure given that it comes under the supervision of the central bank.

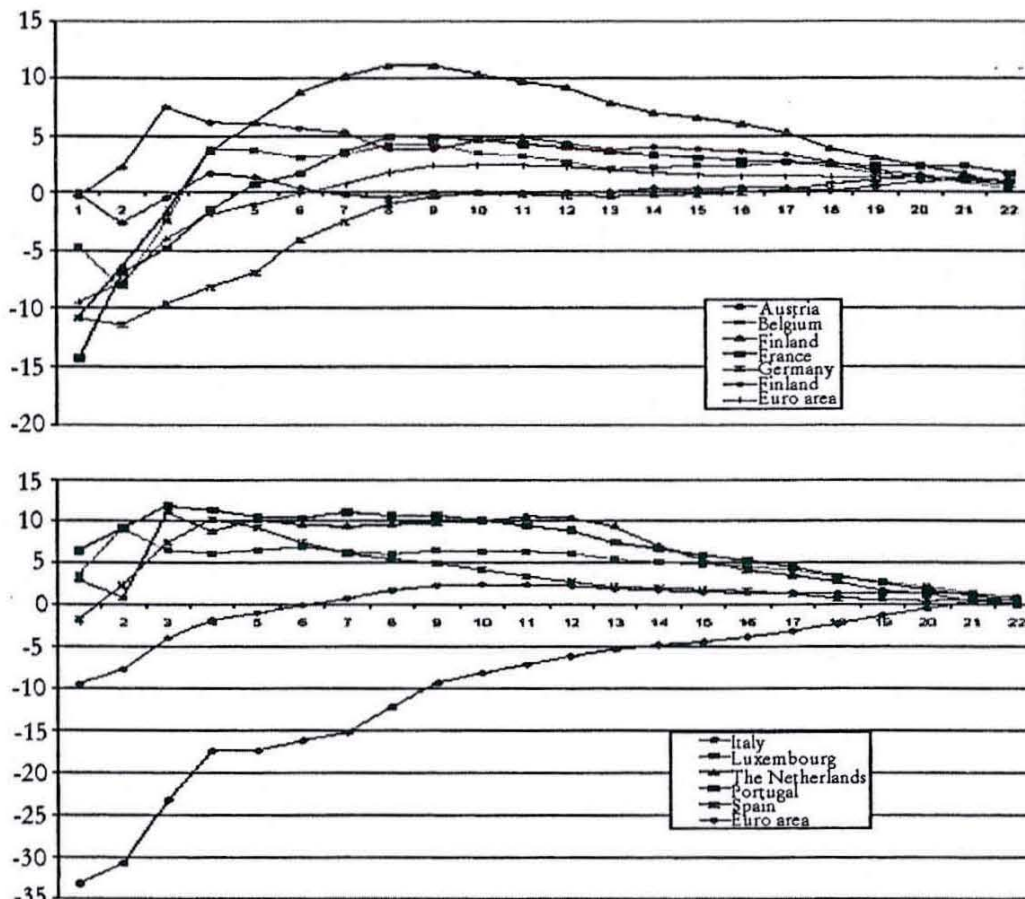
As reported in Banca d'Italia (2002, p. 219), econometric analysis revealed that the Italian banks' demand for funds on the money market is more elastic to interest rates than is the case with all the other European banks. The reason for this probably has to do with the greater efficiency of the interbank market. In the light of the above-mentioned evidence, we analysed the potential effect of the assumed efficiency of the Italian interbank market on the way of managing reserves during the maintenance period. Using the Eurosystem data cited by Angelini (2002) we can verify the existence of a wide dispersion in the use of reserve accounts among countries, and we may reasonably argue that this phenomenon has something to do with the presence of different interbank structures (Chart 3).

As can readily be seen in Chart 3, given the averaging mechanism for fulfilling reserves, the Italian banks make the largest use of minimum reserves in the euro area within the maintenance period (see also the Appendix). Specifically, in these years they have negative balances in the first days of the maintenance period, whereas they deposit more in the last days. This trend in Italian reserves data could depend on a proactive attitude of the Italian banks, seeking to exploit the opportunity of intertemporal arbitrages between money market and the reserve accounts, as also on their awareness that they can find liquidity at any time and on transparent terms on the e-MID. These conclusions can be confirmed by comparing the curve of Italian reserve accounts with the overnight spread between EONIA and the main refinancing rate for the same period (Chart 4). The spread has, on average, a positive trend in the first days of maintenance period, whereas it is negative in the last six days; in contrast, the Italian reserve accounts show a contrary trend, which could confirm the tendency to use reserves, possibly for overnight deposits, when the market is higher and to do the opposite when it is lower. Finally, the borrowing alternative to MROs represented by e-MID could account for the progressive reduction of allotment ratios in monetary policy operations for Italian banks.

CHART 3

USE OF RESERVES OVER THE MAINTENANCE PERIOD IN THE EURO AREA

(percentage deviation from the amount due. The horizontal axis gives the working days of the maintenance period; the last day is always plotted under the label "22". Jan. 1999-Jan. 2001)



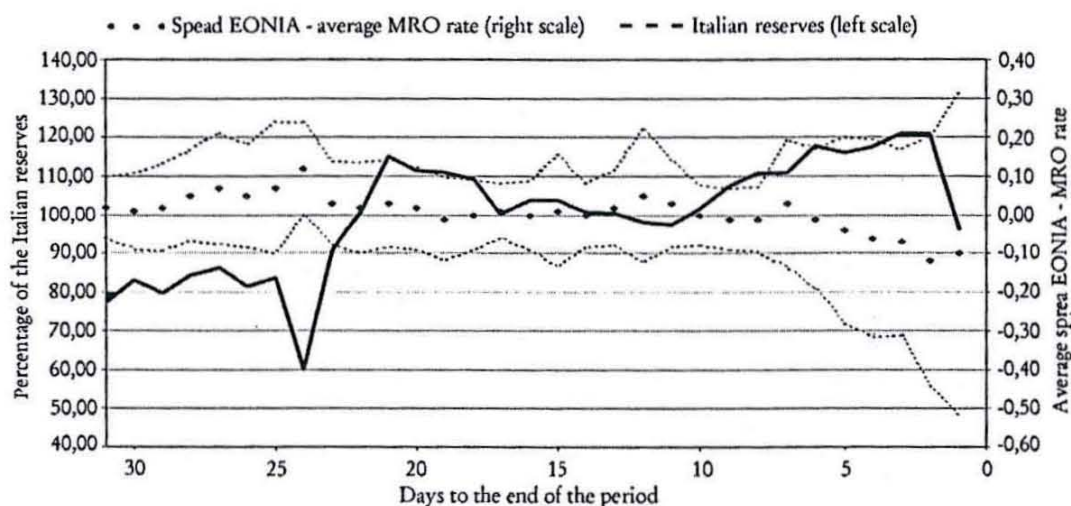
Source: Angelini (2002).

With regard to the size effect, a study by Freixas and Holthausen (2001) formalised what had been evident on the market since the beginning of the third stage: the banks are not homogeneous players in the interbank market, and only a few of the larger banks are operative in the international market, whereas the vast majority of institutions do not have access to cross-border channels, making use of the domestic markets to manage their liquidity needs. The reason for this is mainly a matter of the cost for small and medium banks to obtain information on their potential counterparties abroad, and indeed to make themselves known to foreign institutions. However, the asymmetric information could be reduced if there was a screen-based opera-

tional framework with a central clearing function in charge of controlling the solvency of members and, possibly, of guaranteeing the banks' obligations in case of default. The current debate among operators on the expediency of adopting an electronic trading platform within the euro area (on the model of e-MID) in order to reduce segmentation in the interbank market, or whether to continue with over-the-counter markets seems to be motivated more by the large banks wanting continued revenues from their market positions than by matters of economic efficiency.

CHART 4

PATTERN OF THE EONIA-MRO SPREAD AND ITALIAN RESERVES OVER THE MAINTENANCE PERIOD¹



¹ First differences; average of daily data over 40 maintenance periods between Feb. 1999 and July 2002. Dotted lines delimit a confidence band computed as ± 1 standard deviation of the Eonia-MRO spread series. First differences of the Eonia are computed within each maintenance period. Italian reserves are expressed as percentage of the amount due.

Source: own processing on Telerate data.

6. The proposal to change the tier 2 list: implications for the commercial banks' treasury management

In Eurosystem operations the use of collateral is the most important risk mitigation technique. Nevertheless, collateral is also used by banks in lending, in securities trading and derivatives markets, and in

payment and settlement systems. Over the last decade collateralised transactions have been stepped up while the availability of collateral, having low credit and liquidity risk, has lagged behind,¹⁷ with the consequent risk of higher costs for financial transactions.

It was also for these reasons that the ECB decided to accept a wide range of instruments as collateral. However, in the last few years the existence of tier 2 lists has led to some asymmetries between those countries where the central bank includes, under its responsibility, less liquid assets in the list and the countries where only assets endowed with good liquidity and credit standards are considered eligible. Furthermore, the inclusion of a non-tradable financial asset in the tier 2 list presupposes an 'in house assessment' performed by each central bank which considers including it among the eligible assets; this assessment entails a responsibility for the national central banks with respect to the asset towards all the Eurosystem members. In those countries where the central banks are more active in assessing non-tradable assets, the domestic banking system obtains not only the advantage of having a wider set of eligible assets, but also free evaluation performed by the central bank of some assets that, once assessed, will certainly gain in liquidity and thus in value.

In order to address this phenomenon, and indeed to remedy the lack of collateral, certain reforms are currently being debated. First, it has been proposed to eliminate the two-list system adopting a single list, so as to reduce non-homogeneity in the market. The single list would include bank loans and equities, but this choice implies a problem of assessing the loans, which could be solved by using the banks' internal ratings, central bank assessments or external ratings. On the other hand, a wider use of equities issued or traded in the euro area as collateral at present involves a number of legal difficulties concerning the exercise of rights. However, the EU Directive on financial guarantees (Council Directive 2002/47/EC), which is to be adopted by all the member countries, could partially bypass this problem.

From the banks' point of view, the choice to create a single list would imply a reduction in opportunity cost for treasuries to take part in monetary policy operations; moreover, it would take the MRO interest rates closer to unsecured interbank rates, due to the use

¹⁷ For a broader understanding of the most recent trends on collateral see Committee on the Global Financial System (2001a).

of lower-cost collateral for banks. On the other hand, some doubts remain about the effectiveness of bank loans working as collateral in the case of crisis hitting the counterparty.

After months of debate, in June 2003 the Eurosystem consulted the European banking industry on the project of creating a single list of collateral including the overwhelming majority of the less liquid assets currently in some tier 2 lists. In this way, the competitive disadvantage for those banks located in countries where tier 2 lists are not very large would almost be eliminated.

Finally, the need to increase eligible assets is also due to the imminent extension of the euro area to new countries. This would imply even more collateralised operations, given the scant reciprocal knowledge of institutions located in those countries.

7. Conclusions

The operational framework chosen for the implementation of single monetary policy allowed for generally smooth functioning of monetary policy procedures after the third stage of the EMU. However, there are still a number of factors that, to some extent, hamstring fully efficient liquidity distribution and produce asymmetries within the euro area. The technical features of main refinancing operations tenders contributed to leading first to widespread overbidding and later to episodes of underbidding. Individual recourse to both standing facilities on the same day, although not for large amounts, highlights the insufficient distribution of liquidity across credit institutions, especially among the small- and medium-size banks that have a difficulty in accessing foreign interbank markets. Cross-border differences in the eligible assets owned by banks, as well as differences in the tier 2 collateral lists for monetary policy operations, result in the European banks taking different approaches to obtaining liquidity from the Eurosystem.

In order to test the effectiveness of a screen-based interbank market on liquidity management, the use of minimum reserves during the maintenance period in Italy, where the unsecured interbank market is electronic-based, is utilised as an indicator of the efficiency of

this market. On the evidence of these data, it seems that the Italian banks can reduce the opportunity cost of maintaining minimum reserves, also by performing intertemporal arbitrages between the interbank market and their reserve accounts.

Thus, we may conclude that widespread diffusion of an electronic platform with a central clearing facility for the unsecured interbank market would indeed be useful; the convenience of such a platform is testified by the literature, as well as by the more efficient use of minimum reserves made by Italian banks. For this purpose, the natural candidate to work as European platform seems to be the Italian e-MID. Moreover, reform in the lists of eligible assets is also necessary in order to reduce the asymmetric opportunity cost of using more liquid assets for monetary policy operations. Finally, given the high demand for collateral worldwide, the suitability of a financial asset to be used as collateral in monetary policy operations becomes an important variable in deciding to include it in the portfolio of banks.

APPENDIX

RESERVE ABSOLVED IN THE EURO AREA AND IN ITALY WITHIN
MONTHLY MAINTENANCE PERIODS IN PERCENTAGE
(February 1999-July 2002)

Days to the end of the period	Euro area: reserve absolved	Italy: reserve absolved
31	93.83	77.56
30	95.25	82.62
29	95.84	80.56
28	97.55	83.10
27	98.48	83.59
26	99.01	82.84
25	99.46	82.75
24	99.44	79.60
23	100.00	80.97
22	100.49	83.06
21	100.94	86.17
20	101.27	88.40
19	101.44	90.23
18	101.57	91.67
17	101.46	92.27
16	101.32	93.00
15	101.19	93.65
14	101.04	94.06
13	100.86	94.41
12	100.71	94.61
11	100.56	94.76
10	100.50	95.10
9	100.51	95.67
8	100.52	96.33
7	100.52	96.94
6	100.55	97.76
5	100.64	98.45
4	100.73	99.14
3	100.83	99.91
2	100.90	100.62
1	100.67	100.49

Source: own processing on Eurosystem's data.

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