José Manuel González-Páramo: "Whither liquidity? Developments, policies and challenges"

Speech by Mr José Manuel González-Páramo, Member of the Executive Board of the European Central Bank, at the 28th Nomura Central Bankers Seminar, Tokyo, 14 April 2008.

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1. Introduction[1]

Ladies and Gentlemen,

It is a great pleasure for me to be here in Tokyo. I would like to thank the organisers of this important event, the 28th Nomura Central Bankers Seminar, for giving me the opportunity to share with such a distinguished audience some considerations about the role of liquidity in the recent market turmoil.

The current turmoil in financial markets has been to a very large extent about "liquidity". Since august 2007 the different phases of the turmoil have been marked by repeated disruptions to the traditional mechanisms of liquidity creation and transmission, both at the aggregate and at the individual level.

Indeed, from the start of the turmoil we have experienced several episodes of contraction in the degree of liquidity of a variety of money and credit markets. Some of these episodes have been experienced in the market for inter-bank unsecured loans, a key component of the money market and the starting point of the monetary transmission mechanism. Moreover, liquidity has also dried up in the market for mortgage-backed securities and commercial paper as well as for structured credit products. And, occasionally, poor liquidity conditions have been reported in markets for securities historically regarded as very liquid and safe, such as the market for banks' secured covered bonds or, even, the government bonds of some developed economies.

Indeed, at some points in time over the last few months we have observed rises in order-based measures of liquidity risk for a variety of money and credit markets and declines in traded volumes that could be explained only by the existence of severe stress.

At the individual level, liquidity shortages have taken a toll on a limited number of financial institutions.

In my intervention, I would like to first recall some of the main issues related to liquidity and banks' liquidity management that have played a central role during the recent market turmoil. Second, I will briefly review developments in liquidity in credit and money markets from the start of the turmoil. Third, I will describe some of the actions that central banks (and, particularly, the ECB) have undertaken to mitigate disruptions to the traditional channels of liquidity provision from the start of the turmoil. Finally, I will attempt to draw some preliminary lessons on liquidity management and present some of the public and private initiatives that are currently under discussion in order to reinforce the industry and regulatory framework for liquidity risk management.

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[1] I am very grateful to Samuel López, Philippe Molitor, Romana Peronaci, Valia Rentzou, Ralph Weidenfeller and Alessandro Calza for their valuable inputs and contributions, and to Ulrich Bindseil and Fatima Pires for their useful comments.

2. Liquidity issues

The multi-faceted nature of liquidity

Before moving on, it may be worth agreeing on a working definition of the term "liquidity". Indeed, this term is often used to indicate many different things. This is a problem that has been pointed out by several contributors to a recent volume of Banque de France's *Financial Stability Review* on liquidity issues.[2] For instance, Charles Goodhart notes in his contribution that the difficulty to define liquidity clearly is due to the multi-faceted nature of liquidity itself. Less charitably, Jean Tirole blames the problem on the "unfortunate habit of economists" to use this term to cover different concepts.

While some economists may argue that the specific meaning of the term becomes clear once it is put into context (particularly whether it is used in relation to macroeconomic developments, financial markets or single agents), it is worth striving for more clarity in the use of the notion of liquidity. Since I realise that this may sound like a criticism to the profession's practice, let me come clean by admitting to the same unfortunate habit of using the same term for different purposes. Indeed, I have to acknowledge that at the ECB we refer to liquidity to describe conditions and notions at different levels (individual, market and economy-wide) that are distinct from each other. So, as a sign of repentance, let me try attempt to clarify these different notions and to make the firm resolution to stick to them, at least until the end of this speech.

In the context of the properties of an *individual financial instrument*, the notion of liquidity typically refers to the ability of trading such instrument (i.e. purchasing or selling it) without unduly affecting its price. In particular, an asset is described as liquid, thereby entailing limited liquidity risk, if it is reasonable to assume that it can be easily sold without incurring a loss of value.

The notion can also be used to characterise *an entire market*, also to reflect co-movement in liquidity across assets. In this case, we refer to the ability to trade or liquidate positions in a market without significantly affecting the prevailing market prices. The degree of liquidity of the market for a financial asset is a function of a variety of factors, including: its outstanding size; the relative size, frequency and modalities of transactions; the number and quality of market participants; the relevance of transaction costs; the amount and quality of information on prices, traded volumes and, more fundamentally, on the security of the asset and the credit-worthiness of counterparties. Thus, a market in which trades can be smoothly executed thanks to the stable presence of numerous buyers and sellers willing to undertake large transactions at narrow bid-offer spreads is generally regarded as highly liquid.

When talking about the *market liquidity*, it is also customary to distinguish between exogenous and endogenous market liquidity.[3] Exogenous liquidity is related to the ability of a market participant to execute a trade at little or no cost. By contrast, endogenous liquidity refers to the fact that large sales over a given time period may affect market prices, thereby giving rise to valuation losses. The degree of exogenous liquidity of a market very much depends on many of the factors that I have just mentioned, notably its size and degree of completeness. However, whether or not a market is exogenously liquid may vary over time and some times dramatically. Indeed, markets that normally present some desirable properties ensuring a high degree of liquidity may become highly illiquid under stress, as illustrated by the experience of the very short-term money market in recent months.

Going back to the issue of the different notions of liquidity, from the start of the turmoil we have also heard reports about liquidity (or, to be more precise, lack of liquidity) of *specific*

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[2] Banque de France, Special Issue Liquidity, *Financial Stability Review*, February 2008.

[3] See for instance Box 15 in the *ECB Financial Stability Review*, December 2007.

individual financial institutions. In these reports, liquidity problems at specific individual banks are usually referred to as equivalent to difficulties in funding their business activities. Indeed, an additional notion of liquidity refers to the ability of a firm (not necessarily from the financial sector):

- to convert its assets into cash by disposing of them or borrowing against their value in order to meet expected and unexpected obligations, or
- to issue liabilities in order to raise funds.

The degree of *funding liquidity* of a firm may depend on a number of factors, notably the amounts of liquid assets it holds and the liquidity of the credit and securities markets it relies on for its external financing.

The last observation points to the fact that, while the different notions of liquidity (notably, market versus liquidity funding) are conceptually distinct, *they are in practice interrelated*. Indeed, some authors have developed models in which market and funding liquidity reinforce each other, leading to the emergence of positive or negative "liquidity spirals" that may account for some of the declines in the liquidity of markets and individual institutions observed in recent months.[4]

Aggregate liquidity

Before closing the subject of defining liquidity, let me briefly recall that there is a more *aggregate* notion – that should be fairly familiar to this audience of experts on the Japanese economy and Bank of Japan's Quantitative Easing Policy – that is often used to describe monetary developments at the macroeconomic level. Indeed, liquidity is often used as a synonymous for money supply. In particular, at the ECB we use the term "excess liquidity" to indicate the existence of a stock of money relative to income in excess of the level needed to finance non-inflationary growth in the medium term (as in the quantity theory of money).

Of course, even this notion of liquidity is not entirely unrelated to those mentioned above, since money supply measures are derived from the consolidated balance sheet of the banking sector. However, it is important not to confuse references to liquidity in the context of liquidity management (that refer to the overall liquidity needs of the banking sector) with the aggregate money holding behaviour of agents other than banks.

Market and funding liquidity risks

As I mentioned above, the liquidity of a financial instrument may vary over time, and may become severely impaired under conditions of stress. Uncertainty about liquidity implies that market participants face the risk that it may not be possible to execute a transaction when they wish to do so due to the lack of counterparties. For instance, a market participant may not be able to sell a security or liquidate a position due to lack of buyers.

Similarly, firms (but also households) face the risk of being unable to obtain enough cash to meet their obligations. This funding liquidity risk is particularly relevant for banks since their core business involves the maturity transformation of funds. Indeed, the traditional activity of banks consists of providing liquidity transformation services, by collecting short-term deposits in order to finance the provision of loans with longer maturities. As a result, banks intrinsically face a maturity mismatch in their balance sheets that exposes them to funding liquidity risks.

Under supposedly extreme circumstances (that the experience of Northern Rock suggests may not be that extreme), the maturity mismatch may even imply the risk of a bank run. This

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[4] Brunnermeier, M.K. and L.H. Pedersen, "Market liquidity and funding liquidity", forthcoming in *Review of Financial Studies*.

may happen if large numbers of depositors perceive liquidity conditions (or solvency, for that matter) at a specific institution as untenable and rush to withdraw their deposits in waves. Several mechanisms and policies have been developed over time for prevention and resolution of bank runs. These include deposit insurance schemes (whether privately or publicly funded), regulatory and supervisory policies (e.g. on reserve and capital requirements) and the possible recourse to emergency liquidity assistance from the central bank (the "Lender of Last Resort" classic policy prescription).

The "originate and hold" vs. "originate and distribute" models

The characterisation of the liquidity risks faced by banks I have made so far conforms to that of the so-called "originate and hold" business model, according to which banks create loans to firms and households and hold them to maturity in their balance sheets. However, in recent decades, many banks have taken advantage of financial innovation and of developments in securitisation to progressively shift towards the so-called "originate and distribute" model. Under this new model, banks originate loans but sell them to structured investment vehicles (often set up by themselves) to be repackaged and subsequently sold as asset-backed securities.

In principle, this business model is attractive for banks since it provides them with a new source of financing to expand lending, thereby mitigating their funding liquidity risks, while also allowing them to economise on costly capital requirements. Indeed, it has been argued that regulatory capital arbitrage has been one of the main reasons why banks have adopted the "originate and distribute" model.

Also from the point of view of the economy as a whole, the "originate and distribute" model could be viewed as having many advantages. First, being capital costly, the ability to sustain a given level of credit with a lower volume of capital enables the banking sector to reduce the costs of credit for borrowers and favours financial development. Moreover, it may be seen as representing a step towards more complete credit markets, thereby contributing to enhancing the efficiency of the economic system. In addition, the securitisation of loans in principle could reduce a secular source of vulnerability of the economies, by taking risk concentrations associated with loan portfolios away from the banking sector and spreading them more broadly across other sectors. As a result, the "originate and distribute" model may potentially diminish the likelihood of the credit busts and banking crises that have historically been a major source of macroeconomic and financial instability in many economies.

It should be noted though that, even before the outbreak of financial market turmoil, some commentators have voiced doubts about some of the welfare-enhancing effects of the "originate and distribute" model. For instance it has been argued that, while securitisation certainly spreads existing risks, it may in fact encourage the creation of further risks, particularly by relaxing the incentives for banks to screen and monitor borrowers in order to alleviate the informational asymmetries associated with credit contracts. More generally, it has been questioned whether the securitisation of loans may not perversely shift risk concentrations to sectors potentially more vulnerable than those that originated them.

In this regard, I remember reading a few years ago in the Bank of Japan's *Financial Stability Review* that in Japan credit derivatives based on loans originated by large and relatively well-capitalised commercial banks had been acquired by small regional financial institutions with significantly weaker balance sheets. Also in the course of the current turmoil, we noticed that some of the individual European banks affected by exposures to the sub-prime mortgage market were relatively small institutions without the necessary technical expertise or balance sheet strength to withstand them. In addition, for many banks all over the world, risks do not seem to have travelled farther away than the balance sheets of their own conduits, and have been re-internalised once the market turmoil has erupted.

While this certainly does not mean that securitisation is not welfare-enhancing, it suggests that – in the environment of historically low returns on traditional securities and an implied

imprudent hunt for yield that preceded the turmoil – the markets for asset-backed securities and credit derivatives may have failed to spread risks as effectively as expected and exacerbated information asymmetries, probably as a result of their opacity and the complexity of contracts.

More generally, the events of the last few months have revealed that, while the adoption of the "originate and distribute" model relieves banks from traditional *funding liquidity risks* and "liquefies" the underlying assets, it increases their exposure to the *risk of market illiquidity*. Indeed, this model relies on the assumption that banks are able to dispose of mortgage loans in the form of repackaged asset-backed securities, which requires the existence of highly liquid wholesale markets. As I will explain in the next section, over the last few months liquidity has become severely limited in a number of markets playing a key role for the execution of the liquidity risk management strategies of the banking sector. This has particularly affected banks pursuing very aggressive strategies of maturity transformation, relying on the continuing issuance of asset-backed commercial paper at short maturities.

To illustrate this point, we only need to recall the start of the current market turmoil. The deterioration of the US sub-prime mortgage market led to the drying up of liquidity in the markets for mortgage-backed securities. These developments led to liquidity funding difficulties at the structured investment vehicles (SIVs) specialised in purchasing mortgage loans from banks and transforming them into mortgage-backed securities for their subsequent sale to investors. Liquidity funding problems at SIVs translated into analogous problems at banks as they were no longer able to dispose of their stocks of mortgage loans, while facing unexpected obligations arising from contingent credit lines and, in some cases, also from the prospects of being forced to incorporate struggling in-house SIVs into their own balance sheets. Uncertainty about future obligations among individual banks led to significantly increased precautionary demand for liquidity, which – together with asymmetric information – resulted in severely diminished liquidity in the money market.

3. How has liquidity been affected by the turmoil

I have anticipated already some of the developments in liquidity from the start of the current market turmoil. Let me now review them more in detail in the remainder of this section.

As you are well aware, in July and early August a series of events led to an intensification of the tensions in the US sub-prime mortgage market and a sharp decline in the degree of risk appetite of global investors. Market volatility increased across almost all financial asset classes. Stock prices declined as investors sold equities and moved funds into safe-haven investment assets, such as government bonds. In this context, several investment funds holding asset-backed securities suspended withdrawals from their clients. At the same time, a number of European banks made public their direct or indirect exposures to the US mortgage market, particularly to its sub-prime component.

In this environment, market liquidity declined for a number of assets. This was most obvious for the *markets directly related to the core of the current turmoil*, namely the market for sub-prime asset-backed securities (ABS). During the turmoil, the problem of illiquidity however spread much further, first affecting other ABS and asset-backed commercial paper (ABCP), then mortgage-backed securities (MBS) and basically all structured credit instruments, such as collateralised debt obligations (CDO).

The *market for government bonds* is the only fixed income market in which liquidity has remained fairly good. It should, however, be noted that within the euro area there has certainly been a differentiation among different government bonds: while German Bunds have generally remained quite liquid, the liquidity of bonds issued by countries with weaker public finances, such as Italy and Greece, has at certain point in time been heavily impaired. This has also had an impact on the yield spreads between these government bonds and the

benchmark Bunds, which in some cases have widened to their highest levels since the introduction of the euro.

In *money markets* the impact of the turmoil was initially felt mainly in the longer-dated unsecured inter-bank market. It can be said that liquidity in the unsecured deposit markets almost completely dried-up in maturities beyond 1-month (although it should be noted that these were not the most liquid ones even in "normal" times). These frictions eventually spilled over to the very short-term money markets (i.e. below one-week), at first in the US dollar market where banks – particularly, from Europe – encountered difficulties in raising short-term liquidity.

Early in the morning of Thursday 9 August, the tensions spread to the short-term euro money market (and also to other money markets such as the British pound and the Swiss franc markets) triggering an exceptional fine-tuning operation of the ECB. Important factors driving these adverse liquidity developments in the unsecured market were general uncertainty about banks' sub-prime exposures and the scope for related write-downs resulting in ever increasing lack of mutual confidence within the banking community. Indeed, rising adverse selection together with increased precautionary demand for liquidity, nearly led in august 2007 to the euro money market providing a real-life illustration of Akerlof's "market for lemons" prediction of how information asymmetries in a market with uncertainty about the quality of goods (in this case of credit claims) may lead to a decline in trading and, potentially, to the collapse of the market.

Interestingly, also the liquidity in the *secured non-government repurchase agreement (repo) markets* was heavily impacted, as many banks no longer wanted to accept the types of securities mentioned above (ABS/MBS/CDO) as underlying collateral in repo transactions. As a result, only the repo markets based on government bonds remained fairly liquid, but even in these markets the degree of price differentiation across repos secured with different types of government bonds was larger than normal.

Another market segment that saw a partial (temporarily even severe) deterioration of liquidity conditions is the *foreign exchange swap market*, which is very important for banks managing liquidity in different currencies. In particular at times when many banks were keen on obtaining USD liquidity, most market participants tried to swap other currencies into dollars, while hardly any bank was willing to provide the USD funds to the extent that the market became dysfunctional for maturities beyond 1 week.

4. Actions of central banks: What has the ECB done? What have other central banks done?

From the start of the market turmoil, the ECB has undertaken a variety of *liquidity management operations* – in some cases in coordination with other major central banks – in order to mitigate the disruptions to those segments of the money market that are under its direct influence.

The ECB's liquidity interventions have been accompanied by an intensification of its *communication* policy in order to stress the separation between monetary policy and liquidity management policy.

In addition, given the rather technical nature of issues related to liquidity management and the relative lack of familiarity of the general public with them, more intense communication has been needed to prevent and correct occasional misunderstandings in the financial press about the scale, modalities and objectives of our liquidity operations. In fact, observers often fail to notice that the magnitude and nature of a central bank's liquidity management interventions is very much conditional on the structural features of its operational framework. Therefore, impressionistic comparisons among interventions from different central banks, abstracting from the structural differences in their frameworks, do not necessarily serve well the public's interest in assessing policy responses to the market turmoil.

The Eurosystem's operational framework

Thus, before explaining what the ECB has done, let me briefly outline some elements of the Eurosystem's operational framework that have proved crucial to enable it to continue influencing short-term money market rates in spite of the difficult situation in financial markets.

The operational framework of the Eurosystem has been chosen with great care to function both in normal and stressful times.[5] It aims at steering short-term money market rates close to the main policy rate in a smooth and efficient manner, with the primary aim of *implementing the monetary policy decisions* of the Governing Council of the ECB.[6] It consists of elements that are regularly employed and those that can be activated should the need arise. In particular, this framework comprises three categories of instruments: 1) open market operations, 2) minimum reserve requirements and 3) standing facilities.[7]

Even though *open market operations* include several different operations, the Eurosystem has so far almost exclusively conducted two types: *refinancing operations*, through which liquidity is temporarily lent to counterparties against eligible collateral and at a minimum bid rate which signals the monetary policy, and the *collection of fixed-term deposits* (*use of reverse transactions*) for fine-tuning purposes, which are used to temporarily absorb (provide) liquidity from (to) counterparties.

Moreover, banks must hold a certain amount of liquidity to fulfil their *reserve requirements* (calculated as a ratio of their short-term liabilities). This requirement needs to be fulfilled on average over each reserve maintenance period, which is approximately one month long.

The Eurosystem offers on each operating day two *standing facilities* which can be accessed at the discretion of individual banks, namely a deposit facility and a marginal lending facility. At their own initiative, banks can place liquidity in the deposit facility on an overnight basis, at a rate which is decided by the Governing Council and is normally one percentage point below the policy rate (the minimum bid rate in main refinancing operations), while they can borrow overnight liquidity against eligible collateral via the marginal lending facility at a rate which is normally one percentage point above the policy rate.

With these instruments, the Eurosystem implements the *monetary policy decisions* of the Governing Council of the ECB. More precisely, by using these instruments the Eurosystem manages liquidity conditions in the euro area money market so as to steer very short-term interbank money market rates as close as possible to the policy rate – the minimum bid rate – decided by the Governing Council.

Eurosystem's open market operations during the financial market turmoil

At times of increased liquidity risk at longer maturities, a key concern of central banks is to support the re-establishment of the smooth functioning of the very short-term money market. This is a precondition for ensuring the transmission of the monetary policy impulses to the economy.

In the context of the current market turmoil, the primary aims of the ECB's liquidity management policy have been: (1) as in normal times, to *keep the overnight rate as close as*

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[5] For a more detailed description, see the following articles in the ECB Monthly Bulletin: The role of the operational framework of the Eurosystem: description and first assessment, May 1999; and Changes to the Eurosystem's operational framework for monetary policy, August 2003.

[6] See Manna, M., H, Pill and G. Quirós (2001), The Eurosystem's operational framework in the context of its monetary policy strategy, *International Finance* 4(1).

[7] For an analysis of the role and properties of the different categories of instruments see Bindseil, U. (2004). *Monetary Policy Implementation: Theory, Past and Present*, Oxford University Press.

possible to the minimum bid rate; (2) the ECB has endeavoured to ensure the *smooth functioning of the money market,* also at term maturities, by facilitating access to liquidity to solvent credit institutions, thereby helping them to meet their liquidity needs in a smooth manner. By doing so, the ECB has intended to contribute to re-establishing confidence among market participants and to safeguard financial stability and the appropriate functioning of the monetary policy transmission mechanism.

In line with these aims, during the recent period of financial market volatility, the Eurosystem has supported banks' access to liquidity and the general functioning of the money market by implementing various measures, which can be summarized as follows.

First it has made some relatively small *adjustments to the modalities of its supply of euro liquidity* by adjusting

- the *distribution of liquidity* supplied to the market within the reserve maintenance period without, however, increasing the average quantity of the liquidity supply (*front-loading policy*), and
- the *way in which the liquidity is allotted* to the banking system, i.e. it has increased the maturity of its refinancing operations, it has augmented the frequency of its fine-tuning operations, and it has occasionally applied different tender specifications.

Box 1

Adjustments to open market operations during the recent turmoil

Distribution of liquidity supply

The main reason for adjusting the distribution of liquidity supply during the turmoil was the perceived *change in the pattern of the demand for liquidity* within the maintenance periods. The financial turmoil showed that interest rates were no longer necessarily linked to liquidity conditions on the last day of the maintenance period, as banks did no longer regard reserve holdings on different days of the maintenance period to be substitutes (contrary to the martingale hypothesis).[a] Indeed, in the first days of the turmoil, interest rates rose significantly because they were driven mainly by precautionary motives. Counterparties were not only reluctant to lend on unsecured terms, but they also feared being confronted with unexpected liquidity needs and, as a consequence, preferred having liquidity buffers. Therefore, to avoid upward pressure to overnight rates, the supply of liquidity had to be brought forward within the maintenance period.

As a result, the ECB accommodated banks' preference for *front-loading* their reserves during the reserve maintenance period, by increasing the liquidity supply at the beginning of the period and reducing it later in the period.

More specifically, since the start of the turmoil and after the first "fire-fighting" fine-tuning operations conducted in August, the ECB has achieved this frontloading by adjusting its regular provision of liquidity in the regular main refinancing operations so as to provide larger amounts at the beginning of the maintenance periods, while it has provided correspondingly less towards the end of the maintenance period, so that in total, over an entire maintenance period, the supply of liquidity has remained unchanged. In addition, since November, whenever notable downward pressure on the overnight rate started to appear, it has also conducted liquidity-absorbing fine-tuning operations with maturities of between two and five days.

Through this policy of front-loading, the ECB has allowed credit institutions to fulfil their reserve requirements relatively early in the maintenance period, but, at the same time, it has kept *unchanged its average supply of liquidity* over the maintenance period. Such an approach is in line with the Eurosystem's aim to provide to the banking system, over each maintenance period, the exact amount of liquidity needed to fulfil their liquidity deficit, which is given by the reserves requirements and the net liquidity-absorbing autonomous factors.

Adjustment in the allotment of liquidity over the reserve maintenance period

In order to support a normalisation of the conditions of the money market, the ECB has adjusted the *way in which the liquidity is allotted to the banking system.* This has been achieved though several actions.

First, as just mentioned, the ECB has made more frequent use of fine-tuning operations than in "normal" times (both in order to inject liquidity in addition to that provided in the main refinancing operations (MROs) and to absorb excess liquidity), as needed in order to keep the very short term interest rates close to the minimum bid rate in the light of the highly unstable and unpredictable liquidity demand.

Second, the Eurosystem has increased the share of refinancing provided via three-month longer-term refinancing operations (LTROs), and reduced the share provided via the one-week MROs. Accordingly, the total amount of outstanding refinancing has remained unchanged, while the average maturity has been extended, thereby contributing to reduce

the future liquidity needs of the banking system.

- More specifically, in addition to the regular monthly LTROs, two supplementary LTROs with a maturity of three months were carried out in August and September 2007. The Governing Council decided to renew these operations, with slightly amended sizes, when they matured in late 2007 and in early 2008, and has since announced the renewal of the upcoming maturities in May and June 2008.
- Besides, on 28 March 2008 the Eurosystem decided to further enhance the provision of supplementary longer term refinancing, and announced two supplementary six-month LTRO of a pre-set amount of EUR 25 billion, to be settled in April and July 2008.

As a result, the share of the total refinancing provided through LTROs is currently 66%, more than double the share (30%) prior to the financial turmoil.

Third, a special tender procedure with *full allotment* has been applied on two occasions.

- Such procedure was first applied for the fine-tuning operation on 9 August, when it was deemed more efficient to leave it to the market to determine the exact allotment amount, given the large degree of uncertainty.
- A more muted variant of a fixed rate tender with full allotment was applied in the MRO on 18 December. This operation had an exceptionally prolonged maturity of two weeks so that banks could cover their liquidity needs over Christmas and the days around the year-end in advance of this difficult period. This muted variant consisted of pre-announcing a commitment on the ECB's side to satisfy all bids at or above the weighted average rate of the previous MRO (4.21%). As a result, the ECB allotted €348.6 billion. Large amounts of this significant additional liquidity were subsequently absorbed via several fine-tuning operations, mostly with an overnight maturity, to avoid an excessive downward pressure on the overnight rate. This measure significantly reversed the increasing trend in the Euribor/OIS spread and the EONIA remained somewhat below the minimum bid rate, reflecting banks' comfortable liquidity positions.

[a] Evidence in support of the martingale hypothesis in normal times is presented in Cassola, N. (2008), The reserve fulfilment path of euro area commercial banks: Empirical testing using panel data, *ECB Working Paper* 869.

Second, the ECB has agreed with the Federal Reserve System to grant loans in dollars to euro area banks in connection with the FED US dollar Term Auction Facility, in the context of coordinated central banks' actions. The Eurosystem's loans have been financed through a currency arrangement (swap line) between the FED and the ECB.

Box 2

Operations in connection with the US dollar Term Auction Facility

In order to address the concerns of euro area banks on the availability of their funding denominated in US dollars, the ECB agreed with the Federal Reserve System a currency arrangement (swap line) in connection with their US dollar Term Auction Facility. The Eurosystem provided the US dollar funding received via this swap line to its counterparties with access to the marginal lending facility, against collateral eligible for Eurosystem credit operations (i.e. euro denominated collateral), in two operations settling on 20 and 27 December 2007. These operations were renewed on 17 and 31 January 2008 and again on

25 March and 7 April 2008. The USD liquidity-providing operations did not have an effect on the supply of euro liquidity. Similar operations were also carried out by the Swiss National Bank.

At each of the first four operations, the volumes of US dollar loans provided with a maturity of one month totalled USD 10 billion, while at the last two operations, US dollar loans for a total of USD 15 billion were offered. The operations were conducted at a fixed rate equal to the marginal rate of the simultaneous Federal Reserve tenders.

Boxes 1 and 2 explain in greater detail these measures, let me point out that, in fact, they are all only rather minor adjustments to the existing operational framework for monetary policy implementation, which, has so far, proved to be sufficiently flexible to cope with the recent tensions in the market.

Third, throughout the period of financial market turmoil, the *ECB has promptly communicated* to the market its liquidity policy intentions and explained its actions via press releases, statements on newswire services and other communications channels (e.g. speeches, articles in the Monthly Bulletin, etc.). These communication efforts have supported the monetary policy implementation operations by reassuring the market on the readiness of the ECB to take adequate measures when necessary.

Eurosystem's collateral framework

The ability of the Eurosystem to respond to the challenges for monetary policy implementation posed by the recent period of financial market volatility, that in many senses represents its most difficult test from the start of Monetary Union in 1999, has to a large extent depended on its collateral framework.

Indeed, the *collateral framework* is considered to have played an important role in supporting the functioning of the money market and effectively addressing the asset refinancing needs of counterparties, without requiring ad-hoc changes.

In order to understand the role of the collateral framework in the current turmoil, let me recall a key principle of the Eurosystem's operational framework stating that all credit operations need to be based on *adequate collateral*.[8] The concept of *adequacy* implies, first, by statute that *the Eurosystem should be protected* from incurring losses in its credit operations and, second, as a policy consideration that *sufficient collateral should be available to a wide set of counterparties*, so that the ability of the Eurosystem to provide the amount of liquidity it deems necessary for both its monetary policy and payment systems operations should not be impeded by a shortage of collateral in the banking sector as a whole, or even in a significant part of the banking sector. To ensure that this is not the case, the Eurosystem accepts a broad range of debt instruments as collateral, ranging from government bonds, bonds issued by supranational institutions, covered and uncovered bank bonds, corporate bonds and asset backed securities (ABS) to non-marketable instruments, such as credit claims.

This wide list of eligible assets – together with the sizeable number of counterparties and the large size of its refinancing operations – has helped the Eurosystem to implement its liquidity management policies during the recent period of decline in market and banking liquidity.

[8] For an analysis of the role of the collateral frameworks in the Eurosystem's monetary policy operations see Bindseil, U. and F. Papadia (2006), Credit risk mitigation in central bank operations and its effects on financial markets: The case of the Eurosystem, *ECB Occasional Paper* 49.

More specifically, by allowing the refinancing of ABS at a large scale at rates close to ECB policy rates, the collateral framework may have also contributed to financial stability, at least in the short term, by avoiding forced sales of ABS, which would have intensified the liquidity crisis in the ABS market.

Two significant developments have been observed during the turmoil with respect to the Eurosystem collateral framework.

The total amount of collateral held with the Eurosystem by counterparties has increased significantly, the main reason being that banks have increased their *collateral buffer*, i.e. the amount of collateral held with the Eurosystem in excess of the amount of collateral needed for monetary policy operations (*over-collateralization*). This amount has increased from around EUR 600 billions in the first half of 2007 to around EUR 800 billions. The increase in *over-collateralization* during the turmoil might reflect a natural preference of banks to expand their liquidity buffers – in order to get maximum access to intraday liquidity and to the marginal lending facility in case of need. In addition to this, banks have had to collateralise temporarily higher amounts of outstanding Eurosystem credit because of the *frontloading* policy. Finally, regulatory incentives might have played a role, as regulators may have allowed banks to apply better liquidity ratios to assets held with the Eurosystem. Despite the significant rise in collateral held with the Eurosystem, there are no developments indicating a shortage of eligible collateral.

The share of asset-backed securities (ABS) in the total collateral held with the Eurosystem has risen to more than one-fifth in December 2007. As liquidity in ABS primary and secondary markets (including ABS-based repo markets) has dried out almost completely during the turmoil, counterparties have intensified the use of ABS as Eurosystem collateral. It should however be noted that assets held as collateral with the Eurosystem are not refinanced by the Eurosystem on a one-to-one basis, given the high degree of *over-collateralization* of Eurosystem credit that I have mentioned above.

Actions of other central banks

As regards other central banks, in general their primary response to the market turmoil has been to intervene to *keep short-term money market rates near target rates*, through more active liquidity management. Moreover, central banks have aimed to ease the increasing pressure in term money markets by: (1) increasing the *viability of standing loan facilities* as backstop funding options; (2) boosting *the share of longer-term operations* in total refinancing provided to banks; and (3) expanding the *range of acceptable collateral and eligible counterparties*, in those countries where it was needed.

Central banks have also gradually increased their mutual cooperation, initially through *enhanced communication* and collective monitoring of market developments, and later on by undertaking *coordinated actions* to provide funds over the year-end. These actions have included the establishment of the earlier-mentioned foreign exchange swaps.

Box 3

Operations by other central banks

More in detail, the actions undertaken by other central banks in response to the market turmoil have included the following:

In order to **steer short-term market rates**, central banks have conducted operations that were either outside their regular schedule or provided amounts larger than usual, and have taken further steps to equilibrate demand and supply for central bank reserves at the policy

rate.

- The *Federal Reserve* on 17 August 2007 enhanced the attractiveness of the central bank's **standing loan facility** by cutting the spread between the interest rate on its lending facility (the discount rate) and the federal funds rate target to 50 basis points (from 100 basis points), and by increasing the allowable term on loans from overnight to 30 days. On 16 March 2008, the spread between the discount rate and the Fed funds target rate was further reduced to 25 basis points and a new facility for primary dealers was introduced (Primary Dealer Credit Facility – PDCF). This facility, which is very similar to the discount window for depository institutions, has been heavily used from the beginning.
- The *Bank of England increased* target ranges for the maintenance period from the normal ± 1% up to ± 60%, thereby greatly increasing flexibility of banks.
- Central banks have also sought to *address continued pressures in term markets.*
- The *Federal Reserve* has provided longer-term financing (28 days) to primary dealers and introduced a Term Auction Facility (also 28 days) for depository institutions. The *Swiss National Bank* carried out its first ever three-month repurchase transaction on 13 September. The *Bank of England,* offered in September and October 2007 a sequence of additional longer-term refinancing auctions, which, in March 2008, were rolled over, with their size further increased. Moreover, at the end of 2007 many central banks anticipated or expanded the provision of term funds that spanned into 2008 in order to ease year-end pressures.
- Another important development has the *enlargement of the range of eligible collateral* by several central banks, temporarily or permanently, and of the list of *eligible counterparties.*
- The new Term Auction Facility (TAF) introduced by the *Fed* extended the broad range of discount window collateral to a series of substantial longer-term refinancing operations structured as loans against pools of collateral.
- The *Bank of England* broadened its relatively narrow range of collateral for its additional longer term operations.
- The *Bank of Canada* and the *Reserve Bank of Australia* also widened the list of collateral eligible for (some of) their operations.

On 11 March 2008, the *Fed* introduced a new Term Securities Lending Facility under which market participants can swap, for periods of 28 days, certain securities with currently limited market liquidity (but very high credit rating) into highly liquid Treasury securities. This facility allows counterparties to mobilise certain types of collateral, without however having a direct impact on the Fed's liquidity management, as the Fed provides Treasury securities rather than cash in return.

5. Preliminary lessons of the turmoil and ongoing initiatives

5.1. Lessons from an operational framework point of view

Since its inception the operational framework of the Eurosystem, which I have described earlier on, has been tested on several occasions. One such occasion was the management of the cash changeover in early 2002; another test of the resilience of the framework came after the terrorist attacks in September 2001. The present market turmoil however has posed new challenges to the framework, and in many aspects even more significant than those faced in the past.

I would like to stress that the ECB, with its regular set of tools, has been able to stabilise short-term money market rates reasonably well during the ongoing turmoil. Several features of the framework have been – and continue to be – important in this regard. In normal times, the regularity and predictability of operations (such as the conduct of weekly main refinancing operations with predictable allotment amounts) is useful in order to stabilise money market rates. Indeed, with the benefit of several years of experience, the Eurosystem and its counterparties have learned to interpret and predict each other's actions. This has led to stable behaviour in banks' participation in the ECB's operations.

In stressful times, some other features have proved to be very useful, including in particular the wide range of eligible collateral, the large number of counterparties and probably also the relatively large size of refinancing operations. The flexibility of the framework is another feature which is very valuable during turmoil. A good illustration is, for instance, the ability to conduct fine-tuning operations. Other examples are the introduction of supplementary long-term refinancing operations – not only in the regular 3-month tenor, but also for 6-month maturities.

Let me briefly recall the specific way in which the *different features of the framework* have proved to be important in the recent turmoil period:

First of all, the *flexibility* of the operational framework has proven to be extremely valuable, because it has allowed the ECB to adjust its liquidity supply at any time in line with the changing demand for central bank balances.

In this regard, let me stress one particularly important feature of the framework, namely the strict separation of actions related to liquidity policy from the monetary policy stance. The technical measures that have been employed over recent months have – contrary to widespread belief – not had an impact on the overall liquidity provision, defined as the banking sector's current account holdings with us. This is because all the additional liquidity provided has subsequently been compensated for by means of the provision of less liquidity later on. What has changed has simply been the timing of the provision of liquidity to banks. It is important to stress this – particularly at the moment, with risks to price stability clearly on the upside – in order to avoid a misunderstanding regarding links between liquidity policy and inflation.

The *second* feature of the framework that has proved to be very useful has been the *large number of counterparties* in the ECB's operations. The ECB has been able to reach a large number of banks in its open market operations at a time when the money market has been working imperfectly. As a result, the Eurosystem has continued to be able to influence short-term money market rates.

Third, several features of the collateral framework have been important, notably the *wide range of eligible collateral*. First of all, this has, together with the relatively large size of the Eurosystem's refinancing operations, allowed those banks which faced reduced access to the interbank market, to raise liquidity via the Eurosystem. Moreover, the wide range of eligible collateral has made it possible for banks (in their operations with the central bank) to economise on those few assets, such as government bonds, that have continued to be tradable throughout the turmoil. In this respect, the framework has supported the continued functioning of capital markets in general. At the same time, the single list of collateral, which specifies unambiguously the eligible assets, has facilitated banks' liquidity management under stress. This has contributed to the continued smooth conduct of open market operations.

However, the continued low marketability of many assets limits their use as collateral in market transactions, and this has had implications for the markets' willingness to lend and borrow on the money markets. In this regard, I would hope that capital markets will continue to develop further so that markets are, in the future, better equipped to cope with periods of stress.

In addition, we continue to observe certain reluctance by banks to use the marginal lending facility for reputational reasons, as if recourse to it signalled the need for emergency assistance from the central bank. We need to continue thinking about how to make sure that the recourse to this type of facilities is unimpeded so that they can be more effectively used for regular liquidity management purposes by banks.

5.2. Lessons for liquidity risk management

Some observers have argued that liquidity shortages are the symptoms of major failures in liquidity risk management by the financial institutions involved. Indeed, there is no doubt that, once the turmoil subsides, important lessons will need to be drawn as regards liquidity risk management.

In response to the turmoil, there have been concerted policy deliberations both at the international and EU levels, by the FSF and ECOFIN respectively, with the aim of addressing the weaknesses brought to the fore. Among the main areas of this work, one of the most important is aimed at enhancing bank's risk management practices and especially those related to liquidity risk.

Developments at the international level

At the international level, the *Financial Stability Forum (FSF)* has put forward a number of short-term actions to rebuild confidence in the creditworthiness and robustness of financial institutions, in order to facilitate the smooth operation of the market in terms of liquidity flow and provision of credit. In this context, supervisors and central banks are viewed as having a role in ensuring the existence of adequate capital and liquidity buffers of supervised institutions. However, there is a clear consensus that competent authorities cannot substitute the private sector for the more fundamental need of the market to recover confidence in the ability of the financial system to manage current risks.

In the medium term, considerations for expected policy actions concern topics pertaining to the current regulatory framework and practices as well as market functioning. The former aim to introduce a number of measures that will reinforce the capital and liquidity buffers of banks, enhance risk management practices, and improve competent authorities' assessments, responsiveness and exchange of information. The latter will address issues relating to the attributes of the "originate and distribute" model, the role of credit rating agencies and market transparency.

The international committee addressing liquidity risk (and one of the authorities represented in the FSF) is the *Basel Committee on Banking Supervision (BCBS).* The main current focus of a specific substructure of the BCBS (*the Working Group on Liquidity*) is the update of the 2000 guidance on "Sound Practices for Managing Liquidity in Banking Organisations". This update will review the current practices and strengthen areas identified as warranting additional attention due to the financial market developments. The update will include further guidance for the supervision of liquidity risk management and will address issues that are pertinent for cross-border banking groups. This updated supervisory guidance is expected to be issued by July 2008.

It is also worth to note that in February 2008, the *Basel Committee* released a report on the management and supervisory challenges related to liquidity risk resulting from the structural changes in financial markets. The report reviews different jurisdictions' approaches to supervising and regulating funding liquidity risk and assesses preliminary lessons and implications arising from the market turmoil.

Its main findings can be summarised in the following three points:

First, the structural changes in the financial markets have given rise to a significant set of challenges in assessing liquidity risk. In this respect, the establishment of the "originate and distribute" model as well as the growing use of securitisation and market –based funding

have increased the funding capacity of institutions at the price of increasing their vulnerability to adverse market conditions. The increased use of securitisation has also engendered contingent liquidity risk, for instance, through liquidity backstop arrangements, early amortisation provisions, or through support of sponsored conduits and off-balance sheet vehicles. Money market instruments, being much more volatile than retail deposits, require a prompt replacement of any loss of funding. Moreover, these instruments are difficult to price, as they are normally not actively traded and their short track period impinges on the reliability of cash-flow predictions and correlations with other financial assets.

Second, the real-time nature of an increasing number of payment and settlement systems has heightened the importance of intraday liquidity risk management. The recent improvements to the design of payment and settlement systems pose increasing challenges. For instance, eventual failures in time-critical payments and major liquidity shocks can be transmitted from one institution to another, both domestically or internationally. Moreover, institutions must ensure liquidity to meet their obligations on a timely basis throughout the business day.

Finally, financial markets are increasingly integrated, which in combination with the aforementioned structural changes, imply that any event in one market can spread and reverberate more quickly than ever. On the one hand, liquidity disruptions can move faster across international markets. On the other hand, liquidity may not be fully transferable across borders due to rules from national regulators for local operations. Thus, institutions need to consider the conditions of overseas markets, as well as the time and restrictions taken to complete the transfer of funds or collateral across jurisdictions.

Developments at EU level

At the same time, work has been progressing *at the EU level in accordance with the ECOFIN mandate*. The two main fora conducting work in this area are the *Committee of European Banking Supervisors (CEBS)* and the *European Central Bank (ECB)* in cooperation with the *Banking Supervision Committee (BSC)*.

The work of *CEBS* on liquidity risk management is covering the three following areas:

First, reviewing technical issues such as collateral management; concentration of liquidity sources; the distinction between banking and trading book; the relation between liquidity funding risk and liquidity market risk; the use of internal methodologies; and the impact of payment and settlement systems design.

Second, investigating the possible differences in the regulatory and supervisory treatment of branches and subsidiaries and clarifying the underlying reasons and objectives that drive the different approaches in relation to the allocation of tasks and responsibilities for these two types of entities.

Third, assessing the possibility of achieving further convergence by developing high level principles for the use of internal methodologies in the supervision of liquidity risk.

In parallel to the work of the CEBS, the *ECB*, in cooperation with the *BSC*, is conducting work aimed to investigate (i) the typology of EU banks' liquidity stress-testing techniques and contingency funding plans, (ii) the performance of stress-tests during the turmoil and (iii) the implications of identified shortcomings for counterparties and money markets. This strand of work is currently progressing and is expected to be finalised before the end of 2008.

Work in the field of liquidity risk already underway before the turmoil

Although recently work on liquidity risk management has attracted increased attention, this does not mean that it is a new issue in the supervisory agenda. Over the past years concerns were voiced over the divergence of prudential requirements for liquidity risk and over structural changes in the banking sector, such as the increasing reliance of more market-based and volatile sources of funding that could constitute contagion channels in the

event of a stress. As a result, deliberations and further work in the area of liquidity risk management were underway even before the turmoil, with the aim of ensuring that practices by both the industry and the competent authorities were keeping pace with the rapid developments in the market.

In this context, *CEBS* published in August an updated survey of the regulatory frameworks adopted by the Member States and the three EEA countries. The survey was conducted in light of market developments and included specific information regarding any different treatments provided for specific types of credit institutions and/or investment firms

The *ECB* has also been performing extensive work in the field of liquidity risk management, focusing on three main areas, namely: 1) assessing the impact of structural changes in the banking landscape; 2) gauging the extent to which liquidity risk management practices have progressed; and 3) ascertaining the industry's views about eventual barriers to the efficient management of liquidity risk across borders. In October, the ECB, in cooperation with the BSC, published a comprehensive report on the organisation of liquidity risk management for cross-border banking groups in the EU, covering various pertinent issues, namely regulation, obstacles to the pooling of liquidity and cross-border use of collateral and recent market developments.

In particular, the report confirmed the trend towards the centralisation of liquidity risk management policies and procedures and de-centralisation of day-to-day liquidity risk management. Against this background, the internal corporate governance and organisation of liquidity risk management varied according to the individual bank's structure and business model. The use of more sophisticated internal liquidity risk approaches such as Liquidity-at-Risk was not common; however, cross-border banks were increasingly developing such approaches for internal risk management.

Coming to the factors affecting the liquidity risk management of cross-border banks, liquidity risk regulation was not considered by the market as imposing undue restrictions. Cross-border banks requested a more concerted approach by their supervisors and cited the home/host arrangements and the large exposures limits as posing possible obstacles to the cross-border management of intra-group liquidity.

Certain obstacles regarding the pooling of liquidity and the cross-border use of collateral were also identified, including the divergence in standards of access to central bank money outside the euro area, the non-connectivity of payment and security settlement systems and legal issues. In this context, the industry acknowledged the importance of the initiatives taken by central banks to address problems in international flows of liquidity and the cross-border use of collateral.

In addition to the aforementioned issues, market developments that also affected liquidity risk management of cross-border banks consisted of the shortening time-horizon for payment obligations, the increased reliance on wholesale and potentially more volatile funding sources as well as the growing need for high-quality collateral.

Let me also mention initiatives by the *industry* in the field of liquidity risk. For instance, the *Institute of International Finance (IIF)* published in March 2007 the "Principles of Liquidity Risk Management" consisting of a number of key recommendations and appropriate practices. The IIF paper establishes that the needs and strategies of individual institutions can vary for a variety of reasons, suggesting that any liquidity recommendations or guidelines must be seen as describing a "range of good practices" and not necessarily prescribing one "best" practice. Governance and organisational structure are identified as critical in managing liquidity risk, given that no narrowly prescribed approaches can be followed, as liquidity issues arise in different ways for institutions with different structures and businesses. Another area of recommendations from the IIF concerns the coordination of supervisor's efforts, suggesting the harmonisation of regulations where possible in order to foster sound internal risk management systems. This would also include – in the view of the IIF – harmonisation of the range of collateral that central banks and settlement systems

accept and increased convergence and transparency from central banks in their role as lender of last resort.

6. Conclusions

While the current turmoil's ultimate cause are the substantial losses of financial assets linked to the US housing market, liquidity problems have driven its fever curve ever since its outbreak in the summer of 2007. Diminished liquidity in the markets that play a key role in enabling banks to implement their risk management strategies have led to a decline in funding liquidity at individual banks and given rise to adverse liquidity spirals.

In response to these tensions, the ECB and other central banks have undertaken a variety of liquidity management operations in order to support the interbank money market. However, some observers have argued that market tensions are partly the symptoms of major failures in liquidity risk management by private financial institutions in the past and that, by supporting banks when they get into trouble, central banks may be encouraging moral hazard. For instance, Goodhart (2007) has warned that "liquidity management has been passed from the commercial banks to the central bank".[9]

There is no question that moral hazard issues need to be taken very seriously into account when central banks decide on measures to support the banking system in a situation of financial turmoil. Of course, any such support policy, if anticipated, will be taken into account when banks establish their risk management frameworks for "tail" events. Still, one should refrain from generalising and concluding from this observation that central banks should not re-act and support the financial system in the case of severe liquidity disruptions to money and credit markets. In fact, nobody would dispute that the entire economy can be seriously affected if we allow financial market turmoil to develop into a credit crunch or a banking crisis.

In the context of the current turmoil, the primary objectives of the ECB's liquidity management policy have been from the beginning clearly identified: (1) to steer the overnight rate close to its key policy rate so as implement the monetary policy stance determined by the Governing Council; and (2) to support the proper functioning of the money market as a whole by helping credit institutions to meet their liquidity needs in a smooth manner. By doing so, the ECB has contributed to safeguarding financial stability and supported the effective functioning of the mechanisms through which monetary policy is transmitted in the euro area.

I am fully confident that, once the current turmoil subsides, we will have learned much about how to render the operational frameworks of central banks even more effective in providing access to liquidity in both normal times and under stress. At the same time, I think it is legitimate to expect that banks will make substantial progress in addressing the weaknesses in their liquidity risk management practices that the current turmoil has revealed and that, by doing so, they should make it less likely that history will repeat itself.

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[9] Goodhart, C. (2007), Discussion of "Success and failure of monetary policy since the 1950s" by D. Laidler, Conference on Monetary Policy over Fifty Years on occasion of the 50th anniversary of the Deutsche Bundesbank, Frankfurt, 21 September.