

Monetary operations and the financial turmoil¹

A proper understanding of central bank operations in response to the recent financial turmoil and of their implications for the monetary policy stance and for market functioning calls for an understanding of operating frameworks. And yet, not only are these the least familiar aspect of monetary policy, they also differ considerably across countries. The frameworks can have a first-order influence on the size and type of liquidity injections employed and on the need for exceptional measures.

JEL classification: E43, E49, G21, G32.

The serious disruptions in the interbank markets of several mature economies associated with the broader financial turmoil since August 2007 have firmly put the spotlight on central bank operations designed to implement monetary policy. This aspect of policy, normally taken for granted, is often not well understood, as the operations depend heavily on the peculiar characteristics of the market for bank reserves and on country-specific institutional features. While some of these features are largely immaterial in normal times, they acquire particular significance at times of stress. Moreover, at these times the risk of misunderstanding the nature of the operations is highest, not least as cross-country differences in institutional features may be misconstrued as substantive differences in the nature of the central banks' response.

Against this backdrop, the objective of this special feature is threefold. First, it provides a conceptual roadmap that can help to understand better the challenges that central banks face in implementing monetary policy at times of stress. Second, it discusses how central bank responses have been influenced by the operating frameworks in place. Finally, it highlights some questions that are raised by these operations. The focus is on seven central banks: those of the United States, the euro area, Japan, the United Kingdom, Canada, Australia and Switzerland. These central banks provide a broad, representative range of institutional arrangements in place.

The article is structured as follows. In the first section we briefly summarise the key features of operating frameworks, paying particular

¹ We would like to thank Magdalena Erdem for excellent research assistance and Piti Disyatat, Már Gudmundsson, Mico Loretan, Frank Packer, Christian Upper, William White and staff at central banks for their comments. The views expressed are our own and not necessarily those of the BIS.

attention to their operation in normal times and to similarities and differences across countries. In the second we examine central bank responses during the recent turmoil. In the third we discuss the validity of the distinction between setting the monetary policy stance and liquidity management operations at times of stress and elaborate on some trade-offs faced in the design of the frameworks to cope with both normal and stressful conditions. The conclusion summarises the key messages.

Operating frameworks²

Monetary policy operating frameworks establish the means by which central banks implement the desired monetary policy stance. It is important to make a distinction between two elements of such frameworks. One is the *signalling* of the desired policy stance, nowadays done through the announcement of a key interest rate (“policy rate”). The other is the *liquidity management operations* (LMOs) that support that stance by seeking to ensure that a short-term *market* rate (a “reference rate”)³ is consistent with the policy rate.⁴

The closeness of the relationship between the policy rate and the reference rate is a measure of how successful the implementation of the stance is. This is so regardless of whether the policy rate takes the form of a rate actually set through a regular market operation of the central bank, such as the minimum bid rate for the ECB, or of simply an announced target for a market rate, as in most of the other central banks in the sample (Table 1).⁵ Moreover, because the reference rate has to be controlled closely, it is generally an overnight rate.⁶ The main exception to this is the Swiss National Bank, which defines the policy rate as a range for the three-month uncollateralised interbank rate and therefore the reference rate has that maturity. Even so, the target is again achieved by ensuring consistency between the three-month rate and the overnight rate through adjustment in the one-week rate on its weekly fixed rate repo operations.

All LMOs share a common element: they are designed to regulate the amount of liquidity supplied through a mix of discretionary operations and

Elements of operating frameworks:

signalling ...

... and liquidity management operations;

² For an elaboration on the conceptual framework and on the evolution and the cross-country dispersion of actual practices, see Borio (1997, 2001) and Blenck et al (2001). For a recent discussion of operating frameworks also in emerging market countries, see Ho (forthcoming). For a more technical discussion and a review of the literature, see Bindseil (2004).

³ This reference rate is often also known as the “operating target”.

⁴ While in the past it was not uncommon for central banks to rely also on quantity signals, thus blurring the distinction between signalling and LMOs, since the mid-1990s this has generally no longer been the case, except perhaps in exceptional circumstances, such as in Japan when the policy rate was set at zero.

⁵ The Bank of England's policy rate is the rate at which it remunerates banks' target balances held with the central bank. This rate coincides with that at which short-term repos are carried out.

⁶ While the ECB does not officially have a reference rate or operating target, the EONIA rate appears to perform a similar function.

Key features of operating frameworks before the turmoil							
	AU	CA	EA	JP	CH	GB	US
Policy rate	o/n target	o/n target	MBR1	o/n target	target range 3m	Bank Rate2	o/n target
Reference rate (maturity)	o/n	o/n ³	s-t ⁴	o/n	3m	o/n ⁵	o/n
Reserve requirements/ target balances			✓	✓	✓	✓ ⁶	✓
Maintenance period	•	•	4–5w ⁷	1m	1m	1m	2w
Remuneration	•	•	✓			✓ ⁶	
Size (domestic currency)	•	•					
Lending facility (maturity/pricing, bp)	o/n + 25	o/n + 25	o/n + 100	o/n	o/n + 200	o/n + 100 ⁸	o/n + 100
Deposit facility (maturity/pricing, bp)	o/n – 25	o/n – 25	o/n – 100			o/n – 100 ⁸	
Main market operation ⁹	RT	SB ¹⁰	RT	RT ¹¹	RT	RT	RT
Frequency	daily	daily	weekly	daily ⁷	daily	weekly	daily ⁷
Maturity	1d–3m ⁷	1d	1w	1d–4m ⁷	1w ⁷	1w	1d–2w
Other operations ¹²	✓	✓	✓	✓	✓	✓	
Frequency ¹³	medium	medium	low	high	medium	low	•
Maturity	1d–3m	1d	1d ⁷ or 3m	1d–2m ⁷	1d ⁷	1d–12m ^{7, 14}	•

AU = Australia; CA = Canada; EA = euro area; JP = Japan; CH = Switzerland; GB = United Kingdom; US = United States. ✓ = yes; blank space = no; • = not applicable; o/n = overnight; s-t = short-term; d = day; w = week, m = month; bp = basis points; RT = reverse transaction (eg repos); SB = settlement balances.

¹ Minimum bid rate on main refinancing operation. ² Rate paid on target balances; this coincides with the rate at which fixed rate tenders are carried out. ³ Collateralised. ⁴ No formal reference rate but the overnight rate appears to perform a similar function. ⁵ Overnight rates to be in line with the official Bank Rate resulting in a flat yield curve out to the next policy decision date. ⁶ Reserve balances are remunerated at the Bank Rate as long as they stay within a reserve range, in normal times ±1%. ⁷ Typically. ⁸ ±25 bp on the last day of the maintenance period. ⁹ Regular operation used to set the policy rate or most frequent one. ¹⁰ Influencing settlement balances by shifting government deposits from a deposit with the central bank through an auction. ¹¹ Loans against pooled collateral. ¹² Excluding outright transactions. ¹³ Based on typical frequency: low = less than three times per month; medium = three to seven times per month; high = at least eight times per month. ¹⁴ Including a regular fine-tuning operation at the end of the maintenance period.

Sources: Markets Committee (2007); central banks. Table 1

standing facilities. The operations generally seek to balance supply and demand in the market for bank reserves in order to ensure that it clears at an overnight rate consistent with the policy rate. Beyond this common element, they can differ in several respects, reflecting differences in the characteristics of both the demand for, and supply of, bank reserves.

reserve requirements/target balances with averaging provisions;

The demand for bank reserves is strongly influenced by whether or not banks are required to hold some target level of reserve balances measured over a certain period (“maintenance period”). If they are, an *averaging provision* allows banks to offset surpluses with shortfalls relative to the target level of reserves. If they are not, the demand for reserves (“settlement balances”) is determined by a combination of two factors: payment-related needs and residual frictions in the distribution of reserve balances in the system. The former reflects mainly the characteristics of payment systems; the latter includes factors such as the degree to which some institutions actively manage their positions. In both cases, the resulting demand tends to be quite small and *unresponsive* to market rates. Where averaging provisions are in

place, the demand for excess reserves,⁷ which banks typically wish to keep to a minimum because of the zero or low remuneration, is equally unresponsive to market rates at the end of the maintenance period.⁸ The implication of this unresponsiveness is that control over the overnight rate requires central banks to meet that demand rather precisely (see below).

Averaging provisions perform a “buffer function”, allowing banks to absorb shocks in the supply of reserves without creating tensions on the overnight rate. For that to be the case, banks should be largely indifferent between holding reserves at different points over the maintenance period. Thus, systems are generally designed to stabilise the opportunity cost of holding reserves during this period. In normal conditions, this cost is approximately equal to the spread between the remuneration of target reserves, if any, and the overnight rate. Remunerating target reserves at the prevailing policy rate, therefore, is one way of achieving this objective; where they are not remunerated, avoiding expectations of changes in the policy rate over the maintenance period can perform a similar role. Shocks to the supply of reserves will also tend to influence the overnight rate less, the longer is the maintenance period and the larger are the target balances.

The characteristics of the arrangements that influence the demand for bank reserves differ considerably across systems (Table 1). In two cases, Australia and Canada, there are no required or target reserves and so no averaging provisions. Elsewhere, averaging provisions are generally determined as a ratio of the deposit base (“reserve requirements”). The exception is the United Kingdom, where target balances are decided by banks themselves prior to each maintenance period and are set as a range.⁹ The range is normally plus or minus 1% but it can be changed by the central bank depending on market conditions. Given the size of the reserve requirement, the length of the maintenance period and the features of the remuneration, the buffer role is especially large in the euro area and smaller in the United States.

As regards the supply of bank reserves, a key distinction is that between *discretionary operations* and *standing facilities* (lending and deposit facilities). These days, central banks rely heavily on discretionary operations, with standing facilities typically acting only as “safety valves” for end-of-day idiosyncratic shocks to holdings of reserves at individual banks or possibly end-of-maintenance period mismatches in the supply of, and demand for, reserves. As the corresponding rates are set above (lending) and below (deposit) the policy rate, the extent to which such facilities are activated depends in part on the size of the penalty compared with this rate. In a majority of the countries considered there are both lending and deposit facilities (a “corridor”); in the

discretionary
operations and
standing facilities;

⁷ Excess reserves are defined as reserves in excess of those needed to satisfy target levels.

⁸ In the United Kingdom, the fact that the target level of reserves is set as a range allows additional flexibility in the use of the averaging provisions.

⁹ For an elaboration on the UK system, which presents a number of specific features, see Tucker (2004) and Bank of England (2006). In the United States, banks may establish required operating balances, which are similar to target balances at the Bank of England.

United States, Japan and Switzerland no deposit facility is in place.¹⁰ Penalties vary considerably, from as low as 25 basis points in Australia and Canada to as high as 200 basis points in Switzerland (Table 1).

maturity ...

The *maturity* of discretionary operations is largely determined by their objective. Given their safety-valve and stabilising role in relation to the overnight market segment, standing facilities have an overnight maturity in all the systems selected, at least in normal times. By contrast, given the overriding objective of achieving the desired path in the supply of bank reserves to balance the market, the maturity of discretionary operations is decided quite independently of the maturity of the reference rate. Considerations include: the desired frequency of operations (see below); matching the expected duration of the shock to the supply and demand imbalance;¹¹ and possibly a certain reluctance to operate at longer maturities, so as to avoid the risk of influencing prices for the corresponding instruments at those maturities. Reverse transactions, such as repos, are so heavily employed at the expense of outright transactions precisely because they allow considerable flexibility in terms of maturity while at the same time having no or very limited impact on the price of the underlying instrument. The central banks in the sample are no exception to this general pattern (Table 1). They rely largely on reverse transactions with maturities that generally do not exceed one month, although they may extend infrequently up to three months and sometimes beyond. Outright transactions in securities at longer maturities are less frequent.

... and frequency of
discretionary
operations;

The *frequency* of discretionary operations is largely a matter of choice. Central banks that prefer to avoid a frequent presence in the market rely more on the buffer function of averaging provisions, which offset any volatility in the supply of reserves arising from “autonomous factors” beyond the control of the central bank over the relevant horizon. These include in particular, to varying degrees, changes in the demand for cash balances,¹² Treasury balances with the central bank, and lagged effects of foreign exchange operations. In the absence of averaging provisions, daily intervention is typically required to meet the inelastic demand for settlement balances, unless the remuneration on those balances through a deposit facility is very generous. In the sample of countries considered, the ECB and the Bank of England operate infrequently: in addition to the keynote operation, they rarely resort to fine-tuning operations, except perhaps at the end of the maintenance period or in unusual conditions. By contrast, the other central banks considered operate at least at a daily frequency (Table 1).

¹⁰ Legislation passed in October 2006 allows the Federal Reserve to remunerate required reserves beginning in October 2011.

¹¹ Likewise, permanent increases in the demand for reserves are more likely to be met by outright purchases and longer-maturity reverse operations.

¹² This demand is intentionally accommodated. That is, changes in the public’s demand for cash (currency), which is a liability of the central bank, must be matched by a commensurate change in central bank assets to leave banks’ reserve balances, the other main central bank liability, unchanged.

Two additional dimensions in which operating frameworks may differ, and which acquire particular significance at times of stress, are the range of eligible counterparties and that of collateral (Table 2).

As regards *counterparties*, arrangements vary considerably across countries. In the euro area, for instance, the range of eligible counterparties is very broad and common across operations, potentially including all the institutions that hold reserves with the central bank, although fine-tuning operations in normal times may be restricted to institutions meeting more selective operational criteria. A similarly broad set of counterparties, with complete or nearly complete overlap across operations, can be found in Australia and Switzerland.¹³ At the other end of the spectrum, in the United States and, to a lesser extent, Canada, the overlap is limited and the set of counterparties for discretionary operations is considerably smaller than that with access to standing facilities. For example, in the United States discretionary operations are done with primary dealers – 20 large securities dealers – while all institutions that have reservable deposits have access to the lending facility. The situation in the other countries is somewhere in between.

choice of counterparties ...

As regards the range of *collateral*, central banks differ not only in terms of the varieties accepted but also in terms of whether collateral requirements vary across operations. The Federal Reserve, for example, accepts the widest range of collateral among central banks for its standing facility (it accepts most securities and loans on banks' books, including assets denominated in the

... and collateral

Key features of operating frameworks: collateral and counterparties							
	AU	CA	EA	JP	CH	GB	US
Collateral, MOs							
Government securities	✓	✓ ¹	✓ ¹	✓	✓ ¹	✓	✓ ²
Private sector securities	✓ ¹		✓ ¹	✓ ^{1,3}	✓ ¹		
FX ⁴	✓				✓	✓ ⁵	
Collateral, LF							
Same as MOs	✓		✓	✓	✓	✓	
Broader		✓					✓
Counterparties, MOs							
Securities firms	✓	✓		✓ ¹		✓ ^{1,6}	✓ ⁷
Banks ⁸	✓	✓	✓ ⁹	✓ ¹	✓	✓ ^{1,6,10}	
Counterparties, LF							
Same as MOs	✓		✓		✓		
Broader		✓ ¹¹		✓		✓	✓
Overlap	complete	limited	complete	large	complete	large	limited
MOs = (discretionary) market operations; LF = marginal lending facility. See Table 1 for the mnemonics. ¹ Selected. ² And agencies. ³ As well as loan deeds. ⁴ Including FX swaps. ⁵ Euro. ⁶ Active intermediaries. ⁷ Primary dealers. ⁸ The precise coverage varies somewhat from country to country. ⁹ Institutions subject to reserve requirements. ¹⁰ Including building societies. ¹¹ LVTS participants. Sources: Markets Committee (2007); central banks.							

Table 2

¹³ In Switzerland, all banks, regardless of domicile or the legislation to which they are subject, potentially have access to the central bank's facilities.

major foreign currencies) but the narrowest range for its repurchase agreements (securities issued or guaranteed by the US government or by an agency). The ECB, by contrast, accepts a uniform, and relatively broad, set of collateral for its lending facility and market operations, although notably only assets denominated in euros.

Some common misconceptions

Three implications of this analysis are worth highlighting. First, because of the unresponsiveness of settlement balances and excess reserves to market rates, central banks change interest rates through signalling mechanisms without *permanently* altering the stock of bank reserves in the system (eg adding to it when reducing rates). By implication, actions that do change the amount of reserves in the system in a manner inconsistent with the demand run the risk of moving the overnight rate substantially away from the policy target.¹⁴ Second, it is misleading to compare the size of net liquidity injections across systems to get a sense of the degree of accommodation of liquidity demands. Net liquidity injections over any given period are fundamentally determined by the balance between the net supply (possibly negative) associated with autonomous factors, previous maturing liquidity operations and the demand for bank reserves (“liquidity deficit”). For example, other things equal, the larger the reserve requirement, the larger is the net liquidity injection required to balance the market.¹⁵ Finally, a fortiori, because of differences in the maturity of the operations it is equally misleading to compare the cumulative sum of gross operations over time. And yet, during the financial turmoil it was not uncommon for observers to make precisely these types of comparison to infer the degree of generosity of central bank injections, despite the large differences across countries in the required operations.

Operations at times of stress

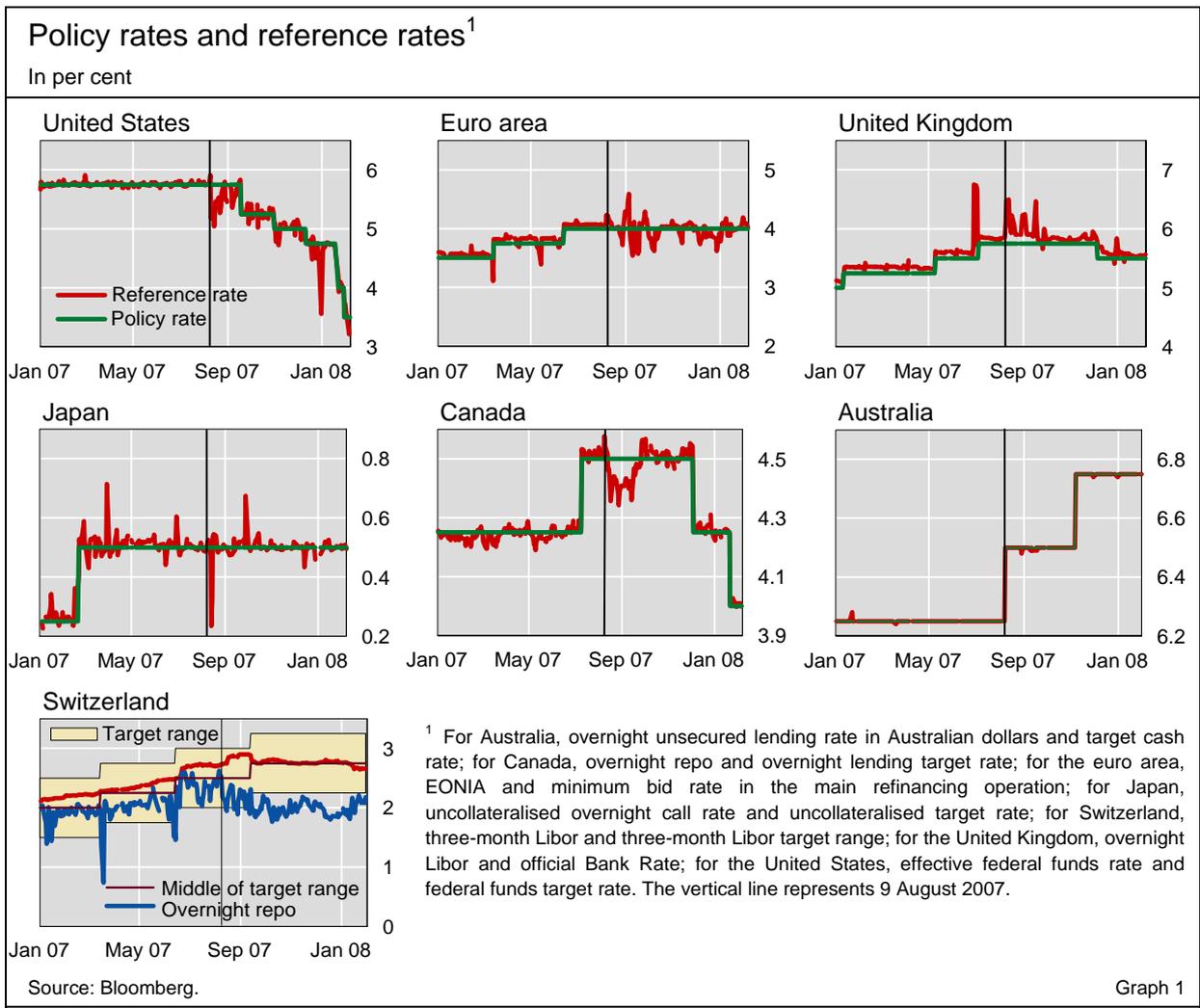
The disorderly repricing of risk ...

Before turning to the central bank responses to the financial turmoil, it is useful to recall briefly its key characteristics, extensively analysed elsewhere.¹⁶ The turmoil was triggered by a sharp and disorderly repricing of credit risk, with the US subprime mortgage market at its epicentre. Given the leverage built up in the system and the opaqueness of valuations of new structured products and of their distribution within the system, the repricing led to, and was exacerbated by, an evaporation of liquidity in many markets, including in the interbank market. As the strains spread, banks became very concerned with the liquidity and capital implications of potential large-scale involuntary reintermediation and distrusted their counterparties. The reintermediation was primarily

¹⁴ In the United Kingdom, reserves can be varied within the permissible range for target balances without having such an effect.

¹⁵ For instance, in the absence of a reserve requirement and in the limiting case in which, over a given period, the net impact of autonomous factors is zero and no previous operations mature, the net injection would also be approximately zero, as the demand for settlement balances hardly changes over time. This would be so *regardless* of the level of, or any induced change in, the policy rate.

¹⁶ See the Overview section in this issue and that in the previous one.



associated with banks' backup credit lines for securitised vehicles and with the inability to dispose of assets intended to be sold off, in line with the originate-and-distribute model.

In August, tensions were thus transmitted to the heart of the financial system – the interbank market, both in the United States and in a number of other mature markets (Graph 1).¹⁷ These tensions took a variety of forms, including higher volatility in overnight and short-term interest rates, a sharp increase in interbank rates at longer tenors (such as the three-month rates), a drop in volumes, signs of rationing and greater dispersion in pricing. The increase in interbank rates reflected a mix of liquidity and counterparty credit risks, in proportions that have proved hard to disentangle. The problems intensified at year-end, owing to the usual seasonal pressures, as borrowers wanted to avoid the rollover risk and lenders wished to report as liquid a balance sheet as possible.

Against this backdrop, central banks faced a number of challenges. The first was to implement a given policy stance effectively in the face of the serious market disturbances; this involved keeping reference rates near targets

... spills over to money markets ...

... raising three challenges for central banks

¹⁷ See Michaud and Upper, Gyntelberg and Wooldridge, and Baba, Packer and Nagano in this issue.

or in the desired range through the control of the overnight rate or short-term market rates by means of supportive LMOs. The second challenge was to promote more “orderly” conditions in the term interbank market, a key price indicator of success being a narrowing in the sizeable “premium” over expected policy rates that had emerged in market rates at maturities longer than overnight. Finally, and outside the scope of this special feature, they had to decide whether and how to adjust the policy rate to respond to the potential macroeconomic implications of the turmoil.

Key distinction:
implementing a
policy stance ...

The distinction between implementing a given policy stance and promoting orderly conditions in the term market segment, as reflected in the risk premium, is subtle but important. Implementing a given policy stance is largely a matter of responding to the changing characteristics of the *demand for bank reserves* at times of stress. This has primarily to do with the assets side of banks’ balance sheets, ie their choice between reserves with the central bank and other liquid assets, such as government securities and widely accepted collateral. The liabilities side is relevant here to the extent that frictions in the interbank market – such as banks’ reluctance to lend to each other – inhibit a smooth distribution of reserves. Promoting orderly conditions in the term segment is primarily a question of responding to the imbalance in the demand and supply in term markets, and hence to the changing *maturity composition* in the net demand for funding liquidity by banks, driven by perceived liquidity and counterparty risk concerns. This has to do largely with the liabilities side of the banks’ balance sheets, in particular with the increase in the net demand for term funding relative to that for overnight funding, in relation to banks’ total liquid assets. Central banks can address imbalances in term markets in two ways. First, they can seek to ensure stable and reliable overnight funding conditions, so as to encourage banks and other money market investors to supply more term funding. Second, they can provide more term funding themselves to the participants needing the financing.

... and addressing
imbalances in the
term market

The relationship between these two objectives – implementing a given policy stance and addressing imbalances in term markets – suggests that there is no clear-cut one-to-one mapping between actions addressed to one and the other. For example, ensuring that lending facilities are a reliable funding mechanism or that the central bank is more actively present in the overnight market to provide funding can promote both. It is fair to say that, by and large, central bank actions initially focused on the overnight market and, as time wore on and end-of-year seasonal tensions loomed, their strategy shifted towards more direct and ample provision of term funding.

No large cumulative
net injections of
reserve balances

It is equally important to dispel the apparently common belief that to implement policy effectively central banks, *on net*, had to inject large amounts of liquidity into the system (Table 3). In fact, given the specific nature of the market for bank reserves, the amount that banks hold on average remained pretty stable, broadly in line with historical patterns. For example, in the United States, there was only one maintenance period, in August, in which excess reserves were not reabsorbed, with the corresponding marked softness in the overnight rate indicating an excess supply and the central bank’s preference for erring on the side of caution. The reason for this overall stability is that, as

Composition of reserve balances										
	United States ¹		Euro area		Japan		Switzerland		United Kingdom	
	Total ^{2,3}	Excess ⁴	Total ²	Excess ⁴	Total ²	Excess ⁴	Total ^{2,5}	Excess ⁴	Total ²	Excess ^{4,6}
Jan–Jul 2007	15.1	10.4	182	0.5	5,106	7.2	10.2	15.0	16.4	0.00
Aug 2007	18.0	25.5 ⁷	192	0.4	4,966	5.0	10.1	14.1	16.6	0.00
Sep–Dec 2007	14.9	10.9	194	0.4	6,840 ⁸	5.6	10.1 ⁹	13.9 ⁹	21.5	–0.02

¹ Average of days in maintenance periods chosen to correspond closely to the periods indicated. ² Includes the sum of required/target reserves and excess reserves; in billions of units of national currency. ³ Deposits of depository institutions at Federal Reserve Banks. ⁴ As a percentage of total reserves. ⁵ Includes banknotes and coins, which account for nearly half of the total. ⁶ Measured relative to the top (excess) and the bottom (shortfall) of the target range. ⁷ Excess reserves for the two-week maintenance period ending on 15 August 2007 were equal to 44% of total reserves. ⁸ The increase is largely explained by the addition of the Japan Post Bank in October. ⁹ Average of September and October.

Sources: Bloomberg; central banks; BIS calculations.

Table 3

vehicles to park liquid funds, there are superior instruments in terms of risk/return characteristics to bank reserves, not least short-term government securities. As a result, excess reserve holdings tend to be minimised. In other words, *what central banks put in with one hand they largely took away with the other*, while at the same time responding to the changing properties of the demand for bank reserves.

While the steps taken to do this reflected the specifics of the situation and judgments about the most effective response, they were also influenced by the characteristics of the operating frameworks. In particular, in frameworks with no averaging provisions and with standing deposit facilities remunerated at close to the target rate, central banks accommodated a certain increase in precautionary holdings, which in any case remained contained in absolute terms (Australia and Canada).¹⁸ In systems with reserve requirements, strategies differed somewhat, given the degree of leeway provided by averaging provisions. In particular, the ECB and the Swiss National Bank systematically front-loaded liquidity injections during the maintenance period, withdrawing liquidity towards the end of the period or when overnight rates fell below a certain level. In the face of heightened uncertainty and of frictions in the distribution of reserves, owing to tensions in interbank lending, this provided banks with a greater degree of comfort in meeting their needs. Elsewhere, not least where the size of the buffer was smaller, this strategy was not followed. In the United Kingdom, from September to December, banks decided to target higher reserve balances, in part to better exploit the flexibility in liquidity management provided by averaging provisions. In addition, alongside further liquidity injections, the Bank of England broadened substantially the band around reserve targets. As a result, it became unnecessary to withdraw any liquidity at the end of the maintenance period, since funds would be remunerated at the Bank Rate as long as they stayed within the band.

¹⁸ Over the period January–July 2007, transaction balances (local currency amounts) averaged 50 million at the Bank of Canada and 816 million at the Reserve Bank of Australia; for August–December 2007 the respective figures were 260 million and 3 billion.

Steps taken during the financial turmoil							
	AU	CA	EA	JP	CH	GB	US
Exceptional fine-tuning (frequency, conditions)	✓	✓	✓	✓	✓	✓	✓
Exceptional long-term open market operations	✓	✓	✓	✓	✓	✓	✓
Change in the standing lending facility							✓
Broadening of eligible collateral	✓	✓			✓ ¹	✓	✓ ²
Change in banks' reserve requirements/target balances	•	•				✓	
Broadening of counterparties						✓ ³	✓ ²

See Table 1 for the mnemonics.

¹ Entered into effect on 1 October, but not linked with the turmoil. ² The collateral and counterparty rules did not change, but the discretionary operations under the Term Auction Facility utilise the broader lists pertaining to discount window credit compared to those for ordinary open market operations. ³ Only for four auctions of term funding for which, however, there were no bids.

Source: Central banks. Table 4

Additional responses: adjustments to ...

To varying degrees, the influence of the operating frameworks can also be traced in the steps taken to increase the frequency and gross size of the operations, to broaden the range of collateral and counterparties, and to increase term funding at the expense of short-term funding (Table 4).

... frequency and gross size of operations ...

Increasing the frequency and gross size of discretionary operations was the first, common line of defence, largely in response to a more variable and uncertain demand for bank reserves and frictions in its smooth distribution. The actual frequency and amounts were closely related to the characteristics of the frameworks. For example, the ECB carried out overnight fine-tuning quick tenders for each business day from 9 to 14 August. The amount of credit provided through the operations began at €95 billion, adding about one third of the average outstanding amount of credit provided through the main refinancing operation over the previous month, but declined over the five days to €8 billion. On 10 August, the Federal Reserve conducted three auctions of overnight repurchase agreements totalling \$38 billion, nearly double the average outstanding amount of credit provided via repurchase agreements over the previous two weeks. Its final auction occurred in the early afternoon, well after its normal operating time. Likewise, in the same month, and in some cases subsequently, the Reserve Bank of Australia, the Bank of Canada, the Bank of Japan and the Swiss National Bank also conducted market operations in response to the turmoil that were either outside their regular schedule or in larger than normal amounts. The Bank of England did not increase the frequency of its operations in August, in part because its monetary policy framework is designed to accommodate variations in the demand for reserves automatically. It did so, however, in September, not least as market rates continued to exceed the desired targets by more than normal.

... standing facilities and tender procedures ...

Where felt appropriate, the increased size and frequency of operations were complemented by adjustments to other terms on the supply of funds. In particular, for the first fine-tuning operation, the ECB took the unusual step of meeting all demand at its policy rate of 4% rather than through the normal variable rate tender. This allowed it to inject an amount of liquidity matching counterparties' demand given the heightened uncertainty. In addition, on

17 August the Federal Reserve cut the interest rate on its standing loan facility (the discount rate) by 50 basis points and increased the allowable term on loans from overnight to 30 days. Admittedly, this change was primarily intended to temper upward pressure in term funding markets by signalling that the central bank stood ready to be a backstop source of liquidity (see below). Even so, it also tended to lessen upward spikes in the federal funds rate.

In order to overcome the impediments to the smooth distribution of liquidity in the system, some central banks broadened the range of eligible collateral and, in fewer instances, also that of counterparties for discretionary operations. For example, both the Bank of Canada (in August) and the Federal Reserve (in December, see below) made it feasible to carry out some discretionary operations with the same, broader range of collateral as that available under their lending facilities.¹⁹ Like the Federal Reserve, the Bank of England enlarged the eligible collateral for its term operations, while the Reserve Bank of Australia included additional securities issued by banks and securities backed by mortgages in the eligible set for both its market operations and its lending facility. The only two central banks that did not make any adjustments were the ECB and the Bank of Japan, which accept relatively broad ranges of collateral.²⁰ As regards counterparties, the Federal Reserve opened up its discretionary term operations to the larger set of institutions that had access to its standing facilities.²¹

... range of collateral and counterparties ...

To a varying degree, all the central banks increased the availability of term funding supplied to the market through discretionary operations (Graph 2). Some of them started doing this well ahead of the year-end. Notable examples include the ECB, through some exceptional tenders of three-month funds beginning in August and renewed thereafter as the amounts matured, and the Swiss National Bank, which carried out its first ever tender of three-month funds in September. Starting in December, the Bank of England began to offer similar funding at the prevailing market rate in larger than normal amounts against extended collateral. The Bank of Japan started providing funds covering year-end in early October, earlier than in previous years.

... and reliance on term funding ...

Term operations intensified in December, as attention focused on the heightened tensions surrounding the end of the calendar and accounting year, but this time as part of a broader and coordinated international effort. In addition to showing a common resolve, the coordinated measures announced on 12 December also targeted the specific shortage of dollar funding faced by some non-US institutions, largely as a result of time zone differences and central bank counterparty restrictions. Thus, alongside the special Term (one-

... including through coordinated measures

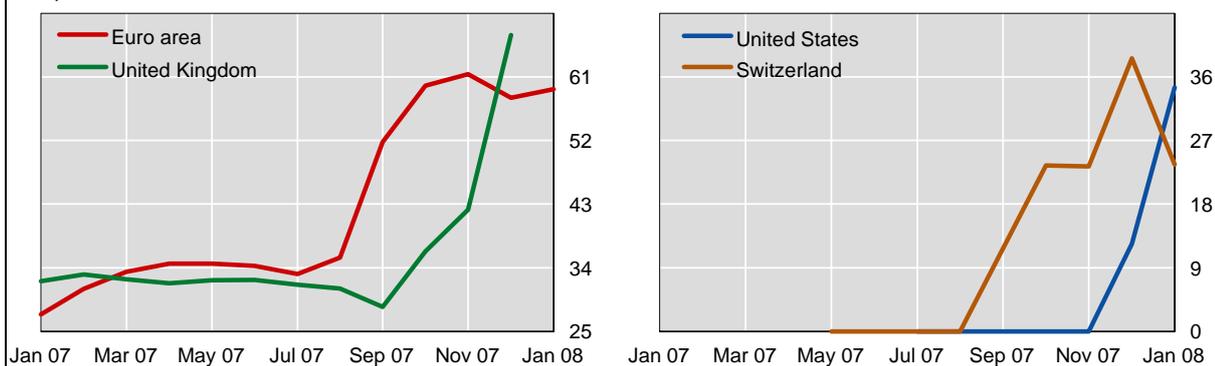
¹⁹ The precise means, however, differed. The Bank of Canada temporarily broadened the range of collateral in its normal discretionary operations; the Federal Reserve introduced a special facility to auction loans under the same legal framework as that of discount window lending.

²⁰ In addition, however, the steps taken by the Swiss National Bank had already been planned before the turmoil and were unrelated to it.

²¹ The Bank of England took a similar action for four auctions of long-term funds; however, owing to a somewhat elevated minimum bid rate relative to prevailing market rates, no bids were received.

Share of longer-term reverse operations at selected central banks¹

In per cent



¹ Long-term reverse operations (one-month or greater); as a percentage of total outstanding reverse operations.

Sources: Central banks; BIS calculations.

Graph 2

month) Auction Facility against the broader set of collateral and counterparties announced by the Federal Reserve,²² US dollar swap lines were put in place with the ECB (\$20 billion) and the Swiss National Bank (\$4 billion).²³ These were activated for the nearly simultaneous one-month auctions carried out by the three central banks in December. Additional term funding auctions in their own currencies were also announced by the Bank of England and the Bank of Canada.²⁴ Joint term operations in dollar funding and, in some cases, unilateral ones in local currency continued for some time after the turn of the year.

How successful were central banks' actions to address the consequences of the turmoil? Judging from the relationship between the policy rate and the reference rate, after some difficulties in a number of jurisdictions in August and September, central banks regained control over the implementation of the announced policy stance (Graph 1). Judging from the term premium at longer tenors in the money market, operations were successful in easing tensions around year-end, although the premium remained somewhat elevated up to late January (Michaud and Upper, this issue).

Selected questions

Central bank operations at times of stress raise several interesting questions. Here, we consider briefly two of them.

²² The facility was also partly intended to address the "stigma" associated with borrowing from the lending facility.

²³ The swap lines also helped establish a mechanism to address the pressures on the federal funds rate early in the US business day as European institutions sought dollar funding, an intraday pattern in the demand for reserves which complicated the Federal Reserve's liquidity management operations.

²⁴ While the Bank of Japan and Sweden's Riksbank did not announce any new measures, they welcomed those taken by the other central banks.

The first is whether the distinction between setting the monetary policy stance, on the one hand, and implementing it through LMOs, on the other, is as clear-cut at times of stress as in normal times. If “stance” is defined as the current and possibly future intended path of the policy rate, the answer is affirmative. In particular, it is important to avoid the wrong inference that such LMOs, *by themselves*, carry any information about the policy rate path.

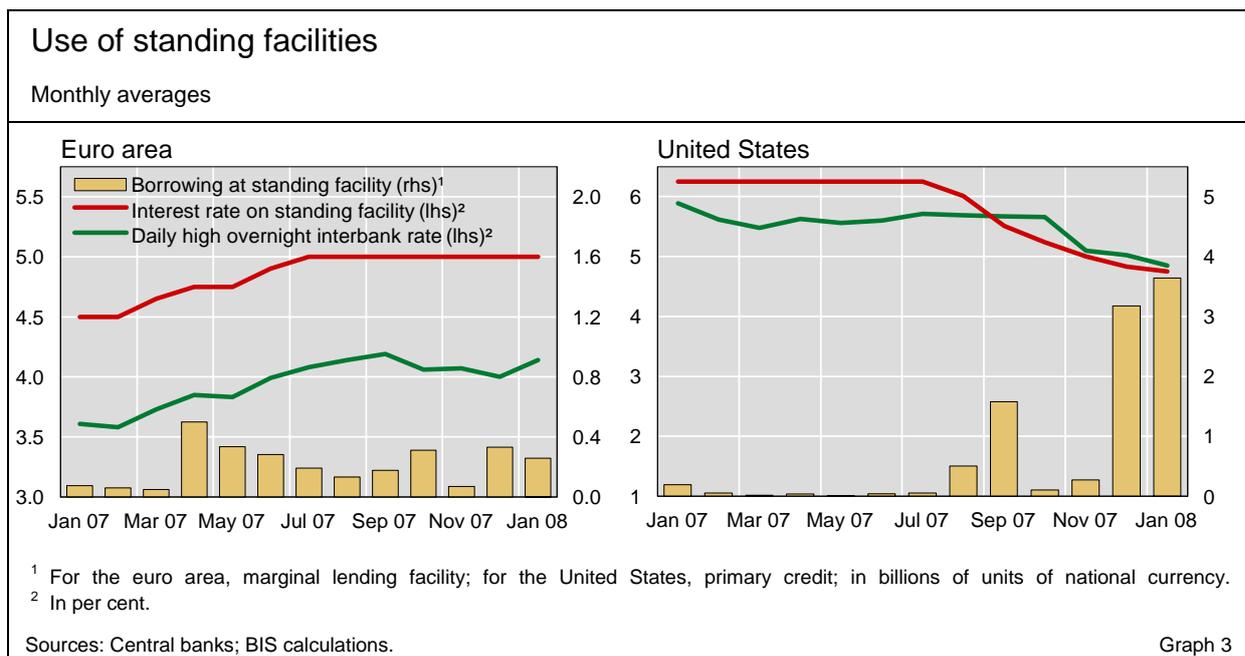
Distinction between setting the policy stance and implementing it via LMOs

At the same time, of course, this does not mean that LMOs are irrelevant for the actual strength of the monetary stimulus for a given stance. In particular, to the extent that LMOs go beyond ensuring consistency between the policy rate and the reference rate and succeed in affecting the term risk premium, and that this premium is important in the transmission mechanism, then this stimulus is affected to some extent.

Nor does this mean that the choice of reference rate within an operating framework is irrelevant for the policy stance and its communication. The difference between an overnight rate and a three-month rate is especially relevant here. In order to keep its announced policy stance unchanged, the Swiss National Bank had to guide down the overnight rate to offset the increase in the risk premium in the three-month rate (Graph 1). By contrast, for other central banks, keeping policy unchanged required them *not* to respond to the increased premium. Clearly, the implied stimulus to the economy was different in the two cases.

The second question is how far operating frameworks should be explicitly designed with stress periods in mind. The answer is not so obvious because there can be trade-offs between desirable features in normal times and in times of stress. Exceptional adjustments at times of stress can imply costs. One may be the risk of sending the signal that the situation may be worse than it actually is. Another may be the risk of encouraging moral hazard, by giving the impression that rules may be softened to lessen the consequences of market

Designing frameworks for normal and stress periods



participants' mistakes. However, there are also costs of weighing considerations relevant at times of stress too heavily.

The potential trade-offs can best be illustrated by considering the issue of the limited willingness to resort to the lending facility during a period of financial turmoil. The recent experience has highlighted that financial institutions may perceive a "stigma" associated with such borrowing, for fear that it might be seen as a sign of weakness. For historical reasons, this stigma has been strongest in the United States, partly because a similar facility had been used to provide emergency liquidity assistance in the past. But during the current turmoil, signs of a stigma have also become visible elsewhere, such as in the United Kingdom. An (admittedly rough) indicator of this phenomenon is the spread between the daily high uncollateralised overnight interbank rate and the rate on the lending facility (Graph 3). One way of addressing this problem would be to have more frequent borrowing in normal times (eg by reducing the penalty rate). But this could have the undesirable side effect of tending to inhibit the development of an independent and active interbank market. Different views concerning this trade-off would point to a different architecture of the operating framework. To varying degrees, similar trade-offs also apply to issues such as the breadth of eligible collateral and the choice of counterparties.

Conclusion

Central bank responses to the recent financial turmoil exhibit considerable similarities. On net, liquidity was only temporarily, if at all, injected in larger amounts than usual in line with the fundamental characteristics of the demand for reserve balances. Beyond this, the average maturity of liquidity injections was lengthened in an attempt to meet the increased demand for term funding by banks. At the same time, the size, frequency and other modalities of the liquidity injections, while exhibiting many similarities, have been considerably influenced by the operating frameworks in place. Combined with the varying intensity of strains across currency areas, the frameworks have affected the need to make adjustments to existing practices in order to meet the changing conditions. If these differences are not taken into account, there is a serious risk of misunderstanding the character and implications of the operations.

The turmoil has highlighted a number of questions that would tend to go unnoticed in normal times. For example, we have argued that the distinction between setting the monetary policy stance and implementing it through liquidity management operations remains valid at times of stress. We have also argued that a trade-off can arise between the desirable characteristics of operating systems in normal times and times of stress, depending on views concerning what those desirable characteristics are and on country-specific circumstances. No doubt, these and other questions, such as the desirability and ability to influence the interbank risk premium, or the potential moral hazard implications of operations at times of stress, are likely to remain the focus of serious reflection in the period ahead.

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