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### Central Bank Collateral Frameworks: Principles and Policies

Alexandre Chailloux

Simon Gray

Rebecca McCaughrin

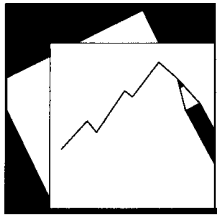
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WP/08/222  
IMF Working Paper

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Central Bank Collateral Frameworks:  
Principles and Policies

*Alexandre Chailloux, Simon Gray and  
Rebecca McCaughrin*



**IMF Working Paper**

Monetary and Capital Markets Department

**Central Bank Collateral Frameworks: Principles and Policies**

**Prepared by Alexandre Chailloux, Simon Gray and Rebecca McCaughrin<sup>1</sup>**

Authorized for distribution by Peter Stella

September 2008

**Abstract**

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Policy Discussion Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Policy Discussion Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Central bank collateral policies came under pressure with the 2007-08 financial market crisis. This paper addresses the rationale for and constraints in taking collateral, and recent practices in different collateral frameworks. It then considers the risks of adverse selection. The paper concludes that (i) the collateral framework needs to include market incentives; (ii) central banks face trade-offs between risk and counterparty access; (iii) emerging markets may see pressure on collateral policies in coming years; and (iv) further work is required to develop pricing incentives and the structure of central bank facilities, both during normal times and in periods of market stress.

JEL Classification Numbers:

Keywords: Adverse selection, central banking, collateral, financial market crises, risk mitigation

Author's E-Mail Address: [achailoux@imf.org](mailto:achailoux@imf.org), [sgray@imf.org](mailto:sgray@imf.org), [rmccaughrin@imf.org](mailto:rmccaughrin@imf.org)

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<sup>1</sup> The authors would like to thank participants in the MCM seminar held on June 19, 2008; Peter Stella, Adnan Mazarei, Laura Kodres, Geoffrey Heenan, Seiichi Shimizu, Imène Rahmouni-Rousseau and Arnaud Marès for useful comments and discussions.

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## GLOSSARY

|                     |   |
|---------------------|---|
| ABS                 | Asset Backed Security   |
| BCBS                | Basel Committee on Banking Supervision                            |
| BdF                 | Banque de France  |
| BIS                 | Bank for International Settlements                                |
| BoC                 | Bank of Canada  |
| BoE                 | Bank of England   |
| BoJ                 | Bank of Japan   |
| CGFS                | Committee on the Global Financial System (BIS committee)          |
| CMO                 | Collateralized Mortgage Obligation                                |
| CSD                 | Central Securities Depository                                     |
| ECAF                | European Credit Assessment Framework (ECB)                        |
| ECB                 | European Central Bank   |
| Fed/Federal Reserve | U.S. Federal Reserve Bank   |
| FX                  | Foreign Exchange  |
| LTRO                | Long-Term Refinancing Operation (ECB)                             |
| MBS                 | Mortgage Backed Security  |
| MoF                 | Ministry of Finance   |
| MRO                 | Main Refinancing Operation (ECB)                                  |
| NBFI                | Nonbank Financial Institution                                     |
| NCB                 | National Central Bank (part of the Eurosystem)                    |
| OMO                 | Open Market Operations (undertaken at initiative of central bank) |
| OTC                 | Over the Counter  |
| PDCF                | Primary Dealer Credit Facility                                    |
| RBA                 | Reserve Bank of Australia   |
| RMBS                | Retail Mortgage Backed Security                                   |
| SF                  | Standing Facility (used at initiative of commercial bank)         |
| SME                 | Small and Medium-sized Enterprises                                |
| SOMA                | System Open Market Account (securities portfolio held by the Fed) |
| TAF                 | Term Auction Facility   |
| TSLF                | Term Securities Lending Facility                                  |
| EONIA               | Euro OverNight Index Average                                      |

## I. CENTRAL BANK OPERATIONS AND COLLATERAL

Since the onset of the market turmoil in August 2007, the collateral frameworks of major central banks have come under pressure, and have received much more attention than previously.<sup>2</sup> The huge increase in demand for good quality, liquid collateral—primarily government or government-guaranteed—has increased the opportunity cost of using such collateral in operations with the central bank; and to some extent central banks have willingly accommodated this.<sup>3</sup> They have provided liquidity to the market in a nonstandard way.

This behavior, observable in one way or another in many countries, prompts a range of questions. What sort of collateral is acceptable? Should the same pool be used for Open Market Operations (OMO) and Standing Credit Facilities (SF); and in normal times as well as in times of stress? What are the interactions between the central bank’s definition of eligible collateral, the market’s choice of asset portfolio, and the pricing of credit and liquidity spreads? If standards are eased during times of stress, how and when should the central bank seek a return to “normality”?

Central banks have long-term goals of delivering monetary and financial stability. Transactions which might impair the central bank’s balance sheet, whether through losses or reduced flexibility, would be likely to hinder the achievement of these goals. A collateral policy which minimizes the risk of balance sheet impairment, and encourages commercial banks to manage liquidity prudently, is therefore of great importance.

Central banks in emerging markets have predominantly, in recent years, faced a structural surplus of liquidity and so have had little need to lend to the market. However, as a second-round effect of the market turmoil, several have seen a reversal of capital flows which has prompted a need for lending. We judge that in coming years the need for emerging market central banks to lend, and thus to consider collateral policy, will increase significantly.

Section II of this paper looks at the rationale for taking collateral in central bank operations and the constraints faced by central banks in defining collateral eligibility. Section III considers the risks of adverse selection (which we term “Gresham’s law of collateral”), particularly in times of market stress. Section IV suggests some approaches for a dynamic management of the collateral framework. Section V offers some preliminary conclusions. The appendices offer detail on specific collateral issues arising during the 2007-08 market turmoil; and on the collateral frameworks of the U.S. Federal Reserve, the Eurosystem and the Bank of England.

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<sup>2</sup> A separate Working Paper, “Central Bank Response to the 2007-08 Financial Market Turbulence: Experiences and Lessons Drawn”, gives broader coverage of the operational issues faced by central banks during the turmoil.

<sup>3</sup> *“Quite understandably, [central bank counterparties] have economized on the use of central government bonds which has been often almost the only collateral counterparties could still use in interbank repo markets. Instead they have brought forward less liquid collateral...including ABSs, for which primary and secondary markets have basically dried up.”* José Manuel González-Páramo, ECB Executive Board Member, June, 2008.



## II. CENTRAL BANK COLLATERAL FRAMEWORKS

### A. Collateral Policy Key Principles

#### Why lend?

Any economy has a certain demand for central bank liabilities—cash or reserves balances. Where there is a structural shortage of liquidity in the economy, the central bank will lend reserves balances to banks (and in some cases to securities firms) on a regular basis in order to fund the market’s holdings of central bank liabilities. Some of this lending is purely liquidity management; but, importantly, some is used to implement monetary policy. In economies where there is a structural surplus of liquidity—the majority by number at present—the central bank may not need to lend regularly to the market, but may well have occasional need to lend to individual banks. In recent months a number of countries with a structural surplus have seen sharp swings in capital account flows in a way which requires the central bank to provide credit to the banks—perhaps for the first time in years. In coming years, many more central banks are likely to face such changes.

As a rule (to which there are very few exceptions), central banks take collateral when extending such loans. In considering the range of issues related to collateral, and making decisions about where to make trade-offs, central banks should keep in mind the purpose for which they are lending. The goal is to provide the right amount of liquidity, at the appropriate price, to the institutions the central bank wishes to transact with. Collateral policy should support the high-level goal.

Collateral policy does go wider. The central bank’s collateral policy may have an impact on the asset portfolios held by commercial banks (and any other central bank counterparties), and thus on financial stability. This paper explores some of the issues relating to the portfolio impact of the definition of eligible collateral; but does not deal substantively with emergency lending to individual institutions. It may not be possible to pre-determine a collateral policy for such lending.

#### Why lend against collateral?

It is standard practice for central banks to take collateral when injecting liquidity, whether intraday for payment system purposes, in short-term or long-term Open Market Operations (OMO), or overnight in Standing Facilities (SF). Thus with very few exceptions, when a central bank lends funds to the market, it takes some form of security against risk. Liquidity can be provided by the outright purchase of assets – a central bank could buy securities, or foreign exchange for instance.<sup>4</sup> But those central banks which operate with a structural shortage of liquidity provide liquidity predominantly in the form of short-term or reverse

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<sup>4</sup> The U.S. Fed and the Bank of Japan both have large, long-term outright holdings of securities broadly to match cash in circulation. Some central banks do purchase a lot of foreign exchange outright, but this is predominantly for exchange rate management purposes, not for liquidity provision.

transactions, as a collateralized loan, repo, or foreign exchange swap rather than through outright purchase, as this gives them better control of the maturity of such credit extension, and reduces the impact on other markets. This is true whether they lend regularly or occasionally; and whether the liquidity is extended intraday, overnight, or for a longer period.

Central banks do not necessarily take collateral owing to concerns of a substantial risk of default: they are, after all, lending to a restricted group of authorized and supervised institutions, which are likely in good standing with the central bank. Rather, central banks take collateral because the consequences of loss—in the rare case of default—are particularly serious; and because an appropriate collateral policy can influence the behavior of potential counterparties, and discourage adverse selection.

Central banks take collateral primarily to limit credit risk, and so have tended to focus on the value of collateral rather than on its liquidity. However, liquidity risk is also important. If the collateral is of good credit quality but not marketable, then if the borrower cannot repay, the central bank's balance sheet will be constrained, as part would be blocked with unusable collateral. Haircuts can be used to mitigate liquidity risk; but liquidating nonmarketable collateral can take several years—during which time the central bank's balance sheet is weakened.

A small loss should have only small consequences; but a large loss could threaten central bank independence. A central bank loss will tend to lead to an expansion of the monetary base, implying some loss of control of the balance sheet. This could, if substantial, threaten the achievement of the central bank's goal of keeping inflation low. It may also weaken its ability to respond flexibly to any future financial stability crisis. The need for recourse to the Ministry of Finance (MoF) for re-capitalization may also threaten policy independence, which is a real concern to a number of central banks (Stella and al, 2008).<sup>5</sup> There are instances where the government clearly wants a loosening of monetary policy, or perhaps of regulatory enforcement, and may want to trade off action on these points against re-capitalization. But if adequate collateral can be taken, then counterparty default should not mean losses or damage to financial soundness, allowing the central bank to run monetary policy without a too distracting focus on the creditworthiness of its counterparts.

Central banks also take collateral to ensure even-handedness in the conduct of monetary policy and to eliminate the difficulties which would be caused by having to differentiate the pricing of operations based on the creditworthiness of counterparties.<sup>6</sup> Unsecured lending would require an ongoing assessment and monitoring of counterparties' creditworthiness that

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<sup>5</sup> Stella, P., Lonnberg, A., 2008, "Issues in Central Bank Finance and Independence," *IMF Working Paper* 08/37.

<sup>6</sup> Rejecting or charging higher interest rates to counterparts based on individual creditworthiness, and particularly on a change in perceived creditworthiness, would give market signals very damaging to the institution.

would be complex and costly, and result in discretionary decisions.<sup>7</sup> Conversely, secured lending allows lending at or around a single rate to a heterogeneous set of counterparts—important for monetary policy signaling and transmission.

Taking collateral—provided there are some constraints on eligibility—is also likely to impact the way the market interacts with the central bank. Imagine the central bank took no collateral in its market lending, and there was no case of default. Banks with a higher cost of funding—e.g., those which do not maintain a portfolio of securities for repo—would have an incentive to take a larger share of central bank borrowing; and if the OMO are conducted on a bid-rate basis, would have an incentive to bid up the price.<sup>8</sup> This will adversely impact both the direction of central bank credit, and the transmission of monetary policy. The first of these points begs a question: does the central bank aim to provide credit to market makers who will efficiently distribute credit throughout the economy, or more simply to create a level playing field and “refinance” any bank which wishes to transact with the central bank? On the second, in the case of bid-rate OMO (for short-term transactions used to implement monetary policy), should the central bank aim to avoid collateral-driven fluctuations in the interest-rate cut-off which are large in relation to typical changes in the official policy rate?<sup>9</sup>

One might question whether it is desirable to create a level playing field between a bank which has good quality, liquid assets and one which does not. To the extent this diminishes the value of holding the good quality, liquid assets, it may provide a perverse incentive to the financial system and increase vulnerability to liquidity shocks. This is an issue which needs to be considered carefully in the light of the recent financial market turmoil, bringing together those involved in the operational framework of the central bank as well as in financial stability oversight, and, if separate, banking supervisors.

We also need to distinguish between collateral taken as part of a bank rescue, and collateral taken in the normal course of monetary operations and provision of liquidity to the payment system. In the case of a bank rescue, the central bank can decide how much credit to provide, or indeed whether to provide it at all; and it may have the explicit backing of the MoF, so that any losses would be fiscalized. The size and the duration of the impact of default on the central bank can thus, in principle, be contained. But it may not be possible to pre-determine the type of collateral to be taken: the central bank, having decided on a bail-out, must take whatever is available.

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<sup>7</sup> Unsecured lending may also raise some criticisms on the use of insider knowledge acquired through a central bank’s supervisory role.

<sup>8</sup> If “BestBank” can borrow at Libor in the market, and “WorstBank” at Libor plus 25bp, then—assuming that Libor is at least a few basis points above the central bank short-term OMO rate—“WorstBank” will bid above Libor for central bank funds, whereas “BestBank” has little incentive to do so.

<sup>9</sup> If the monetary policy decision of the central bank typically considers changes to official rates in steps of 25bp, it would be odd if changes in the opportunity cost of collateral could impact the result of OMO auctions by a similar amount.

There is no such MoF backing for normal operations.<sup>10</sup> It would be natural, then, to expect the list of eligible collateral for normal, market-wide operations (particularly OMO, to the extent that the bulk of the central bank's lending operations are transacted as OMO) to be narrower. Moreover, the frequency of such operations may preclude specific analysis of the collateral to be taken and so point to a more restrictive definition. If the central bank needs to broaden its definition of collateral, or lower the threshold for eligibility, but without the explicit prior backing from the government, it must consider carefully the trade-offs between accepting less desirable collateral and the consequences of not doing so.

### **Collateral—the history**

Debates over the types of guarantees central banks should take to hedge the exposure stemming from their credit operations have only recently escaped the narrow circles of central bank technicians and taken center stage. (In the past, some have questioned whether the type of guarantee matters at all.)

Historically, a number of central banks discounted<sup>11</sup> short-term commercial bills as a means of providing liquidity to the markets. This reflected the lack of alternatives in undeveloped financial markets, and also the “Real Bills” doctrine (*cf.* Box 1), and was as much driven by monetary policy as protection against credit risk; but its legacy lasted well beyond the demise of the Real Bills doctrine in thinking about monetary policy operations.

- The Federal Reserve, whose charter was influenced by the Real Bills doctrine, granted eligibility to government securities only in 1932, following the provisions of the Glass-Steagall Act (loans backed by government debt had been made temporarily eligible during the First World War). The Fed framework has since gradually evolved toward a strong preference for highly-liquid government, or government-backed, securities.
- In 1992 the Bank of England (BoE) updated a collateral framework that was largely influenced by the Real Bills doctrine, in the context of a dramatic liquidity shortage related to the large-scale (but ultimately unsuccessful) foreign exchange interventions to support the pound as part of the European Exchange Rate Mechanism. Faced with an immediate need to expand the collateral pool to scale-up its liquidity provision, the BoE had to accept coupon-bearing government securities—which had previously been used only periodically—because the outstanding amount of eligible Bills of Exchange (and Treasury Bills) was insufficient to meet the borrowing needs of the market.

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<sup>10</sup> Other than general legislative provisions—in some countries—for the government to re-capitalize the central bank in case of need.

<sup>11</sup> That is, bought outright, at a discount rate reflecting the desired interest rate. Where such bills had already been traded once—in some cases a requirement for eligibility—the practice was referred to as re-discounting.

### Box 1. The Real Bills Doctrine

The “Real Bills doctrine” asserted that the provision of central bank money would self-regulate and avert inflation if central bank credit were backed by self-liquidating, good quality commercial claims such as bills of exchange, trade receivables or other means of financing which were directly related to economic activity and trade. This would gear money to production, thereby ensuring that output generates its own means of purchase and money adapts passively to the legitimate needs of trade. Made famous by John Law,<sup>12</sup> whose famous scheme of the “French East India Company” popularized the paper money experiment<sup>13</sup> in France, this theory was later spelled out in Adam Smith’s writings. In the nineteenth century, the British banker and monetary theorist Henry Thornton was the first to question the Real Bills doctrine.<sup>14</sup> His refutation was based on three main arguments:

1. Bills of exchange cannot constitute a reliable anchor to money provision for they represent a nominal magnitude that may already embed inflation expectations, and consequently fuel an inflation spiral (higher inflation increases the monetary value of bills, in turn increasing money supply).
2. The goods underlying one bill can be sold several times and thus be refinanced *a volo*, with money thereby outpacing the available quantity of goods produced.
3. Excess bill underwriting may also happen were central bank money provision to be inadequately priced: interest rate charges lower than the expected rate of return on investment would represent a strong incentive to create additional claims that would eventually trigger bouts of uncontrolled monetary expansion (“leverage”). This bias was actually observed in some periods in the nineteenth century, when interest rates charged by central banks staged protracted phases of inertia irrespective of the business cycle.

The Real Bills doctrine survived these refutations and retained some influence on central bank charters in the twentieth century. Many central banks - including the Reichsbank and subsequently the Bundesbank in Germany,<sup>15</sup> the Federal Reserve<sup>16</sup>, the Bank of England, and the Banque de France—related the collateral eligibility decision to the idea that central bank money should be directed toward “the real economy.” Its lasting influence might have been due to the fact that the amount of bills of exchange in the system was a rough coincident proxy to the level of economic activity, and thus permitted an “elastic supply” of means of payment that could avert the twin calamities of deflation and inflation, in a context where the decision on the amount of reserve money to supply was done in an environment of great uncertainty, or simply bound by very mechanistic “rules of thumb” (gold coverage, or other commodity-money frameworks).

Modern day approaches reflect a broader debate involving more pragmatic considerations, based essentially on the efficiency of the monetary policy implementation framework and on mitigating credit risk.

<sup>12</sup> John Law, “Money and Trade Considered”, 1705.

<sup>13</sup> Interestingly John Law’s spectacular bankruptcy in 1715 in France was not perceived as an illustration of the fallacy of the Real Bills doctrine.

<sup>14</sup> Henry Thornton, “An Enquiry into the Nature and Effects of the Paper Credit of Great Britain”, 1802.

<sup>15</sup> The hyper-inflation experienced in Germany in the post World War I era was attributed in part to the Real Bills doctrine.

<sup>16</sup> Federal Reserve Board 10<sup>th</sup> Annual Report, 1923: “It is the belief of the Board that there is little danger that the credit created and distributed by the Federal Reserve Banks will be in excessive volume if restricted to productive uses”. Productive use here meant loans to finance production and marketing of actual goods.

- The Bundesbank maintained a preference for taking commercial bills<sup>17</sup> as collateral in its operations prior to the establishment of the Eurosystem; and that approach which considers the re-financing of “real” business to be valid but financing of governments (“monetary financing”) to be bad may be a factor in the ECB’s acceptance of commercial loans but lack of a portfolio of government securities owned outright (other than as part of its foreign exchange reserves).

Another factor which has influenced collateral policy in various countries at different times is that by favoring certain originators—exporters, manufacturing industry for instance—the central bank could encourage lending to “important” sectors of the economy.<sup>18</sup> The idea that reserve money provision should be geared toward specific assets has since been challenged by two convergent phenomena. First, reserve money as a proportion of total commercial bank assets (the “reserve money leverage”) has declined markedly, so that the impact of such a policy becomes marginal; and second, the increasing maturity of financial systems should, in principle, facilitate an efficient re-channeling of credit toward its most effective use without guidance from the central bank. Although this concept resurfaces from time to time, in particular in countries where the availability of credit is problematic, and where monetary policy is sometimes asked to handle some industrial-policy concerns (“directed lending”), the idea that some commercial bank assets should be refinanced in line with sectoral criteria has gradually faded in industrialized (and most emerging market) countries.

In some cases, the remaining default option has been to use only domestic government securities as collateral, leaving banking sector intermediaries to channel credit toward its most efficient use. The spell of “ubiquitous fallacy”<sup>19</sup> cast by Friedman on the “Real Bills doctrine” has arguably biased the debate toward narrowly-defined collateral pools. It is interesting to note though, that modern practices have often emerged under the pressure of circumstances, rather than following a particular theoretical approach.

Over time the discussion on collateral has lost center stage. As monetary policy thinking moved away from the Real Bills doctrine, it has tended to focus on problems of fiscal dominance (which left central banks little or no control on asset growth nor leeway in terms of asset selection), or on the debate between strict monetary targeting and the use of interest rates as operational levers. In both cases, the operational details of monetary policy implementation and central bank liquidity provision, including the nature of collateral, have

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<sup>17</sup> Short-term self-liquidating bills (Handelswechsell), typically used to finance the purchase of physical goods (inventory or inputs) which should quickly generate a cash-flow to repay the financing.

<sup>18</sup> For instance, the Fed has occasionally adjusted its collateral policy based on sectoral considerations. In 1934, it allowed open-market purchases of acceptances of the National Agricultural Credit Corporation, obligations of the Federal Farm Mortgage Corporations, reflecting Congress’s intention to support the agricultural and housing sectors of the economy. Similar measures were taken in 1966 when the Federal Reserve was authorized to deal in agency obligations of the Federal National Mortgage Association (FNMA) and of the Federal Home Loan Bank (FHLB).

<sup>19</sup> Milton Friedman, “A Program for Monetary Stability,” 1962.

been taken for granted and received little attention. Collateral policy in many countries has remained a parochial corner of the technical discussion on the instruments of monetary policy over the last 20 years and lost its policy significance. But recent episodes of liquidity crisis and de-leveraging have revived interest in this topic, and given an opportunity to stress-test *in vivo* G20 central banks' collateral frameworks.

## **B. Modern Collateral Policies**

### **Common features (and differences)**

Modern collateral policies are geared toward the effective implementation of monetary policy operations and the smooth functioning of payment systems, while limiting counterparty risk. The focus is on the purpose of the operations which give rise to a need for collateral. Provided the collateral meets certain criteria—which may be administrative as much as anything—it has not traditionally been viewed as having any policy implications. The principles of creditworthiness, operational efficiency, transparency and accountability are most often used as yardsticks to evaluate eligibility.

Similar goals can lead to rather different results. The Fed aims for “market neutrality” whereby its operations should not significantly influence relative asset prices, and should not leave the Fed open to pressures to include any particular asset. In its short-term OMO, the collateral pool is narrowly defined, and operations (repos) are conducted at market-related rates (via “tranching”). Conversely, a single, penalty rate applies to use of the SF (the Discount Window<sup>20</sup>), whose collateral pool is significantly broader; the penalty rate ensures that the SF is not used substantially in normal market conditions. This price discrimination prevents any distortion to credit spreads which might arise from refinancing a substantial volume of different types of assets at the same price. Moreover, the volume of short-term OMO is normally kept at low levels through the outright holding of a large volume of government securities (see Appendix 2 for further details). The Bank of Canada has a similar approach.

The Eurosystem places greater emphasis on an even-handed allocation of resources (counterparty neutrality) rather than market neutrality, defining its eligible collateral pool in such a way that access to operations is open to a very wide range of counterparties.<sup>21</sup> A single pool is used both for OMO and SF, and is comprised of assets of different quality, whose idiosyncratic risk characteristics are addressed via risk control measures such as haircuts and margin calls.

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<sup>20</sup> The Discount Window involves collateralized lending, not discounting, despite the (historic origin of) the name.

<sup>21</sup> The ECB 2007 Annual Report refers (p101) to “The concept of adequacy [of collateral] implies, first, that the Eurosystem is protected from incurring losses in its credit operations and, second, that sufficient collateral should be available to a wide set of counterparties, so that the Eurosystem can provide the amount of liquidity it deems necessary through both its monetary policy and payment systems operations.”

The Bank of Japan guidelines on eligible collateral refer to the principles of maintaining the soundness of its own balance sheet, and operational smoothness. Its “level-playing field” approach makes it similar to the ECB, as does the restriction to domestic-currency denominated assets.

The BoE approach focuses on liquidity as well as credit risk, and therefore requires securities with high credit ratings for both OMO and SF. Market impact of collateral usage is minimized by drawing the pool as widely as possible—including nonsterling, non-U.K. assets as well as domestic currency, domestically-settled securities.

In countries with a structural liquidity surplus - often due to large foreign exchange reserve accumulation - collateral issues remain generally incidental as most operations are on the liability side of the central bank: there is no need for collateral in central bank liquidity-draining operations.

### **External constraints**

The financial markets infrastructure and the availability of domestic assets represent an external constraint on the central bank’s collateral options.

The level of development of financial markets is the most crucial factor, as it influences the degree of diversification of commercial bank balance sheets and ultimately which assets are available for monetary policy implementation. Banking systems showing little diversification in assets, or countries where nondeposit taking institutions hold the majority of high quality assets, represent a challenge for central banks when defining eligibility criteria. The distribution of assets may also be important. Some countries face both a structural surplus of liquidity and market dominance by a small number of commercial (often state-owned) banks. If the dominant banks are both liquidity-rich and hold the majority of government securities in issuance, then the central bank may find that it is the smaller banks which have occasional need to borrow, but that they lack the assets which are normally accepted as collateral.

The collateral intensity of modern financial systems also complicates the question of the magnitude of the collateral pool available to monetary policy. The need for collateral tends to increase with financial system sophistication: the growing recourse to collateralization for credit-enhancement purposes in derivative OTC contracts or the secular increase in collateralized funding has increased the amount of collateral necessary for the system to function smoothly, outside of the central bank specific needs (BIS, 2001 and BCBS, 2008). Furthermore, the increasing attention given to risk control procedures in the financial markets infrastructure (be it payment systems, for which intraday cash provision or credit is now generally collateralized, or security settlement systems) has also increased collateral demand, and motivates banks to manage their holdings of usable collateral more efficiently.

The legal environment, in particular the quality of bankruptcy proceedings and the length of judicial procedures for collateral enforcement crucially determine the leeway available to the central bank when defining its collateral policy. The transfer of the ownership, when complicated by lengthy rulings or by different level of appeals, can undermine the central



bank's ability to recover its claim. (For instance, some central banks have found themselves owning commercial properties taken as collateral for years, awaiting court rulings.)

For this reason another important factor in emerging countries is the soundness of the inter-agency procedures defined for individual bank resolution. The effective handling of banking crises requires clear-cut arrangements between the central bank (acting as collateralized or uncollateralized emergency liquidity provider), banking supervisors (acting as “whistle-blower”), the MoF (which has “long-run, deep pockets”) and the deposit insurance agency (involved in bankruptcy proceedings and receivership procedures). Procedural ambiguities or institutional discords between these agencies can result in two equally damaging outcomes: either a spreading-out of the crisis to other commercial banks because early coordinated action is impossible, or an eventual monetary financing of the crisis because the central bank early action is not subsequently followed by the action of other agencies. Experience shows that undefined, untested or weak institutional arrangements tend to heighten central banks' sensitivity to credit risk, limit their inclination to accept alternative collateral, and thus reduce their operational leeway even in normal times.

Collateral supply-side issues can be material in modern and sophisticated financial markets. For instance, the Fed's collateral policy was re-assessed publicly (Federal Reserve, 2002) at the turn of the millennium when fiscal surpluses created concern over a potential future shortage of government securities. In Australia, the short supply of government securities created by recurrent fiscal surplus has forced the Reserve Bank to resort increasingly to other types of assets and foreign currency-denominated collateral (notably through foreign exchange swaps), while maintaining the supply of government securities to the market through an *ad hoc* overfunding scheme whereby the proceeds of Treasury security sales are managed via a special account with the RBA.

If there is an inadequate supply of domestic securities (or other acceptable domestic assets), the central bank could accept foreign exchange, or nondomestic assets. To some extent, the ease of doing so will depend on the financial infrastructure and the time-zone in which the market operates. A central bank might be willing in principle to accept foreign currency, or a nondomestic security, as collateral, but needs to be able to confirm receipt of the currency or asset before close of business on the relevant day if it is to be able to supply domestic liquidity against it.

### **Internal constraints**

Aside from the considerations listed above, it is clear that practical decisions regarding collateral eligibility are also contingent on the overall design of the monetary policy implementation framework. In the case of the Fed, the borrowing needs of the banking sector are low, predominantly because of the practice whereby banknotes in circulation are broadly matched by Fed outright holdings of government securities, but also due in part to the nonremuneration of required reserves and the fulfillment of reserve requirements with cash in vault. This set-up entails low borrowing needs of the banking sector and fits well with the “market neutrality” approach of the Fed. Likewise, operating in normal times with a small set of primary dealers specialized in the trading of government fixed-income securities is also

consistent with this “narrow definition.” Consequently the amount of collateral used in short-term OMO represents a tiny fraction of eligible collateral, and the conditions applied to these operations are subsequently not likely to affect overall conditions in the securities markets. Likewise the pool of collateral eligible in the Primary Credit Operations (the credit SF, better known as the Discount Window) outstrips by far<sup>22</sup> normal recourse to this facility (including recent recourse to this collateral pool as part of the Term Auction Facility, TAF).

The ECB operational framework, which by contrast is characterized by a high level of fully-remunerated reserve requirements but no fulfillment with vault cash, results in a high demand for central bank balances. Reserve requirements amounted to EUR190 billion on average in 2007—some 15 percent of the consolidated balance sheet of Eurosystem central banks.<sup>23</sup> In addition, the absence of outright holdings of government securities means that the Eurosystem liquidity provision is predominantly short-term in nature. Moreover, the aim of providing potential access to all commercial banks<sup>24</sup> makes broad eligibility quasi-mandatory.

In Japan the loosening of collateral policy came largely in the wake of the quantitative easing policy. The BoJ opted to target a large amount of excess reserves, a policy which required a broadening of the collateral pool as well as the outright purchase of a large portfolio of government securities.<sup>25</sup> Circumstances called for decisive action. Interestingly, the BoJ’s role as lender of last resort in the 1990s did not lead to any change in collateral policy, as the lender of last resort operations were viewed as exceptional and not something that should alter the principles underlying collateral policy.

Some countries use narrowly-defined collateral frameworks owing to specific circumstances, such as the large availability of government debt, or a situation of fiscal dominance in which a politically-dominated central bank must grant preferential treatment to government debt (when not directly purchasing the government debt itself). Financially-repressed environments<sup>26</sup> generally feature some elements of preferential treatment for public-sector debt. And a structural liquidity surplus may mean there is little need for borrowing, reducing the collateral intensity of the system (see Box 2 below on collateral intensity).

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<sup>22</sup> Perhaps by several thousand times: an exact figure is not possible as eligibility is not always judged until an asset is discussed with the relevant regional Fed.

<sup>23</sup> Commercial bank reserves held at the Fed are typically 1-2 per cent of the Fed’s balance sheet. For the Bank of England the figure is around 25 per cent.

<sup>24</sup> In principle 2,000 financial institutions may participate in the Eurosystem OMOs and 2,700 use standing facilities.

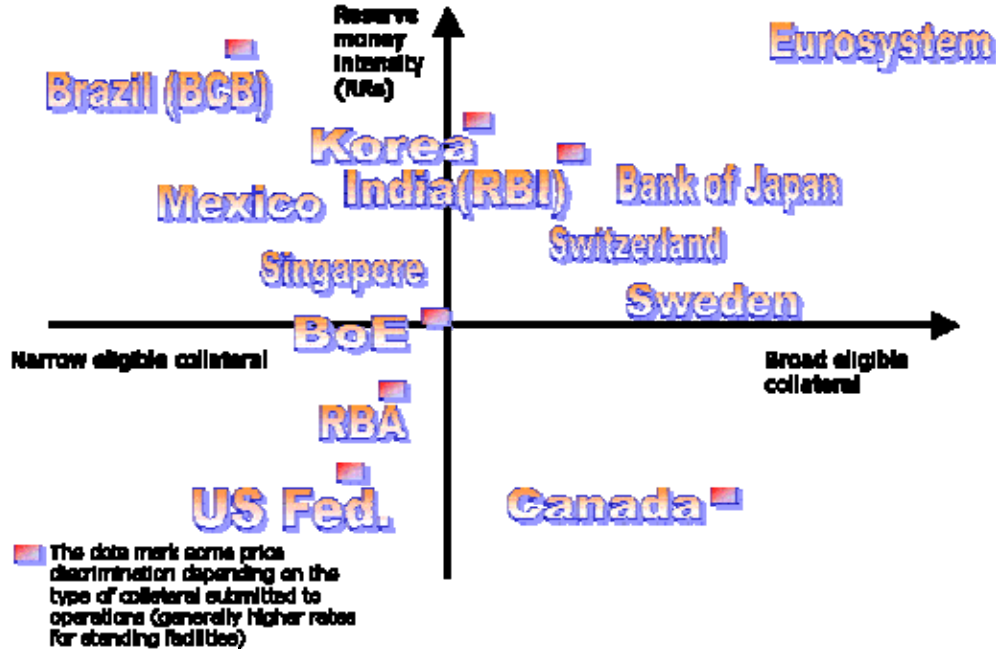
<sup>25</sup> The BoJ, like the U.S. Fed, roughly matches currency in circulation with outright holdings of domestic currency government securities.

<sup>26</sup> Generally characterized by some combination of the following: uncontrolled central bank lending to the government or large accumulation of quasi-fiscal assets, high reserve requirements, or structural excess liquidity, typically leading to high inflation, substantial banking spreads and quasi penalty interest rates on customers.

### Box 2: A Mapping of Central Bank Collateral Frameworks

Operational frameworks in countries where commercial banks have to hold relatively large balances at the central bank (high reserve-money intensity<sup>27</sup>) and where there is a structural liquidity deficit generally require larger pools of collateral. Many emerging countries with high reserve-money intensity because of excess liquidity can operate with a smaller collateral base, because their operations are essentially liability-based (i.e., they do not lend much to the banks). Figure 1 below illustrates this pattern. The X-axis represents an amalgam of the various dimensions of the collateral actually used, irrespective of eligibility to SF only or OMO. The Y-axis represents the reserve-money intensity of the central banks' frameworks. Canada stands at the bottom because reserve money corresponds essentially to bank notes (zero reserve requirements and daily operations which can effectively minimize excess reserves holdings). The Eurosystem stands at the top of the graph because of the high absolute amount of reserve requirements, coming on top of substantial bank note demand.<sup>28</sup>

Figure 1. Mapping of Collateral Frameworks pre-turmoil



<sup>27</sup> “High reserve money intensity” can be seen as the ratio of commercial banks’ current account holdings with the central bank related to the size of its balance sheet. This ratio can be high because of high reserve requirement (for countries with a structural liquidity deficit), or because of an excess liquidity environment. Countries with “low reserve money intensity” are those where the central bank implement monetary policy with a small amount of commercial banks balances related to the size of its balance sheet.

<sup>28</sup> The market has to borrow from the central bank—or sell its assets outright—in order to finance purchases of notes on behalf of customers.

Three areas in collateral policy where major central banks differ are (i) its breadth and depth, (ii) the commonality in OMO and SF, and (iii) pricing.

**(i) Breadth and depth of the collateral pool**

There are many dimensions to the definitions of eligibility for collateral. A two-dimensional approach could distinguish horizontal (which currencies are acceptable) and vertical (which credit ratings are acceptable). A third dimension might be market liquidity. Within these, the central bank could distinguish by other features such as legal jurisdiction.

At the narrowest and shallowest, a central bank could take only domestic-currency denominated, domestically-settled central government (and central bank) securities – a subset of the top horizontal layer. This should eliminate credit, exchange rate, settlement and cross-jurisdictional risk; and as far as possible also liquidity risk as such securities should be the most liquid available to the market. Although this might be the ideal in terms of minimizing risk, most central banks find it to be too narrow, both operationally and for policy reasons. Operationally, there may be an insufficient volume of these securities in circulation to cover lending to the market, perhaps because of fiscal surpluses, or in some cases because the government borrows abroad rather than domestically; or that a restriction of eligibility to these assets would still mean that central bank collateral demands had a greater than desirable impact on market liquidity and pricing. In policy terms, the central bank might not wish to single out government securities as “special;” or perhaps it may want to deal with some counterparties which do not hold a substantial portfolio of government securities (but do hold other high-quality collateral).

The list could be broadened in terms of issuer, to all domestic currency issues by, say AAA-rated issuers: e.g., some other sovereigns and IFIs; local government and some private sector debt. This would still remain within the domestic-currency subset of the top horizontal layer, and so would maintain the benefits of zero to low exchange-rate, settlement and jurisdictional risk, but with a small increase in credit and liquidity risk. A next step might be to accept foreign currency denominated securities from the same group (cf. section II.D.)—accepting a larger section of the top horizontal layer; or go wider still by accepting securities issued by foreign governments in another currency.<sup>29</sup> This would introduce exchange-rate risk (which could be handled with a suitable haircut); and in most cases cross-border jurisdiction and settlement risk—but central banks which are used to managing foreign exchange reserves should be able to cope with this for major currency issues. In all these cases, the collateral is securitized, and in most cases legal title can be verified by a third party.

Instead of, or as well as, extending the acceptable section of the top horizontal layer, the central bank could go down vertically, to accept lower-rated (including internally-rated) assets. It is a moot point how far down the ratings scale a central bank should go. In many cases, the central bank will not have a completely free choice: the choice may lie between

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<sup>29</sup> For instance, the Bank of England could accept U.S. Treasuries, or a U.S. dollar bond issued by another suitably-rated European government.

accepting collateral of a lower than ideal quality, or closing a bank which is, in other respects, in good standing. In some countries the choice will raise hard policy issues: extension of the collateral pool may be required to allow the private banking sector enough breathing room to grow; without this, monetary policy may be stifled by transmission through an unresponsive state-owned banking sector.

In the case of asset-backed securities (ABS) and some other private sector securities, the issuer may be closely connected to the settlement agent. Third party verification of the securitized assets may be provided by auditors or a rating agency, but this is rather different to an independent central security depository (CSD) confirming that securities have been transferred/pledged to the central bank. While the special purpose vehicle (SPV) issuing ABS may be legally independent from the bank (or NBFI) which originated the assets, the originator may still manage the assets and so be closely connected. In the same way that trade bills were traditionally accepted only with two names by the BoE (the underlying borrower and the issuing bank, in addition to the bank which used the collateral in borrowing from the central bank), it may be argued that ABS and similar assets should not normally be accepted from a connected bank.<sup>30</sup> A second, genuinely independent, name should be required.

As opposed to moving along the horizontal and vertical dimensions—currency and rating—of the range of securitized assets deemed eligible, the central bank could accept non securitized assets, such as loans on a bank’s portfolio. There will be no “market price” for such assets, and little prospect of independent valuation. As with ABS, there may be no independent verification of the assets. Moreover, it will not be possible to use the legal mechanism of repo; and the administrative work, in verifying documentation etc, may be substantially greater than when using securities as collateral. Against that, the benefits might be that a number of domestic banks might hold this type of asset, but not eligible securities; and that the legal issues in utilizing assets within the domestic legal jurisdiction may be reasonably straightforward (cf. part C.).

Finally, a central bank could take foreign exchange balances as collateral—effectively offering a foreign exchange swap. This may not be risk free—there is a big difference between confirmed settlement of euro in a Bundesbank account in the same time zone, and unconfirmed settlement of U.S. dollars in a commercial bank in a different time zone, for instance— and may raise other policy issues; but it could be at least as good as genuine alternatives.

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<sup>30</sup> On September 4, 2008 the ECB announced, amongst other technical updates to its collateral system, that “The definition of ‘close links’, as given in Section 6.2.3 of the General Documentation, will be extended to include situations in which a counterparty submits an asset-backed security as collateral when it (or any third party that has close links to it) provides support to that asset-backed security by entering into a currency hedge with the issuer or guarantor of the asset-backed security or by providing liquidity support of more than 20% of the nominal value of the asset-backed security.”

## **(ii) OMO and SF differentiation**

Broadly speaking, the Fed, the BoC and the RBA have a narrow definition of OMO-eligible assets (domestic currency good quality securities); and in the case of the first two a broader and deeper definition of collateral for SF. The BoE has a broader definition of collateral for OMO, but uses the same definition for SF.<sup>31</sup> The Eurosystem and BoJ have a broad and deep definition of collateral, and use the same definition for both OMO and SF.

There are two main justifications for accepting a broader and deeper range of collateral for SF than for OMO, which reflect some difference in function. Most central banks aim to channel the bulk of their transactions with the market via OMO, where they will inject (withdraw) the net amount of reserves required by the market overall and leave it to their counterparties to distribute that liquidity as needed. The credit SF is normally more important as a fall-back for payment system needs or in meeting required reserves, and typically meets the needs of individual banks rather than the market as a whole. The larger number of banks which have a potential need to use SFs points to a possible need to accept a broader range of collateral, rather than requiring them to hold and manage a collateral pool which might not fit in with their normal business. The second reason is to incentivize banks to provide the best quality collateral to the central bank. (“Best quality” is taken to include credit, liquidity, currency and other factors of importance to the central bank, and is used in a relative sense. Central banks would not of course choose to accept collateral of poor quality per se.)

If bank loans, or securities based on bank loans, can be used as collateral in liquidity-providing OMO, then banks could price some loans at a spread above the central bank’s rate, package the loans and (attempt to) refinance them at the central bank at the policy rate, locking in a profit. If OMO are structured as bid-rate auctions, this could lead to the cut-off rate being bid up; if the volume of OMO credit is constrained, overbidding could become an issue, though a bank’s ability to engage in this sort of business would also be constrained. A group of market makers (sometimes known as Primary Dealers) who obtain reserve money in OMO and on-lend it will, naturally, seek to profit from doing so. But they cannot always lock-in a profit upfront—this will depend on their skills in the market—and the spread should be limited by competition, and by the service provided to the interbank market.

It may be reasonable to accept lower quality collateral on an overnight basis in order to support the functioning of the payment system, while giving banks a pricing incentive to find other solutions; and the central bank may prefer to minimize prolonged exposure to the lower quality collateral, as this must increase the risk of holding such assets if a counterparty defaults.

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<sup>31</sup> As an exception to this general approach, the BoE’s 3-month maturity OMO has, since December 2007, also accepted some securitized assets which are not eligible for other OMO or for SF.

### **(iii) Pricing differentials**

For a given borrowing rate, banks have an incentive to provide the lowest quality acceptable collateral to the central bank because of the opportunity cost involved. It is not that they expect it to be loss-making—the banks are not transferring credit risk—but because it leaves them with better quality collateral for (potential) use in the market. Since the market does operate price discrimination based on collateral type, this should lower their overall cost of funding (and/or increase leveraging). The differential in opportunity costs/benefits for the collateral pool will tend to be greater where the definition of eligible collateral is very wide. Borrowers can take most advantage of it where the central bank does not impose collateral concentration limits; and if the central bank uses a bid-rate rather than a fixed rate in providing liquidity. In a bid-rate auction, holders of the lowest quality eligible collateral have an incentive to bid a (slightly) higher rate to obtain more of the central bank funds (see section III.). The marginal extra cost—a few basis points—may be small compared to the opportunity benefit (the market might demand a substantially higher spread, if it would accept the collateral at all). It may then be particularly easy for lower quality collateral to drive out good quality collateral in central bank operations. By contrast, if central bank lending rates take account of the opportunity cost of the collateral used, the problem of adverse selection can be reduced. If the central bank wishes to avoid adverse selection, pricing should, ideally, approximate opportunity cost (for the market as a whole, rather than for an individual institution); and should track changes in relative opportunity costs. But by definition, this pricing approach can only be used for traded instruments.

Pricing—the interest rate charged for borrowing—is different from the use of haircuts. Haircuts provide some protection against market and liquidity risk, and vary across different types of collateral, but may only affect the borrower's behavior if it is collateral constrained. This is unlikely to be substantially the case where a very wide definition of collateral is accepted: if a bank can effectively pledge a large part of its loan book to the central bank, it is unlikely to face a collateral constraint. But with a narrower collateral definition, or if the administrative costs of using less liquid collateral are passed on to the borrower, the ability of or incentives for banks to provide lower quality assets may be reduced. Consider, for example, a bank with assets of 100, consisting of a loan portfolio of 90 and liquid securities of 10; and the bank wants to borrow 10 from the central bank. If only the liquid securities are eligible, then a haircut of 10 percent would mean the bank could only borrow 9. But if the loan book is eligible, then a haircut of 85 percent would allow the bank to borrow 10 using only its loan portfolio and retaining all the liquid securities.

It is important in this respect that pricing is understood to be not simply the interest rate applied by the central bank to the loan, but also any administrative charges the central bank may make; any costs payable to third parties (to a registrar for settlement of securities, or registration of a collateral pledge, for instance); and costs internal to the borrower (for instance, the back-office costs of repoing a government securities holding may be smaller than arranging for the pledge of a number of smaller-value assets). The administrative costs, especially for a short-term loan, may be nontrivial.

One relatively straightforward way to deal evenly with collateral showing different opportunity costs might be to operate different collateral pools. For instance, short-term

OMO around the policy rate might accept a more narrow definition of collateral e.g., traded securities. Longer-term OMO, at a market rate, might accept a broader pool. Credit SF—overnight but at a penal rate<sup>32</sup>—could accept a yet wider pool. This would represent a passive, broad-brush administrative approach.

If a wider range of collateral is eligible at the SF, the margin of the SF rate over the policy rate is sufficient in many markets to discourage regular use, so there is no need for an add-on for less liquid collateral. But if regular and substantial use is made of the SF—this might happen if the central bank adopts a relatively passive approach to liquidity management, whether because of difficulties of liquidity forecasting or related to a pegged exchange rate—then the central bank may want to consider some means of differentiating between collateral types.

An alternative might be for the central bank to hold simultaneous OMO auctions with add-ons to reflect the “opportunity cost” differentials between different types of collateral (a form of “tranching”); or organize one single auction, but charge specific add-ons depending on the type of collateral offered, so as to offset the impact of a lower “opportunity cost.” If the add-on were to be determined by the central bank, and set somewhat above the normal market pricing, then in normal conditions counterparties would have an incentive to use the more liquid collateral. Administratively-determined add-ons could be adjusted periodically in the light of longer-term market developments, so that the incentives were kept in line with market levels. If the market tightened, then less liquid collateral would become relatively more attractive to use and the central bank could choose to limit the pricing impact of the market tightness by accommodating a change in the mix of collateral provided by the market—something some central banks have indeed sought to do. By contrast, if all eligible collateral is traded, and market prices used rather than a central-bank determined add-on, the securities would be priced by reference to the market yield curve. This framework would not automatically offset a tightening in market conditions.

In a situation of market disruption where uncertainty or illiquidity might lead to a sharp increase in market pricing, the central bank could adopt a more pro-active approach to offset more of the uncertainty premium.<sup>33</sup> This might involve temporarily moving to one of the broader collateral pools for a given type of operation,<sup>34</sup> or adjusting the add-ons.<sup>35</sup>

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<sup>32</sup>The U.S. Discount Window Rate is fixed by reference to the Fed funds target rate, but not by reference to the Fed’s OMO transactions; the latter can vary, at times substantially, from the target rate. The Eurosystem likewise fixes the SF rates by reference to the minimum bid rate at short-term OMO, rather than the outcome of the OMO auctions themselves.

<sup>33</sup> This might be similar to the setting of Standing Facility rates. Normally a credit SF is sufficiently above the policy rate to encourage the market not to use it; but in times of market disruption it deliberately sets a ceiling to market spreads.

<sup>34</sup> The Bank of Canada did this in August 2007, allowing the use of the SF collateral pool in its short-term OMO.

<sup>35</sup> The U.S. Federal Reserve did this in 2007-08, reducing the spread of Discount Window operations over the target rate on two occasions.



A very finely-differentiated pricing policy—with many tiers of pricing and several pools of collateral—could become difficult administratively: it must be possible to differentiate clearly between each category in the collateral policy. This points to the need to use market pricing for anything other than broad-brush distinctions. If tranching is used, the normal spreads between the top and bottom tranches should be comfortably within the spread between the policy rate and the standing facility rate to avoid an undue overlap between short-term OMO and SF transactions.

It may also be the case that tranching with a market price is only possible where central bank policy (i) targets a market rate (e.g., the Fed funds rate) rather than announcing the rate at which it will operate, and uses a variable price for its OMO to achieve this, since use of a market price precludes restricting operations to official rates; and (ii) an element of discretion can be exercised in deciding which bids to accept. This fits in with the approach taken by the U.S. Fed and the RBA. It is not obvious how it would work where central bank policy is to announce its short-term OMO price either as a minimum bid price (ECB) or fixed price OMO (BoC and BoE), with an implicit target for the short-term market rate. For instance, if the central bank sets the (minimum) rate for its short-term monetary policy OMO at 5 percent, but government repo is trading at 4.9 percent, banks would have little incentive to use government securities in the OMO. Or if it announces an OMO rate of 5 percent for government repo, 5.1 percent for local government and other G10 repo; 5.2 percent for ABS repo and 5.3 percent for CD and CP repo, the market might struggle to imply the targeted short-term interbank rate and hence the central bank's likely operational reaction to movements in market rates. Moreover, central banks are reluctant to tell the market how to price the liquidity and other aspects of different securities.<sup>36</sup>

### **Standard approaches to risk mitigation**

Due to the nature of their operations, central banks are exposed to a host of risks, including credit, market, liquidity, concentration, reputational, legal etc. With respect to their collateral frameworks, central banks seek to minimize their credit risk through collateralized lending and extending credit only to well-capitalized borrowers against highly-rated collateral. To manage the remaining market and liquidity risks associated with their operations, central banks typically apply the following techniques:<sup>37</sup>

- *Haircuts*: Central banks typically deduct initial margins (“haircuts”) in order to protect against credit, interest rate, foreign exchange, and liquidity risk. The margin generally is contingent on such factors as price volatility of the relevant asset class, the prospective time to liquidate the asset, the maturity of the asset, and the

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<sup>36</sup> Eligibility criteria, collateral valuation and haircuts address the credit risk.

<sup>37</sup> Market risk refers to the potential change in prices during the course of a loan, exogenous to the unwind of a collateral position. Liquidity risk refers to the potential price effect caused by an attempt to quickly unwind an outstanding position.

creditworthiness of the borrower. It is meant to take into account potential movement in asset prices over the time horizon of the loan. A more volatile (whether because of longer duration or other factors), less liquid asset carries a higher haircut.

- *Margin call practices:* To limit market risk, central banks also value the haircut-adjusted collateral with a pre-determined trigger level. If the collateral value falls below a certain level, a margin call is implemented, meaning that the counterparty is required to provide additional assets or cash payments to make up the difference. (This may also operate in reverse: if the collateral value increases, part of the collateral may be returned to the borrower.)
- *Limits on collateral issuers/sectors:* Some central banks also impose limits on the use of collateral from certain issuers or on the use of certain types of collateral, or on the share of total issuance (so that some must remain in the market) in order to reduce concentration risk. These limits can only easily be imposed on individual bank access to OMO: it would be difficult to restrict one bank's access to central bank operations on the grounds that another bank had used the same type of collateral, or to refuse access to an SF because of such limits.

The approaches to risk mitigation are broadly similar in major central banks. The Fed, Eurosystem and BoE apply haircuts that reflect the volatility in market values and mark-to-market the collateral which backs their repo agreements,<sup>38</sup> requiring counterparties to post additional collateral as needed. Valuation of marketable securities is based on independent market prices, or if unavailable, a theoretical valuation model is used to mark-to-model the collateral. Haircuts on collateral accepted by the respective banks for their regular money market and other operations range from 0.5 percent to 40 percent of market value in the U.S., 0.5 percent to 41 percent in the Euro area and 0.5 percent to 10 percent in the United Kingdom, depending on the different residual maturity, type of collateral, and currency denomination. Where appropriate, foreign-denominated securities generally require an additional margining for currency risk (5 percent is a common haircut; this will of course vary with the expected volatility of the relevant currency pair). The major central banks all employ margin calls that are based on the total value of the borrower's collateral pool. As such, there is no earmarking between a specific loan and the underlying assets in the collateral pool. For the sake of operational simplicity and equal access, neither the Fed nor the Eurosystem apply limits to the amount counterparties may borrow or issuer limits on their regular open market operations or standing facility loans, while the BoE applies issuer limits to control concentration risk. [Appendix 6]. Such limits can only easily be applied to intraday credit and OMO, not to SF.

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<sup>38</sup> Ideally, collateral should be marked to market daily; in some markets this is done less frequently because of data problems, and in such cases the haircut may be larger to offset the longer periods between mark to market.

## Recent challenges to risk mitigation

In response to the 2007-08 financial market turbulence, the major central banks, to differing degrees, injected term liquidity through their respective open market operations. The central banks will have needed to adjust their risk measures following these developments, to take account of longer maturities and newly-eligible assets (Chailloux et al, 2008).

In light of the longer term of the loan and reduced liquidity of eligible collateral, the Fed may have increased the range of haircuts for the newly-introduced Term Securities Lending Facility (TSLF) securities loans against schedule 2 collateral (e.g., private label MBS, commercial MBS, agency-backed CMO, asset-backed securities), though rates are not disclosed. Market participants speculated that margins (on private label MBS) were in the range of 15 percent, lower than the market haircut, though likely higher than haircuts on the regularly-accepted OMO collateral. Valuation of the collateral offered by primary dealers via the TSLF and the Primary Dealer Credit Facility (PDCF) is priced by the clearing bank acting as agent for the primary dealer, prompting concerns of a potential conflict of interests between the clearing agent and primary dealer. The Fed imposed maximum borrowing limits by individual participants of 20 percent of the par value offered at TSLF loan auctions (there is no upper limit on normal short-term OMO), geared toward the objective of distributing securities amongst a wide range of counterparties. Standard valuation and haircuts for the Discount Window applied to the TAF, and maximum limits are imposed on how much of the available funds an individual depository institution could bid in the auction. As in the TSLF, limits were established in order to ensure that the funds could be distributed across a number of institutions. There is no limit on PDCF loans, given their standing facility nature, though the Fed applied a frequency-based fee on loans exceeding 30 days of use within the first 120 business days of the program.

As part of its cross-currency swap arrangements related to the TAF, the Eurosystem applied the standard haircuts used on Main Refinancing Operations in addition to a 17 percent margin to cover foreign exchange exposure during the duration of the operation and to account for liquidation risk in case of a counterparty default.<sup>39</sup>

The BoE maintained the same limits on its special 3-month term auctions (maximum bids could not exceed 20 percent of the total size) while increasing the range of margins to 1-17 percent (versus 0.5-10 percent on regular OMOs). For the SLS, in contrast to the Fed, the BoE valued eligible securities using market prices from third-party vendors, or if unavailable, used its own calculated price and applied a higher haircut. The haircuts ranged from 12-22 percent for AAA-rated securities, the highest of which was on 10-30 year fixed-interest rate RMBS, covered bond securities, or credit-card ABS. An additional 3 percentage points were added for nonsterling denominated securities to account for currency risk and another 5 percentage points for securities with no observable market price and for own-name paper.

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<sup>39</sup> Unusually, in this case the loan was in foreign currency while the collateral was domestic-currency denominated.

A number of challenges related to risk mitigation practices emerged in response to these developments, some of which were covered by safeguards already in place.

- First, the larger size and longer term of operations (some of which require substantial margin maintenance adjustments) likely increased operational challenges and market risk.
- Second, broadening the range of eligible collateral has likely increased central banks' overall credit risk since counterparties are prone to submit the cheapest collateral to obtain credit. These are likely to be inferior relative to other eligible assets, whether in terms of credit quality or of liquidity, potentially resulting in the risk of adverse selection.
- Third, expanding the range of eligible collateral possibly introduced valuation risk, forcing central banks in some cases to rely on outside parties for assistance.<sup>40</sup>
- Fourth, central banks likely also faced model risk, if they relied on value-at-risk (VaR) models to assess haircuts. As the financial crisis underscored, risk models based on historical data covering benign periods fail to capture outside shocks relative to the historical norm.<sup>41</sup> Model-generated prices, when used for the calculation of market risks and liquidity haircuts, may have further underestimated the risk. Since volatility-based haircuts reflect backward-looking volatility conditions—which become benign during risk-seeking periods—this may argue in favor of establishing countercyclical risk control measures.
- Fifth, the TAF facility introduced long-run incentive concerns related to allocating subsidies<sup>42</sup> to potentially risky borrowers. Since it is a single-price auction (all successful bidders pay the same rate), additional credit may be channeled to institutions that face either the highest borrowing costs or greatest constraints in the market, since they will have an incentive to bid more aggressively.
- Finally, it is unclear whether a central bank should set, or cap, the price of liquidity. If term liquidity injections were carried out at rates significantly lower than prevailing market rates, then central banks have risked supplanting the interbank market, possibly forcing it to shrink further. However, this may be precisely the policy intention, increasing the supply of term liquidity and undercutting the market, with the aim of reaching a new, lower equilibrium at which some restoration of trading can take place.

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<sup>40</sup> For instance, the Fed relied heavily on Bear Stearns' own valuation assessment as part of the \$29 bn loan extended to the firm on March 24, 2008.

<sup>41</sup> An assessment on firms' risk management practices found that VaR calculations based on data collected during the financial crisis were 10-200 percent higher compared with earlier VaR calculations that covered more favorable market conditions, owing to incorrect assumptions on volatility. See Senior Supervisors Group, "Observations on Risk Management Practices during the Recent Market Turbulence," March 6, 2008.

<sup>42</sup> It may be a moot point whether central bank credit operations involve a subsidy by providing credit more cheaply than available elsewhere, or whether they help to correct a situation where (short-term) market failure leads to overpricing of some transactions.

The first four of these concerns do not raise fundamentally new issues: they indicate that a range of existing risks—for which control measures do exist—may have increased significantly, and may warrant a review of procedures. The last two are of a different nature, raising difficult policy questions.

### **C. Bank Loans as Collateral**

Nonmarketable collateral has to be considered if the pool of marketable collateral is too small, or is already exhausted by outstanding operations, or if for policy reasons the central bank wishes to extend access to institutions which do not hold marketable collateral.

Aside from pure credit considerations, bank loans pose a number of operational problems that represent clear impediments to their use by central banks.<sup>43</sup> Their credit assessment may be difficult (especially for claims on SMEs). Legal issues are numerous because of their legal heterogeneity (e.g., standard loans, revolving loans, trade receivable, and bills of exchange). Their physical handling is more difficult—often substantially so—than with assets which are designed to be traded. In case of default of the counterpart, disposal of bank loan collateral may be complicated by the absence of a market for such assets. This complexity explains some reluctance toward this solution and sometimes the choice of alternative solutions, such as securitized loans, which are at least easier to handle administratively.

But acceptance of certain commercial bank loan portfolios can entail benefits. First, it increases the number of counterparties which can access central bank transactions. Second, from a diversification perspective, to the extent it broadens the representation of different economic sectors in eligible private sector collateral, it may provide risk mitigation benefits. Another benefit not to be overlooked is the potential positive externality for the banking sector as a whole. Providing incentives to banks to better document the evaluation of their loan portfolio credit quality and the status of individual loans (with the central bank eligibility acting as an incentive) could facilitate progress toward securitization, and a more flexible asset-liability management environment for commercial banks.

Once the general decision is taken to accept bank loans as collateral, the central bank must consider the scale of use, and the specific costs and advantages of having a wide coverage of this specific collateral pool versus a more selective use. Broad coverage may be justified from the standpoint of economies of scale. Using bank loans generally involves the setting-up of technical capacities and infrastructures (for loan credit evaluation and handling) that are more likely to be amortized if used over a larger scale.

Broad eligibility of bank loans nonetheless involves specific hurdles and difficulties. The main difficulty is the assessment of small-value loans to SMEs. Rating agencies' absence of SME coverage renders necessary the setting-up of *ad hoc* credit assessment techniques. Different options are available but the choice of a single methodology may be difficult. When confronted with this problem and the complexity associated with the diversity of

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<sup>43</sup> See Appendices 2-3 for further details on the treatment of bank loans as collateral by the Fed and the ECB.

banking practices, the Eurosystem set up a multi-faceted credit assessment framework methodology, ECAF, whose objective is to ensure consistent outcomes, while allowing the different central banks to determine the precise methodology chosen.<sup>44</sup> The other hurdle is the complexity of handling this type of collateral on a large scale. Some countries (like France) have set-up electronic book-entry systems to handle such collateral in a dematerialized fashion and thus simplify the physical transfer of collateral, and the necessary checks on the quality of the collateral once used. Obviously, systems to reduce the administrative burden and cost at the same time encourage the use of loan-book collateral: depending on the central bank's collateral policy, this may or may not be desirable.

### **Recommendations if bank loan collateral is to be made eligible**

Bank loans are a distinct asset class as to their credit assessment, legal and administrative aspects: if they are to be accepted by a central bank as collateral, then in addition to the definition of appropriate eligibility criteria, specific safeguards should be put in place to ensure that the central bank is adequately protected in the case of a counterparty default. Although the realization of bank loans by central banks is still a largely untested process, a range of procedures ought to be in place at three stages: (i) ex-ante to ascertain the existence, the quality and the legal suitability of the loan taken as collateral; (ii) on an ongoing basis to ensure a close monitoring of the credit quality of pledged loans; and (iii) in case of counterparty default, to proceed with a smooth realization of the loan.

Eligibility criteria for bank loans should encompass loans that best protect the central bank against losses, while still providing on an aggregate basis a significant expansion of collateral availability. Too stringent criteria would deprive counterparties of the benefit of accessing additional liquidity while too loosely defined criteria may shift excessive risk to the central bank.

Eligibility criteria should cover the following main aspects: debtor credit quality, debtor economic sector, close links to the lender, loan registration and transferability, residual maturity of the loan and loan currency. Restricting eligibility to certain specific economic sectors (as done in some emerging countries) may result in unwarranted distortions in credit allocation and is therefore not advisable. By contrast, claims on public sector entities can represent an interesting source of collateral, as is the case for example in the Eurosystem—in particular, an extension to the government sector below federal government (municipalities, local and regional governments, known as Public Sector Entities in the Eurosystem) whose rating can be mapped to the sovereign rating.

Sound and reliable checks related to the loan existence and characteristics are necessary prerequisites for qualification. In the absence of a central depository or registry for loans, alternative checks should give the central bank sufficient certainty as to the status and the amount of the claim presented as collateral, as well as to the authenticity of the stated characteristics of the debtor. Targeted on-site inspection of the loan portfolio should be

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<sup>44</sup> See Appendix 3 for further details.

carried out whenever a counterparty declares its initial intention to use bank loans. The inspections should in particular review the bank's approach to assigning loans to credit quality categories, its systems and procedures for identifying eligible loans and their management, and verify the existence of those bank loans pledged at the central bank.

A minimum size threshold for loan eligibility can help to reduce the operational burden of this pre-registration, and limit the risks attached to collateral presented by smaller regional credit institutions (for which close links presumption may be higher). Some countries have implemented instead access limits in relation to a bank's regulatory capital. These limits are though subject to some adverse selection caveats: they could in principle give an incentive to a bank to take an over-optimistic approach in its loan classification process that would consequently overestimate its regulatory capital and so maximize access to the central bank.

To deal with the risks attached to undetected close links, central banks impose concentration limits on bank loans received as collateral in addition to prohibiting assets where the bank has close links to the borrower. This concentration limit could be achieved either by requiring that loans in a pool of pledged assets represent claims on a minimum number of different legal entities (or linked entities), or by the central bank itself choosing which loans to mobilize when using pre-pledged loan pools.

Strong accounting standards are essential for guaranteeing the soundness of credit assessment. The mandatory provision of IFRS-compliant accounts for debtors might be considered as an additional eligibility criterion.

On an ongoing basis, counterparties should monitor default events and rating changes on their portfolios of loan categories eligible for central bank operations. Such monitoring will ensure that the credit quality of the loans assessed is comparable to that of other eligible assets, which are internationally rated. At a minimum, banks using or intending to use bank loans as collateral could be asked calculate at the end of each year the realized default rate of their category I and category II loan portfolios, and if possible, a transition matrix reflecting migration between quality categories over the same horizon.

#### **D. Foreign Exchange Swaps and Securities as Collateral**

Foreign collateral is routinely used on a cross border-basis by a number of central banks (Sweden, Switzerland, United Kingdom; and in United States for SF). The expansion of eligible collateral toward foreign currency-denominated high-quality government securities may represent a useful line of defense in a context of strains on the high-quality collateral base. In recent years, a number of central banks have opted to increase the eligible collateral pool by such broadening.

FX swaps have been used by some central banks as a routine liquidity management tool. Notable examples are the Swiss National Bank prior to its use of repo; the Reserve Bank of Australia and the Reserve Bank of New Zealand currently, in part reflecting the low outstanding level of government debt; and by others in more specific circumstances for the funding of foreign exchange interventions (e.g., Bank of Italy and Bank of France in the context of ERM crises). FX swaps are self-collateralized operations that are economically

similar to a repo operation i.e., they can be represented as a spot purchase of an asset (in this case foreign exchange rather than a security) coupled with a forward sale of that asset at an agreed price. Cash collateral pledged through FX swaps has two merits: risk control measures are relatively straightforward (the FX risk is easy to account for), and the collateral can be simply held and transferred on correspondent accounts with foreign banks (possibly with the relevant central bank), permitting additional safeguards. For instance, central banks can arrange pre-delivery of the FX collateral. Foreign currency received in a swap should not be treated as part of the central bank's foreign exchange reserves, and safeguards should be in place to prevent it from being used inadvertently. The central bank could ask its correspondent central banks to implement safeguards to secure and earmark the cash collateral (e.g., blocking cash outflows below a certain threshold) during the term of the swap operation.

Foreign-currency denominated securities represent an alternative that may be warranted in a market characterized by a scarcity of domestic collateral, but is more complex than an FX swap. Settlement modalities may pose some difficulties, risk control measures may be more difficult to handle, and may be better reserved for longer-term transactions rather than e.g., overnight. Moreover, using FX-denominated securities may only be a viable alternative for relatively mature financial systems undergoing severe domestic collateral shortages, but where a reasonable number of domestic banks hold some international securities. Less mature markets and dollarized financial systems may provide a less appropriate environment for this kind of alternative, as central banks too open to the use of foreign collateral may hinder domestic market development, or facilitate the dollarization of balance sheets. Some central banks are reluctant to accept substantial amounts of foreign exchange or FX-denominated securities for these reasons.

A working group of the Committee on Payment and Settlement Systems (CPSS) gathered under the *aegis* of the Bank of International Settlement (BIS) has studied the issues related to cross-border collateral arrangements.<sup>45</sup>

### III. COLLATERAL POLICY AND ADVERSE SELECTION

#### A. Liquidity Demand and Collateral Impact in Time of Crisis

In the event of a negative reserve money shock (i.e., a drain of reserve money from the system or an increase in demand), net central bank credit to the commercial banks will increase and there may be pressure on the stock of eligible collateral (Figure 2 below). If this is constrained, the central bank might be faced with the need to expand its collateral base to

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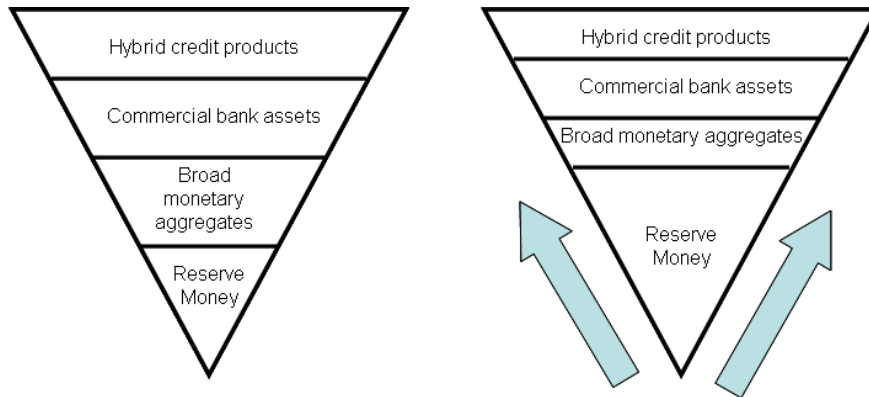
<sup>45</sup> The report, published in January 2007, highlighted the two following key elements: "(i) Accepting foreign assets as collateral, either routinely or only in extraordinary circumstances, is an option that central banks could take in order to address commercial banks' intraday liquidity requirements...(ii) ...the diversity and complexity of domestic financial markets, liquidity usage, and the operational structure of G10 central banks suggest a wide range of approaches regarding whether... it would be appropriate for an individual central bank to take cross-border collateral. Thus, the G10 central banks agreed on adopting an 'à la carte approach', under which it is left to each central bank at this stage to decide independently its policies on foreign collateral..."



meet the increased need for reserve money, while ensuring that safeguards are in place to provide some protection against the additional risk.

## Figure 2. The Inverted Money Pyramid: Reserve Money Shock

*The “inverted money pyramid” and central bank action (reserve money expansion) in case of a systemic reserve money shock*



Note: The provision of extra reserve money liquidity by the central bank is represented by the expanding surface of the “Reserve money” triangle. This expansion does not have a proportional impact on other monetary aggregates, because of the more liquidity-demanding behavior of economic agents (liquidity is hoarded rather than used for asset expansion). In that case, the pressure on the stock of collateral generally rises in proportion to this increase.

Source: IMF

By contrast, if there is an adverse credit or liquidity shock, i.e., a major negative shift in market participants’ perception of the risks attached to different types of issuers, without a related increase in commercial bank demand for holding additional central bank reserves, the central bank will likely face a shift in counterparts’ behavior at OMO credit auctions. Counterparts will retain more creditworthy and liquid assets for use as collateral elsewhere (in the market) and increasingly offer less creditworthy and illiquid (but still eligible) assets to the central bank. The consequence of this adverse selection process is subtle: although the total amount of liquidity is unchanged, the central bank gradually acquires a contingent claim on a pool of assets whose quality changes markedly in the process.

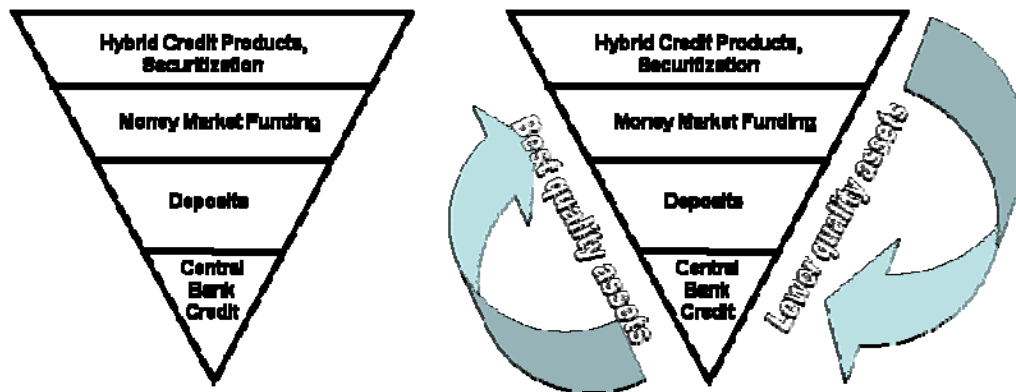
The market turmoil during 2007-08 gives an illustration of the second type of crisis (Figure 3 below). Reflecting the nature of the crisis, most central banks altered the composition of their collateral pool (and/or observed changes in the mix of collateral actually used) rather than changing the supply of reserve money.<sup>46</sup> In the case of a straight reserve money crisis, the

<sup>46</sup> With the caveat that, for purely liquidity management reasons: (i) several central banks provided additional reserves for a few days at the immediate onset of the crisis; (ii) liquidity provision was at times frontloaded within the maintenance period (with an offset toward the end of the maintenance period, whether via tighter allotment decisions or liquidity draining operations – see section III.A in WP08/210, ‘Central Bank Response to the 2007-08 Market Turbulence’); and (iii) some smaller central banks increased the supply of reserves for several months.

central bank injects more reserve balances and may choose to broaden the collateral pool as necessary, to facilitate this. In the case of a funding shock, the change in the collateral pool is a reflection of market participants' demand and funding-cost optimization: depending on the operational framework and policy choices, the central bank may respond to this passively or actively.

**Figure 3. The Inverted Money Pyramid: Funding Shock**

*The “inverted money pyramid” and central bank action (collateral pool) in case of funding liquidity shock*



Note: In this episode (seen from the asset side), the “central bank credit” triangle surface does not change. The demand for best rated and most liquid collateral (e.g., government securities) may increase substantially more than in the case of a reserve money shock because of the cheaper funding opportunities it provides, while low-liquidity least rated eligible products (e.g., top layer of the triangle) are pledged to the central bank. This may lead to a greater change in the collateral mix provided to the central bank. The arrows show the ongoing change in the contingent asset mix underlying the provision of reserve money.

Source: IMF

The market turmoil of 2007-08 also demonstrated that during stressed periods, frameworks in which there is imperfect substitutability of collateral between SF and OMO could give rise to problems where eligible OMO collateral and counterparties are narrowly-defined. For instance, the effectiveness of distributing liquidity via a smaller set of intermediaries may decline amid distressed market conditions if intermediaries do not on-lend funds.<sup>47</sup> The next section describes an issue of adverse selection regarding collateral usage, and touches on two possible consequences for the direction of central bank lending and the relationship between policy rates and market rates.

## **B. Adverse Selection Mechanisms and “Market Neutrality”**

### **Gresham’s law of collateral**

The dislocations observed in the global money markets during 2007-08 have brought about a re-pricing of risk and asset values, as reflected in money-market spreads, that has impacted

<sup>47</sup> See Appendix 1 and Chailloux et al, 2008.

central bank collateral pool quality. But in some cases this has exacerbated an existing trend rather than representing a wholly new development.

When considering central bank financing, commercial bankers compare the cost of central bank liquidity to alternative sources of funding using the same form of collateral. The availability of market funding, as well as the types of assets held and the liquidity position of commercial banks, are key factors in the determination of their bidding behavior. As a rule, treasurers strive to place with the central bank collateral having the lowest opportunity cost, although other factors may occasionally take precedence. Namely, all securities having a greater value on the repo market will be refinanced via market repos; otherwise the commercial bank incurs an opportunity cost equal to the spread between the central bank rate and the (lower) repo rate observed in the interbank market. Collateral selection is also made opportunistically when assets can be used in central bank refinancing operations at a rate lower than would be observed for comparable assets in the market. In both cases, funding-cost arbitrage tends to lower the average quality of the central bank collateral received when using pooling arrangements, in particular for central banks with the most accommodative collateral standards. We call this “Gresham’s law of collateral.”

The incremental risk stemming from this tendency to provide central banks with the most suitable assets from a relative funding-cost perspective (i.e., the least creditworthy or least liquid), can be offset to some extent, for instance by greater haircuts. Risk management techniques like Value-At-Risk can be used to assess some of the idiosyncratic risk components of least rated securities, so as to adjust the overall risk of the portfolio accordingly; though they may not be strong at picking up tail-event risks (e.g., ‘jump to default’).

An alternative approach to this problem is “tranching” as described in section II. The pricing of different tranches at rates in line with coincident market rates prevailing on the underlying collateral provides a “no-arbitrage” environment that limits adverse selection. This is only possible if the collateral accepted is traded in liquid markets, so that a reliable price signal is observed. Limited scope for price differentiation exists in operational frameworks designed to accept regularly only a small set of collateral.

Conversely, monetary policy operating frameworks featuring liquidity-providing auctions organized with a broad pool of eligible collateral but no price distinction (“pooling” rather than “tranching”), or without preset constraints to the eligible assets to be mobilized, are more exposed to “Gresham’s law” of collateral.

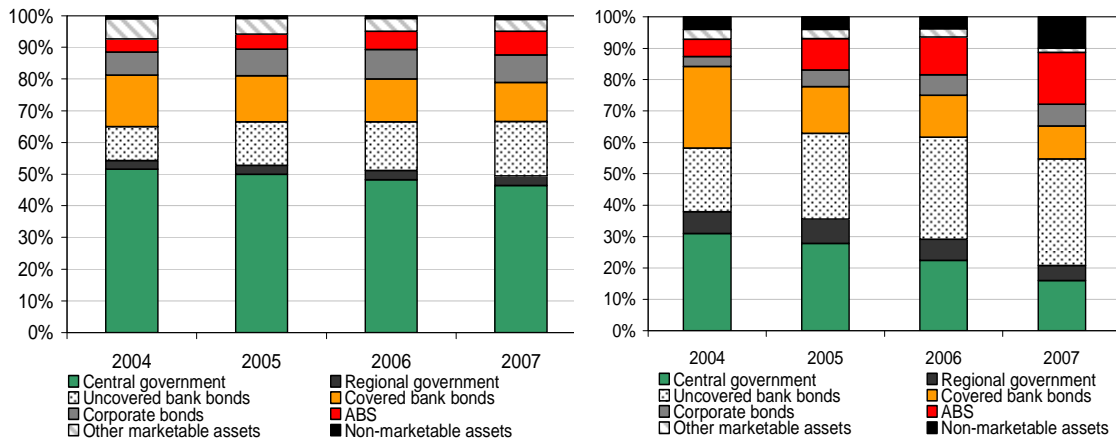
Although the existence of collateral eligibility *premia* may not be evident in benign money market conditions, the widening of money market spreads by a factor 10 in the second half of 2007 has demonstrated the need to review collateral policies in light of a rapidly changing environment (see Box 3 below).

An analysis of the use of collateral in Eurosystem operations for 1999 to 2007 suggests that market participants have exhibited a clear trend toward deploying lower quality assets over a period of several years (see Figure 4), in spite of the relatively low and stable spreads prevailing until August 2007 between unsecured rates, repo rates and the ECB short-term

OMO rate.<sup>48</sup> At the same time, the use of bank bonds as collateral has surged, outpacing their share in the pool of eligible assets, and spurring concerns of “manufactured collateral.”<sup>49</sup> Thus, the share of government securities in the pool of collateral actively used has decreased from near 60 percent in 1999 to less than 20 percent in 2007, in favor notably of nonmarketable assets and asset-backed securities. More recently, interest-rate differentials in the euro area have widened significantly, and with it the incentives to use secured funding and to arbitrage between different types of collateral.

**Figure 4. Eurosystem Collateral**

**Evolution of Eligible Collateral vs. Eurosystem Counterparts' Collateral use from 2004 to 2007**



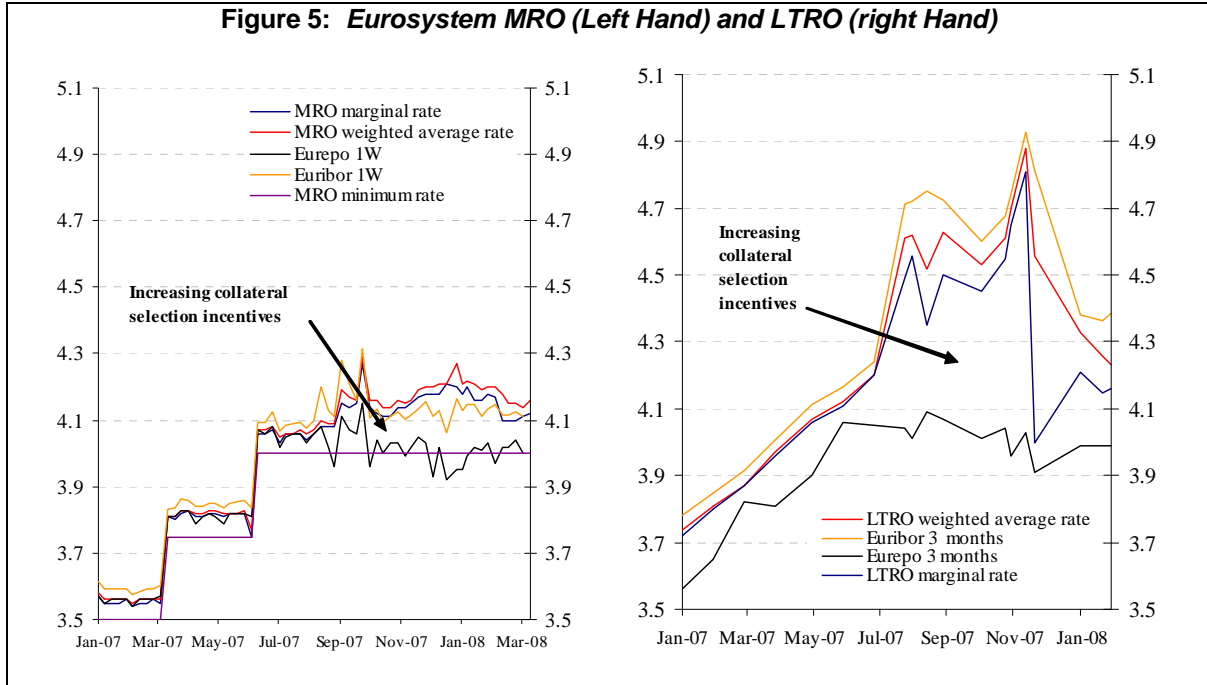
Source: European Central Bank

<sup>48</sup> The cut-off rate in the short-term monetary policy OMO (the 7-day maturity MRO).

<sup>49</sup> One loophole could consist for bank A to issue large amounts of bonds to be placed with bank B, while bank B would issue matching amounts to bank A, both using the thus acquired securities to access central bank liquidity provision. Banks facing similar LIBOR funding costs could thus “create” an easy and “cost-free” access to central bank liquidity. Of note, bank bonds issuance has surged to unprecedented levels for the euro-area in April 2008. That said, some central banks (e.g., RBNZ) may opt to accept bank-issued securities, in part to bolster confidence in the bank bond market.

## Box 3: Eurosystem Operations and Collateral Selection

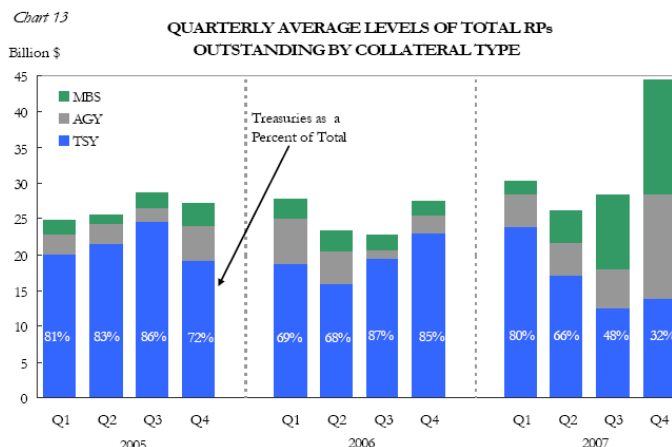
Figure 5: Eurosystem MRO (Left Hand) and LTRO (right Hand)



Source: European Banking Federation and ECB

The charts in Figure 5 above feature the MRO and LTRO marginal and weighted average rates since January 2007, relative to the coincident money market rates at the time of the auctions. The repo rates represent a lower bound to other market rates. Euribor rates represent in normal times an approximate upper bound, as they represent unsecured borrowing rates of prime commercial banks. These charts illustrate well how the deterioration in market conditions altered collateral selection incentives. The left-hand chart shows that pre-turmoil money-market rates were concentrated in a narrow range, with MRO marginal and weighted average rates closely anchored to the repo rate. The proximity to the repo rate highlights that Eurosystem counterparties could either refinance their securities using market repo operations, or via Eurosystem operations, both options being virtually identical cost-wise. Since the onset of the turmoil, market rates and the ECB rate drifted in such a way that the repo rate stood on average 10 to 15 basis points below the MRO marginal and weighted average rate, implying that banks holding government security collateral could reduce funding costs by borrowing from the market rather than the Eurosystem. At the same time, MRO marginal and weighted average rates stood above the one-week Euribor rate, implying that the spread which nonprime banks normally have to pay over the Euribor rate had increased sharply, and that it was cheaper for them to borrow from the Eurosystem, using collateral which was eligible in the Eurosystem but not acceptable—at least, at that price—in the market.

The right-hand chart also shows that money market rates have strongly increased incentives to mobilize least liquid/creditworthy collateral. At end 2007, repo rates stood 90 basis points below the Euribor rate, while LTRO marginal and weighted average rates hovered just below the Euribor curve. The cost of using government securities as collateral for 3-month Eurosystem operations came close to 100 basis points by then.

**Figure 6. Federal Reserve—Composition of Collateral**

Source: Federal Reserve Bank of New York.

A similar phenomenon has also been evident in the U.S. since the onset of the turmoil. Federal Reserve Bank of New York data highlight a shift toward agency debentures and mortgage-backed securities as collateral used in regular OMO (Table 1 below). With the introduction of the TAF in December 2007—not included in Figure 6 and Table 1—the Fed’s short-term OMO have constituted a much smaller proportion of its liquidity provision, thus reducing further the use of best-rated collateral.

**Table 1. Federal Reserve Bank Short-Term OMO Collateral (U.S. Dollar billion)**

|                          | Treasuries |         | Agencies |         | MBS    |         |
|--------------------------|------------|---------|----------|---------|--------|---------|
|                          | Volume     | Percent | Volume   | Percent | Volume | Percent |
| January to end July 2007 | 881        | 66%     | 322      | 24%     | 130    | 10%     |
| August 2007 to end-2007  | 458        | 36%     | 444      | 33%     | 381    | 29%     |
| From January 1st 2008    | 441        | 39%     | 338      | 30%     | 353    | 31%     |

Source: Federal Reserve Bank of New York

It appears clear that accepting less liquid, less marketable assets at the same interest-rate cost as easily tradable assets may encourage banks to retain the most tradable collateral to post with other counterparties, and to see the central bank as “Lender of First Resort.” If the lack of price discrimination continues under normal market conditions, it may also reduce incentives for banks to hold and provide top-rated securities, and lead to deterioration over time of the quality of collateral offered to the central bank. The structure of the central bank collateral pool has other implications for monetary policy: it impacts the behavior of central bank counterparties, and can affect long-run market outcomes by altering the relative prices of assets. Changes to the collateral base can affect the degree of risk taken by central banks in their liquidity provision operations, but also monetary policy transmission via the impact on market spreads.

## Impact on market outcomes and market neutrality issues

The 2007-08 market turmoil has brought to the fore a range of collateral issues, as the flexibility to provide liquidity in times of stress hinges crucially on the collateral framework developed by central banks. Collateral policy divergences have resulted in differences in the way the crisis was handled in different countries,<sup>50</sup> although with perhaps less visible differences as measured by yield curve developments. The broader Eurosystem policy toward well-rated RMBS and covered bonds averted some of the funding stress undergone by banks heavily involved in securitization of real estate loans,<sup>51</sup> while the Fed and the BoE had to change their respective OMO collateral policy for such securities to be acceptable.

Granting eligibility to assets with little or no market liquidity (including certain securitization products) can influence commercial banks' asset-liability management decisions. Commercial banks may be tempted to reduce their holdings of highly liquid assets in favor of higher-yielding, less liquid assets if these assets are deemed eligible by the central bank.<sup>52</sup> The "eligibility option" could thus represent an incentive for a greater level of liquidity leverage, i.e., a propensity to increase the share of low-liquidity and higher-yielding assets relative to the share of assets easy to liquidate in the market. In principle this "liquidity premium" given to lower-liquidity and creditworthy assets could have an impact on the relative prices of assets,<sup>53</sup> as noted by rating agencies<sup>54</sup> and other observers.<sup>55</sup>

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<sup>50</sup> See Chailloux et al. (2008) for a more detailed discussion on the central bank response to the crisis and challenges to their respective exit strategies.

<sup>51</sup> See for instance González-Páramo, speech at Global ABS Conference, June 1, 2008, section 4.

<sup>52</sup> To some extent this may be reasonable e.g., Fed Vice Chairman Don Kohn, who stated that: "central bank liquidity facilities are intended to permit those with access to hold smaller liquidity buffers, which allows them to fund more longer-term assets and thereby promotes capital formation and economic growth." (Speech at FRBNY-Columbia Business School conference, May 29, 2008).

<sup>53</sup> One illustration of the likely market impact in times of stress is the central bank's willingness to accept less liquid collateral (e.g., certain mortgage-related securities during 2007-08). Such access to central bank liquidity may help to prevent fire sales of illiquid assets, suggesting that the eligibility premia may stem excessive price declines in the market. It is a moot point whether this delays market price discovery, or substitutes for a failure of the market mechanism. Likewise, post-crisis accommodation of poor quality collateral can also lengthen the process of getting the market "back on its feet," especially if distressed-asset refinancing by the central bank is not discriminative enough.

<sup>54</sup> Fitch Ratings, May 2008, Europe Special Report, "The role of the ECB: Impact of Increased Liquidity on European Financial Markets and Banks". This report emphasized the impact of ECB standards for the eligibility of RMBS, noting "such instruments being increasingly structured for use as ECB collateral since August 2007...", and that "...ECB-driven issuance has also carried relatively low coupons that would be unrealistic if they were to be placed with investors in the current market-as indicated by much wider credit default swap spreads."

<sup>55</sup> Citigroup Industry Flash, March 2008, "Who is borrowing from the ECB ?" This report also emphasized the market impact of Eurosystem eligibility rules: "This funding route may hamper recovery of public ABS market – Banks have no incentive to return to the public ABS market since ECB funds are so much cheaper..."

Although this impact seems empirically difficult to document and is limited in normal times, it represents a challenge to central banks, and an invitation to rethink the interaction between central bank monetary operations framework, and its potential impact on the credit cycle.<sup>56</sup> In theory, we would expect a collateral framework with broad eligibility rules and no price discrimination to push credit spreads downwards overall; while frameworks with a narrow collateral base and/or price discrimination against less creditworthy or less liquid collateral should have less of an impact on relative asset prices (the relative pricing within each narrow tranche of eligible collateral is instead affected).

The magnitude of this distortion should in principle be different depending on the breadth of eligibility. The introduction of a universal eligibility regime might in principle have an impact on credit spreads overall; relative spreads could change if the liquidity premium was very different for otherwise similar securities. Conversely, a framework restricted to a certain credit rating level could impact pricing vis-à-vis differently rated securities. The magnitude of the pricing impact should also reflect the intensity of the collateral use, namely the share of the usable collateral actually mobilized. In the case of the Fed, the ratio of eligible to actually used marketable collateral for short-term OMO operations is (in normal times) several hundred to one. This ratio stands at 20:1 overall for the Eurosystem. In part, this reflects the substantially higher proportion of the Eurosystem's assets made up by short-term OMO (around 10 times higher in absolute terms). The Eurosystem shows very different outturns when calculated for each subcomponent of the collateral pool. If for instance the collateral intensity of government securities is small (because the proportion of government securities actually used for Eurosystem operations is smaller than their weight in the collateral pool), the same calculation for ABS or bank bonds suggest a greater collateral intensity, and potentially a larger price impact. The heterogeneity of collateral intensity within the Eurosystem collateral pool highlights that collateral use depends on market incentives and tends to go toward a greater use of some specific sub-segments.

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<sup>56</sup> The Fed and the BIS have raised concerns on the potential market impact of collateral eligibility decisions. See for instance Federal Reserve (2002) "The fact that the Federal Reserve Portfolio consists largely of Treasury securities has enabled the Federal Reserve to maintain neutrality...If the Federal Reserve was to conduct the bulk of its operations in assets other than Treasury securities, the risk of affecting relative prices across assets could be significant, although strategies employing substantial diversification and carefully designed trading rules could greatly reduced these effects." Likewise, the BIS in its 2006 report on "Cross-border Collateral Arrangements," BIS CPSS, January 2006, asserted that: "A particularly high percentage usage, for example, might suggest that banks' requirements for eligible assets to back central bank credit are a principal driver of demand in a particular market segment, potentially having a marked effect on pricing, and raising concerns about accessibility/availability of additional assets."



**Table 2. Eurosystem Collateral Use vs. Availability 2007**

| <i>Use of collateral in ECB operations</i> |          |             | <i>Marketable collateral availability</i> |          |             |
|--|----------|-------------|---|----------|-------------|
| <i>Type</i>                                | <i>%</i> | <i>Rank</i> | <i>Type</i>                               | <i>%</i> | <i>Rank</i> |
| Uncovered bank bonds                       | 34%      | 1           | Central government                        | 48%      | 1           |
| Central government                         | 18%      | 2           | Uncovered bank bonds                      | 17%      | 2           |
| Covered bank bonds                         | 15%      | 3           | Corporate bonds                           | 10%      | 3           |
| ABS  | 13%      | 4           | Covered bank bonds                        | 8%       | 4           |
| Credit claims                              | 8%       | 5           | ABS                                       | 7%       | 5           |
| Corporate bonds                            | 7%       | 6           | Regional Government                       | 2%       | 6           |
| Regional Government                        | 4%       | 7           | Others                                    | 3%       | 7           |
| Others                                     | 2%       | 8           |   |          |             |

Source: ECB, 2007

Ranked data on the use of collateral for 2007 as a whole (Table 2, above) show that banks optimize collateral use based on factors others than availability. The quantity of uncovered bank bonds repoed is twice as large as the eligible stock. Conversely, central government securities, the most available collateral (48 percent), represent just 18 percent of the collateral actually used. Covered bonds and ABS respectively ranking fourth and fifth in availability terms (and 15 percent), rank third and fourth in terms of actual use (for a total of 28 percent).

Changing incentives and worsening funding conditions of certain eligible assets might further heighten the collateral intensity of some-sub segments of the collateral pool. Assets whose use at the Eurosystem refinancing would increase, owing to adverse market funding conditions, and represent a large portion of the eligible collateral, could see their price affected in proportion to this “implicit subsidy.”<sup>57</sup>

### **The channeling of funds**

We suggested earlier that as a matter of policy, a central bank can choose between targeting a group of intermediaries (which may be formalized as Primary Dealers, or may have a less formalized structure); or aiming for a framework accessible to as wide a range of banks as possible. The former, relying on market mechanisms to distribute liquidity, may struggle in the face of a widespread credit shock. In the latter case, does it matter if the opportunity cost of collateral results in a particular group of banks taking a disproportionate share of central bank OMO funds? Or if changes in opportunity costs result in de facto changes in the direction of central bank lending?

An analysis of Eurosystem individual institutions’ balance sheets sometimes shows large differences between local structural liquidity deficits and liquidity provision through respective national central banks. For instance, the Bundesbank balance sheet reveals that the

<sup>57</sup> The collateral intensity (and the related market impact) may be magnified depending on the magnitude of the market disruption. As the price of the asset is set by the marginal transaction, the collateral policy of the central bank should only affect prices in the event of rationing. The disruption of trading represents a potential case of rationing that would give the central bank’s refinancing option greater impact in the price setting-mechanism (where the central bank transaction actually becomes the “marginal transaction” or, alternatively viewed, prevents the occurrence of a fire sale marginal transaction which might impact the price sharply).

amount of liquidity provision to German banks outpaced the structural liquidity needs of the German banking system in the early years of monetary union. By contrast, the balance sheet of the Banque de France shows that the amount of liquidity provided to French banks is consistently lower than the local structural liquidity deficit. This pattern is not necessarily problematic in a unified currency zone where banks are free to fund their operations in the market or with the local central bank. It is offset by commercial banks re-channeling reserve money toward other regions of the system. However, it may nonetheless conceal some idiosyncratic bidding incentives related to the collateral base of respective European regional banking groups. Some have argued that the considerable bidding appetite of German banks is related to the existence of a very large pool of Pfandbriefe,<sup>58</sup> whose funding conditions in the market are perceived as less favorable than the ECB repo rates. The large share of the Bundesbank in the Eurosystem repo operations would then reflect funding-cost arbitrage. A substantial increase in the first half of 2008 in the share of Eurosystem lending directed to Spanish banks appears to reflect changes in relative opportunity costs of Spanish ABS. (The different structure of the US and UK markets does not allow a comparable analysis for them.)

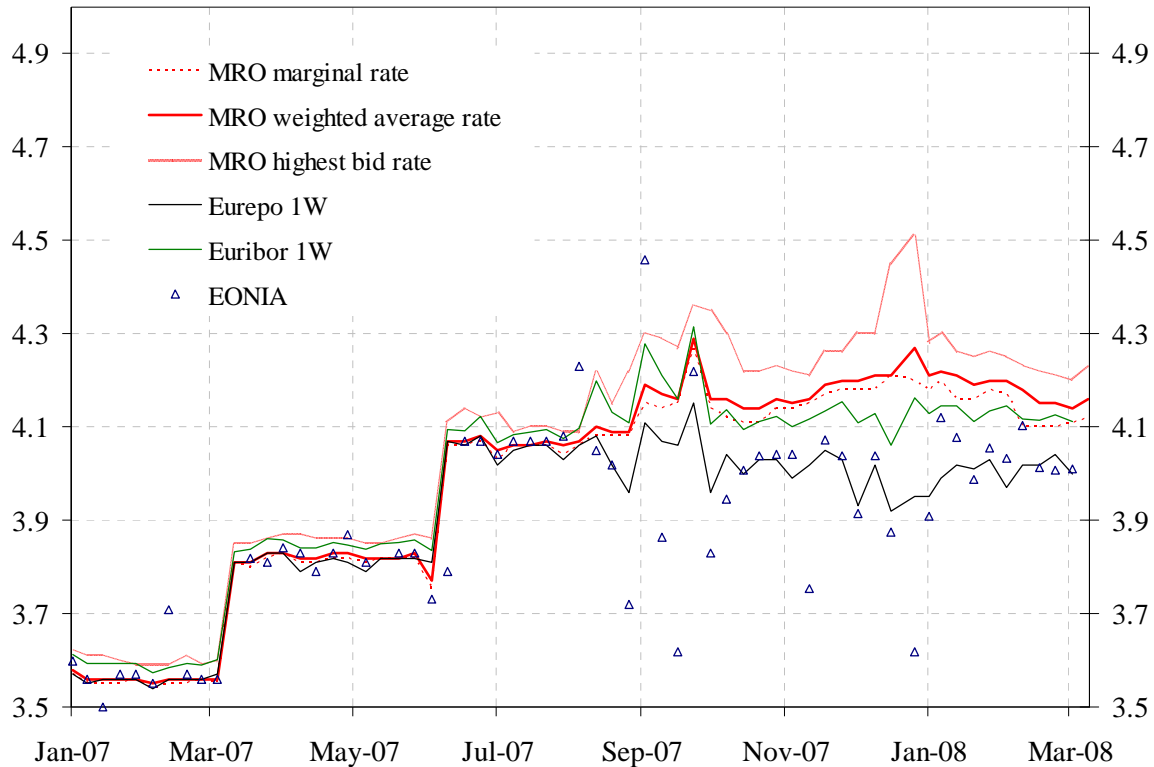
Such developments do not necessarily always represent an “adverse” selection: they may cause no problem to the central bank. But central banks do need to be aware of this potential impact of collateral choice.

### **Interest rate steering issues**

Collateral selection may also make interest-rate targeting more difficult, or change the impact of central banks’ liquidity management operations when market incentives change. The widening in the spread between short-term government repo rates, central bank policy rates, and overnight and term interbank (unsecured) rates has been seen in the dollar, euro (see Figure 7) and sterling markets. It raises the question of which market rate the central bank should target: secured or unsecured? If a repo rate, repo against which securities? If unsecured, the rate obtained by prime banks or the market average? The question goes well beyond collateral policy, but there is a collateral angle. If the outcome at central bank OMO—whether short-term or longer-term—is driven as much by collateral opportunity cost as by the central bank’s policy rate and expectations of future changes in the policy rate, the policy signal may be weakened. In times of stress, if the central bank were to accept only government securities, the likely premium on GC repo would depress rates artificially and make them a poor barometer for the market; but if it accepts a very wide range of collateral, the likely change in collateral mix will see the relationship between the policy rate and the outcome of OMO vary in an uncertain manner.

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<sup>58</sup> German securities backed by a pool of mortgage loans.

**Figure 7. Euro-area Widening of Spreads**

Source: European Banking Federation and ECB

#### IV. DYNAMIC MANAGEMENT OF A COLLATERAL FRAMEWORK

Collateral policies whose features have evolved in congruence with market developments—in terms of instruments commonly used for secured financing and in risk control measures (pricing, haircuts, valuations which are broadly in line with normal market conditions)—proved most useful to market participants in the recent market turmoil while at the same time limiting the increased exposure of central banks to loss. At the same time, however, systems that accept a wide variety of collateral place a burden on the central bank to frequently examine both the breadth and depth of its collateral pool, and the suitability of its pricing policy and risk mitigation measures, so that they are not materially out of line with secular market trends and normal practice. Broadening collateral eligibility without addressing these caveats risks distorting market outcomes and potentially entices the financial system to operate with less liquidity than is prudent. In this section we will try to outline what should be the features of a dynamic collateral framework aimed at meeting the needs of contingency environments, while minimizing the risks of negative side effects in a normal environment.

##### A. Merits of a Contra-cyclical Collateral Framework

The 2007-08 financial market crisis saw a deterioration in the quality of the collateral held by some central banks during the trough of the credit cycle. The fact that the central bank

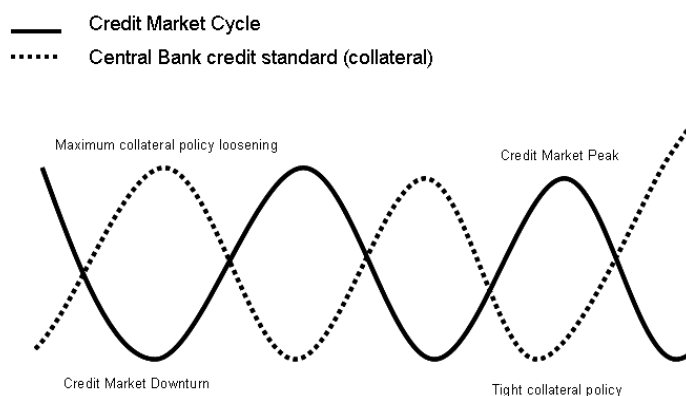
propensity to take risk is not aligned with the market's rising risk aversion in a time of crisis is in fact a highly desirable feature from a financial stability perspective. This can help to stem the excesses of the credit cycle, and provide some funding alternatives when conditions in the market become tight and build an illiquidity discount into some asset prices.

Beyond this, central banks' collateral frameworks could be amended in a contra-cyclical fashion, if central banks are to take on more risky collateral to offset the negative welfare effect of a general increase in risk aversion or an overshooting of the credit cycle. Indeed, it may be better for any substantial change in collateral accepted to be part of a controlled process, rather than purely left to the choice of commercial banks. The Fed's TAF and TSLF, and the BoE's SLS, offered liquidity against a broadly-defined basket of collateral with no price differentiation on the basis of the specific collateral offered; but these facilities are only available for as long as the central banks judge the particular market need to persist, and the pricing of the facilities themselves is intended to encourage the market to find alternatives.<sup>59</sup>

This contra-cyclicality can only be useful over time if neutrality is restored in normal times. Otherwise, central banks would increasingly ease their collateral requirements, and end up undermining public confidence in the soundness of their contingent balance sheet, potentially weakening trust in money. Increasingly loose collateral requirements would imply greater probability of losses in case of a banking crisis, and subsequently greater risks of a monetization of the losses. This could undermine the standing of the central bank, complicate monetary management and potentially impact negatively on inflation expectations.

This entails that the "desirable inertia" of collateral frameworks during the downturn of the credit and liquidity cycles should be offset, over time, by (re-)tightening standards in time of credit-risk appetite and liquidity-leverage propensity, as suggested in Figure 8 below.

**Figure 8. Countercyclical Collateral Framework**



Source: IMF

<sup>59</sup> "...several of the Federal Reserve's new programs are designed to be self-liquidating as markets improve. Minimum bid rates and collateral requirements have been set to be effective when markets are disrupted, but to make participation uneconomic when markets are functioning well." – Don Kohn, May 29, 2008.

Collateral enlargement decisions are well received at times of liquidity stress, whereas decisions to tighten will rarely be welcomed by the market. Moreover, the question of knowing how and when to tighten collateral policy in time of risk-seeking environments and liquidity leverage, or indeed to loosen in times of stress, is indeed delicate: central banks' decisions to exclude (include) some assets, or to harden (ease) risk management measures, could themselves contribute to a turning point in the cycle.

Central banks would not want to adjust collateral policy on a real-time basis, so that the collateral policy over time would not be a smooth curve but, rather, discrete shifts. However, there are trade-offs here too. At one extreme, the central bank could have “normal” collateral rules and “turmoil” rules; but switching to turmoil status would likely happen either too late, from the market’s point of view, or too early, possibly precipitating a crisis of confidence. At the other extreme, frequent changes, while being less noticeable, would be hard to justify and could easily become cumbersome for the market to manage.

Typically central banks do not target a particular collateral pool. The collateral is, after all, a side-product of the lending decision rather than a goal in itself. The central bank could monitor the pool of collateral actually used against the universe of eligible assets available;<sup>60</sup> a standard bias might confirm the success of a collateral policy design (e.g., if the central bank wants to encourage counterparts to use liquid assets); a trend or a sharp change might indicate changes in market pricing or preferences. Monitoring these biases real-time may help to prevent adverse selection at its onset rather than having to deal with it once the least creditworthy and liquid collateral has crowded-out better quality guarantees. The central bank might achieve a counter-cyclical collateral policy using administrative or market-based approaches, and be either active or passive—see Pricing section in part II.B.

### **B. Central Bank Balance Sheet and Collateral Intensity**

Another way to manage dynamically a collateral framework, while limiting the impact on relative asset prices, is to ensure that the collateral intensity stemming from the central bank collateral framework is appropriate. As discussed above, modern financial systems tend to be increasingly collateral intensive, because of the private use of collateral, and also because of the need to collateralize payment systems. All these legitimate collateral needs bring about the question of the size of central banks' monetary operations, and with it the question of the amount of reserve balances necessary for a smooth functioning of the system.

Central banks generally find it more convenient to run monetary policy in a liquidity deficit environment, although in practice many have to operate in a situation of structural surplus. For this reason those which start with a structural surplus often impose reserve requirements whenever the other liability items (predominantly bank notes in circulation) do not suffice to

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<sup>60</sup> This would include assets available in the market, rather than just those held by the commercial banks; but there are some difficult issues here. It is hard to measure nontradable collateral (e.g., loanbook assets) since the central bank may not know which loans meet eligibility criteria unless they are pledged to the central bank; and if foreign assets are eligible, the outstanding volume may be very large, but only a small amount may be available to the domestic financial system.

create a sufficient liquidity deficit, or whenever some asset side items (e.g., foreign exchange reserves) more than offset the liquidity deficit created by bank note circulation. Where reserve requirements are used in response to excess liquidity, they do not generate a collateral requirement. But for those operating with a structural deficit, imposing reserve requirements on top of an already large liquidity deficit will increase collateral intensity, and could increase the demand for reserve money toward a level that is not necessary from the strict standpoint of monetary control.

Although a cushion of central bank money (created by high and remunerated reserve requirements) stands out as a convenient risk-mitigation tool in time of crisis, central banks should aim at reducing the reserve money intensity of their system if the incremental demand for reserve money is creating strains on collateral use with no substantial offsetting benefits.<sup>61</sup> Ideally, a framework providing for a large collateral pool, featuring eligibility rules aimed at avoiding adverse selection, and showing some balance in terms of the size of its operations (reasonable reserve money intensity), would in principle limit the risk of market impact simply because collateral to be used for central bank operations would be a small proportion of the total pool. In a nutshell, a large collateral pool which is little used in normal times is more appropriate than large pools with high use, as it allows (i) a limitation of the market impact in normal environment; (ii) a rapid expansion of reserve money in case of crisis; and (iii) a collateral swap in the case of a liquidity crisis (provided the central bank holds or can access suitable collateral to swap).

### **C. The Case for Harmonized Collateral Frameworks**

The money market turmoil of 2007-08, and the subsequent emergency decisions by some central banks to expand the collateral pool, have highlighted the merit of broadening collateral pools toward well-rated securities denominated in other currencies (see section II.D). Large international banks generally manage their funding on a cross-currency consolidated basis, and the existence of very divergent collateral frameworks could bring about unnecessary complexities. On the other hand, some argue that they might also give such players straddling different marketplaces an unfair advantage relative to domestic-only players.<sup>62</sup>

Central banks can be mutually supportive in the use of cross-border collateral without harmonization: the ECB and SNB loans linked to the U.S.TAF are a good illustration of this. And there may be cases where central banks can support each other through local knowledge and access to particular settlement systems.

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<sup>61</sup> A system of averaging around zero (with full collateralization of any overdraft) may be operationally equivalent – from a liquidity management point of view - to averaging with a positive targeted level of reserves, but is less collateral intensive.

<sup>62</sup> The report published in January 2007 by a CPSS working group of the BIS noted: “Some forms of coordination and cooperation among central banks may increase the effectiveness of an individual central bank's policies and actions, or may aid the private sector in developing more advanced tools for managing collateral and liquidity...”

But there are clear limitations to developing harmonized frameworks. In some countries, they will be of most use to a small number of banks which have least need of greater access to capital; while time-zone and access constraints may make cross-border collateral too expensive to use in normal times. Moreover, there may be relatively few countries which could agree on a harmonized framework and collateral pool which would substantively expand the usable pool available to a large number of institutions. That is not to say harmonization is not worthwhile, simply that it will have limited benefits.

## V. CONCLUSIONS

- Liquidity carries a cost. There are benefits to socializing part of the cost—through central bank liquidity management, and back-up liquidity facilities—but it is important that market participants also have an incentive to recognize and bear some of the cost, through the way in which portfolios are structured.
- Some of the differences in approach to collateral policy appear to reflect different goals regarding targeted counterparties and the way in which liquidity is expected to be channeled in the markets.
- Ideally, collateral taken by a central bank as part of its OMO should not carry credit or liquidity risk, though it will inevitably carry some market risk.
- The majority of central banks, for a variety of reasons, extend the list of eligible collateral beyond domestic-currency denominated government (or central bank) securities and face trade-offs between minimizing additional risk (credit, liquidity, exchange rate, operational) and providing access to a sufficiently wide group of counterparties to allow the effective implementation of monetary policy and liquidity management.
- The incentives for adverse selection will change depending on market conditions. Central banks need to remain alert to such changes and the impact on the market's use of collateral.
- For many emerging market economies, where there is a structural surplus of liquidity, the availability of collateral does not at present cause a major constraint, though the knock-on effects of the 2007-08 market turmoil have given rise to problems in some. In coming years, it could potentially become an important issue for many.
- More work needs to be done to develop central bank pricing incentives to counterparties to hold good quality, liquid assets in normal times.
- More work needs to be done in the pricing and the collateral selection of emergency facilities—whether targeted at pressures facing an individual institution or, more particularly, pressures facing the markets more widely—in such a way that they can be used as intended, while motivating the market to revert to normal funding channels as soon as possible.

## Appendix 1. Collateral and the 2007-08 Market Turmoil

In the Eurosystem and the BoE cases, most banks which do not normally access OMO funds directly had the option of participating in the main or longer-term OMO, using the same collateral they would use for SF, although in practice very few additional participants were seen.<sup>63</sup> In contrast, in the case of the Fed, none of the SF counterparties (depository institutions) has Primary Dealer status and they cannot therefore participate in normal OMO (and vice versa) and might in any case not hold eligible collateral. The Fed brought its OMO and SF closer together by reducing the discount rate (its SF credit rate) spread over the Fed funds target to 50 basis points (bps) on August 17, 2007 and to 25bp on March 16, 2008. Use of this facility was notably higher than in the past from mid August to end September, and again during December 2007 and from mid-March 2008 onwards when the discount rate was relatively attractive compared to market alternatives.<sup>64</sup> A new facility for Primary Dealers - the Primary Dealers Facility (PDCF), approved by the FOMC on March 17—carried no historical associations of stigma, and was heavily used by Primary Dealers.<sup>65</sup>

The Federal Reserve traditionally distinguishes between SF, for which a very large pool of collateral is eligible, and OMOs, to which only a very restricted set of collateral was eligible prior to the Term Auction Facility (TAF). The penalty rate applied to Discount Window operations was the element of price discrimination between the narrow set of first quality collateral, and the broader pool of lower-rated and less liquid assets more normally held and deployed by the banks. The TAF blurred this traditional distinction, as it allows banks to bid in a bi-weekly auction at a single rate irrespective of the type of collateral used. This single pool of collateral for the TAF, outside of price discrimination, represents the only change to the Fed collateral policy since the beginning of the market turmoil.

The Term Security Lending Facility (TSLF) announced by the Fed on March 11, 2007 illustrates very specifically how asset-based operational tools can serve as a crisis management instrument once collateral broadening measures in traditional operations are running into balance sheet management constraints. The TSLF aimed at relieving the tensions in the mortgage-backed securities (MBS) markets. It was built on the existing security lending scheme of the Fed, but allows Primary Dealers to post Agency MBS, high-grade private label residential, commercial MBS, and other collateral in exchange for Treasury securities from the Fed's outright portfolio. As a result, the TSLF allows its users to substitute assets which have little market refinancing access against highly-liquid securities that will give them access to the repo market with a low refinancing rate. While neutral from the standpoint of reserve money provision, the TSLF provided significant relief to the market, because the amount of Treasury securities that the Fed is willing to lend represents a

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<sup>63</sup> In fact, the Eurosystem saw a reduction in the number of OMO participants in individual operations.

<sup>64</sup> Use of the SF peaked at \$2.25 billion and \$4.8 billion, respectively (on 27 December for the latter), compared with previous usage of up to \$0.5 billion.

<sup>65</sup> The end-of-year peak in Discount Window borrowing was dwarfed by the recourse to the PDCF in the last week of March 2008 (\$38 billion).



substantial proportion of the daily turnover in the repo market. The TSLF has been very effective at easing the tensions in the Treasury repo market, and at helping liquidity and good quality collateral-starved Primary Dealers to access the repo market.

As money-market term funding evaporated, many U.S. banks also had recourse to the Federal Home Loan Bank (FHLB) system. Banks could use mortgage assets to obtain term funding from FHLB system at a rate midway between the Fed funds rate and the discount rate, and without the perceived stigma of discount window borrowing. The assets, repackaged by the FHLB system, are eligible as OMO collateral. Thus, the market could access term funding at close to the Fed funds rate via FHLB repackaging, without the Fed having to change its collateral policy.

The **Eurosystem** has a very wide definition of acceptable collateral, and revised procedures (from 2007) have made it easier for banks to pledge nonsecuritized assets. Moreover, there is no distinction between OMO and SF collateral; and in principle any bank which can use SFs can also sign the documentation necessary to access OMO. Fine Tuning Operations (FTOs) are available only to a small number of counterparties; but the collateral pool is the same as for other operations. There was no need to revise collateral policy in order to broaden access to facilities. Instead, the Eurosystem altered the maturity balance of its operations, to provide more term funding to the market. The 3-month LTRO accounted for 40 percent of its lending in July 2007, and by early 2008 accounted for 60 percent.

The **BoE** makes no collateral distinction between OMO and SF.<sup>66</sup> The BoE was forced, in the rescue of Northern Rock, to accept collateral which fell outside its normal definition. This, in itself, is not uncommon (though a few central banks pre-define what collateral is acceptable in lender-of-last-resort operations); and it benefited from support from the Treasury. But the BoE subsequently chose also to accept a broader range of collateral in certain term operations. Four term repo auctions were held in late September and October, accepting a wider range of collateral (in particular, mortgages meeting certain requirements), with a minimum bid rate equal to the SF credit rate. But no bids were received at any of these auctions. In December, when term rates had jumped, ahead of the normal year-end tightening but also because of renewed concerns about the scale of losses facing some banks, the BoE broadened the range of collateral acceptable in its normal 3-month repo auction (which is priced at market rates), and with a T+3 settlement to accommodate the broader range of collateral. The two lists (see Appendix 4) compare the collateral accepted in the different operations; note that single-name corporate commercial paper is included in the first, but not in the second. These auctions met reasonable demand; the range of bids was initially wide, in some cases above the credit SF rate as, unusually, the 3-month OMO accepted some collateral not eligible for the SF.

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<sup>66</sup> With the exception, since December 2007, of the inclusion in its 3-month OMO of certain securitized assets which are not eligible in other operations.

The **BoC**, which has a split similar to the Fed's between OMO counterparties and a narrow range of collateral, and SF access to a broader group<sup>67</sup> with a broader definition of eligibility, expanded OMO collateral to include SF-eligible assets. With a narrow initial spread between its policy rate and the SF rate, reducing the relative cost of accessing the SF would have been difficult.

The **BoJ** has long operated with a very broad range of collateral, in particular after major revisions to its collateral framework in 2000-01. The breadth and nature of the collateral pool has been strongly influenced by lessons from both the episodes of financial fragility in the 1990s, and the Quantitative Easing Policy that followed. The Japanese market was not substantially impacted by the recent market turbulence, and no changes to collateral policy were needed.

The **RBA** has continuously widened the range of securities it accepts in repos over the past decade, and can implement discretionary collateral changes almost immediately. The broadening of its collateral pool in 2007 has therefore been partly viewed as a continuation of this trend, and represents a convergence with practices of other major central banks.

The **RBNZ** implemented temporary changes to limit further disruptions to its banking system liquidity stemming from the global market turbulence. These measures included an extension of the range of OMO-eligible securities (including certain RMBS and securities issued by state-owned enterprise and local authorities, among others). In addition, a graduated haircut regime replaced the existing limit structure for OMO securities. The discount margin applied in the overnight reverse repo facility was standardized at 50 basis points above the policy rate for all eligible securities and the maximum maturity was extended to 30 days (up from one day).

The **SNB's** collateral policy is very liberal in terms of the currencies accepted. It has continuously widened the range of eligible collateral, while maintaining stringent criteria with respect to minimum ratings (AA- for foreign denominated collateral). Some 96 percent of eligible collateral is denominated in a foreign currency—Euro, USD, pounds sterling, and Danish, Norwegian and Swedish kroner. The majority of the foreign-currency denominated collateral can also be mobilized with the respective central bank. The SNB collateral eligibility does not distinguish between OMO and SF. Although Swiss banks also experienced some pressures during the market turmoil, the SNB did not need to vary its collateral policy.

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<sup>67</sup> Unlike the Fed, OMO counterparties may also access SFs.

## Appendix 2. United States Collateral Framework

The Federal Reserve's collateral policy can be distilled down to four key principles: these are intended to serve as guidelines rather than absolutes.

- The Federal Reserve System (FRS) seeks control over its portfolio and the stock of money in the system, in order to reinforce its independence and the soundness of its assets.
- The FRS also seeks to execute its operations while minimizing the impact on credit allocation and asset prices.
- The portfolio should be liquid enough to conduct large operations quickly.
- Transparency and accountability are key priorities, which in the context of selecting eligible collateral means that the criteria should be based on objective and publicly available data, and not appear to favor any special interests.

The eligibility criteria must be consistent with the design of the operational framework. Various factors impact the FRS's eligibility criteria, including the size of operations, the number of counterparties, and the structure of the financial system. Since the FRS relies more heavily on its *permanent* operations (outright purchases of U.S. government securities) to supply funds to the banking sector, its *temporary* operations are fairly small compared to other major central banks. The smaller size means that the range of acceptable collateral can be fairly narrow. Similarly, since the FRS's open market operations (OMOs) are directed at a fairly limited number of counterparties (currently 18) whose balance sheets are fairly homogenous, the choice of collateral is also relatively conservative. The nature of the financial markets also impacts the eligibility criteria. Since U.S. capital markets are deep and liquid, the collateral choice is fairly homogenous for OMOs. For instance, the total outstanding amount of the three asset types that form the basis for the collateral accepted is roughly \$12 trillion, which is more than sufficient to cover the \$25 billion average outstanding temporary OMOs.<sup>68</sup> By contrast, the discount window provides access to as many as 7500 depository institutions, resulting in increased heterogeneity in the collateral accepted.

The FRS's operational set-up is consistent with its principles and eligibility criteria. Reflecting the FRS's emphasis on flexibility, short-term repos are conducted daily and tend to be overnight maturities, while longer-term repos, generally up to 14-day maturities, occur weekly. (As liquidity pressures began to build late last year, the FRS began to arrange longer-term repos more routinely in order to increase term liquidity.) By the same token, reflecting the FRS's market neutrality philosophy, there are no counterparty limits. OMOs, which are conducted in three separate tranches, are based on weighted average benchmark

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<sup>68</sup> Indeed, the \$4.4tn Treasury market would sufficiently meet liquidity needs, though a return to budget surpluses, which could lead to a scarcity of Treasuries, is part of the reason the FRS continues to accept agency debentures and agency-guaranteed MBS, in addition to Treasuries. While participation in these other markets may increase the FRS's credit risk, they also provide insights into market conditions that could not otherwise be achieved.

market prices collected from the dealers on each asset type. The FRS dealers select from bids across the three tranches according to the attractiveness of bids. With no counterparty or issuer limits, a single Primary Dealer may receive all of the funds disbursed in an entire auction.

In addition to its short-run temporary operations, the FRS responds to sustained increases in reserve demand by purchasing Treasuries (nominal and inflation-linked) in the secondary market. Investing exclusively in Treasuries reinforces independence of monetary policy by maintaining neutrality vis-à-vis the rest of government, while reducing credit risk. Similarly, the portfolio is managed in a way that allows the FRS to add and drain reserves quickly, while minimizing interest rate risk.

In contrast to its OMOs, the discount window (a standing facility) is intended to operate as a safety valve, complementing open market operations and providing liquidity to individual depository institutions under certain conditions. The discount window is authorized to lend to just about any depository institution against virtually any collateral in a bank's portfolio. The eligible collateral spans a wide range, including foreign-denominated securities, asset-backed securities, various types of nonmarketable assets, such as bank loans, commercial and residential real estate loans, consumer credit loans.<sup>69</sup> The lowest rating accepted by the discount window is investment grade (or a regulatory "pass" demarcation in the case of nonmarketable assets).<sup>70</sup> The discount window has three separate programs, including the primary credit, secondary credit (for troubled institutions) and seasonal credit programs, in addition to its emergency lending facility.<sup>71, 72</sup> Extending credit through the different

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<sup>69</sup> The Federal Reserve Act does not explicitly authorize the use of other collateral in repo transactions, but it also does not explicitly forbid it. Indeed, during the turn of the year in 2000, the Board of Governors authorized the New York Fed to write options in order to forestall problems.

<sup>70</sup> The major regulators rely on a loan classification that includes categories such as pass, substandard, doubtful, loss, and special mention. (For more information on this, see the federal financial examinations council at [www.ffiec.gov](http://www.ffiec.gov)). The FRS then converts the regulators' classification to its own two-tiered system. See footnote 79 for further details.

<sup>71</sup> Primary credit is extended (generally) without restrictions to institutions in sound condition for a term up to 30 days at a rate typically 100 bps above the policy rate (although in August 2007 the spread was narrowed to 50 bps due to market conditions, and to 25bp in March 2008). Secondary credit is available to financial institutions that are not eligible for primary credit, as a backup source of funding on a very short-term basis, or to facilitate an orderly resolution of serious financial difficulties. Such loans are extended at a rate above the primary credit program and entail a higher level of Reserve Bank administration and oversight than primary credit. The seasonal credit program is designed to address funding needs of smaller institutions experiencing regular swings in their deposits and loans. Only institutions with less than \$500 million in total domestic deposits are eligible. Borrowers must demonstrate a seasonal funding need that lasts for at least four weeks and meet a portion of their funding from market sources. The rate charged on seasonal credit is based on the average of the federal funds rate and the ninety-day certificate of deposit rate over the previous reserve maintenance period. For further details, see <http://www.frbdiscountwindow.org/programs>.

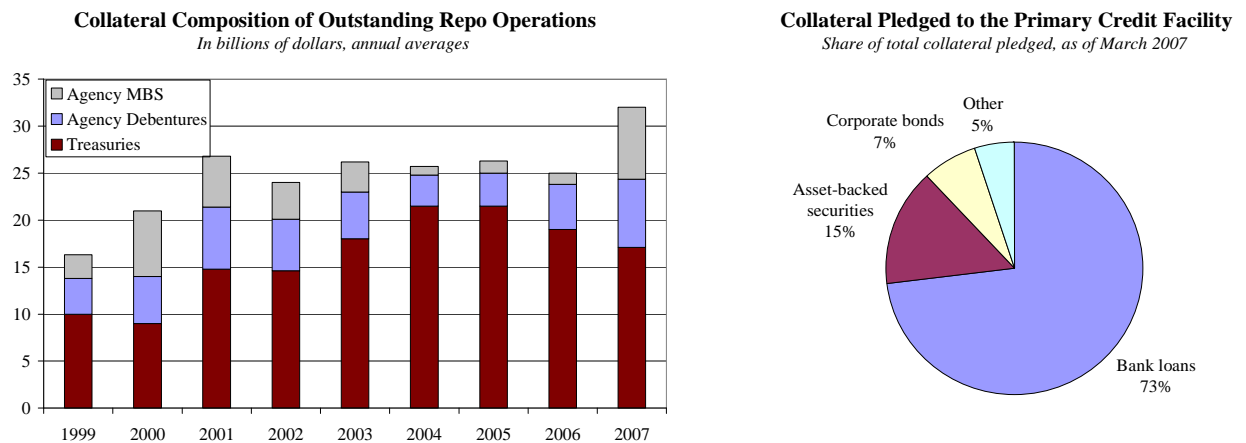
<sup>72</sup> The FRS is authorized to extend credit to individuals, partnerships, and corporations against Treasury and agency securities for up to 90 days under "unusual or exigent" circumstances. There are strong limitations to emergency lending: (1) they must be approved by at least five members of the Board of Governors, (2) they can only occur when no other market funding sources are available, and (3) failure to provide credit would have

(continued...)

programs is contingent on market conditions. For instance, during conditions of emergency lending, it might be appropriate to take on credit risk to prevent a contraction of liquidity.

Discount window loans generally fund only a small part of bank reserves, but are still an important tool for reserve adjustment. That said, the perceived stigma associated with the discount window means that it does not place an absolute upper bound on money-market rates, since some market participants are still willing to pay higher rates in the interbank market. The Term Auction Facility program temporarily set up to manage term funding pressures uses the Discount Window collateral pool, but has avoided the stigma associated with the Discount Window, in large part because it is structured as an OMO, at a market rate.

Figure 9. Federal Reserve: Repo Collateral      Figure 10. Federal Reserve: Primary Credit Facility Collateral



Source: Federal Reserve Bank

The composition of the FRS repo portfolio is weighted heavily toward Treasuries (Figure 9). In recent years, Treasuries on average accounted for about 80 percent of outstanding short- and long-term repos. This pattern continued to hold until late-2007, when strains appeared in short-term funding markets that resulted in more attractive propositions (and higher relative acceptance rates) against agency and MBS collateral tranches.

Despite the wide range of eligible collateral, bank loans account for the bulk of collateral pledged at the primary discount window (Figure 10). This is, in part, because loans comprise such a large share of counterparty balance sheets. In addition, the opportunity cost may be lower for pledging potentially illiquid loans versus more liquid and marketable securities.

In managing its credit risk, the FRS collateralizes loans, frequently assesses valuations, imposes haircuts and margins, and seeks to provide credit only to well-capitalized borrowers. In particular, the FRS carries out daily valuations of its repo operations (regardless of

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adverse effects on the economy. See Section 13(3) of the FRS Act for further details:  
<http://www.federalreserve.gov/GeneralInfo/fract/>.

maturity) using prices that are collected from private vendors.<sup>73</sup> Collateral submitted to the discount window is valued weekly from market prices (or in the case of nonmarketable collateral, the outstanding principal amount of assets plus a standard haircut). In the event of a downgrade in collateral to below investment grade, the FRS would ask the bank to either bring in additional collateral or call the loan back.

### **Haircuts**

In most cases, the FRS applies “haircuts” to compensate for credit, liquidity, and market risks.<sup>74</sup> Haircuts on repo operations are usually 1–5 percent, and vary at the discount window (Table 3). For nonmarketable assets, they are based on characteristics of the specific collateral, such as credit quality, interest rate, maturity, liquidity, etc. The FRS also has margin calls at its disposal, if the total value of a borrower’s collateral pool falls below the total borrowed.

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<sup>73</sup> For instance, a 14-day repo unwinds each business day, meaning that the cash and collateral swap places and the trade is rebooked on a daily basis. This is to ensure that the collateral is properly priced everyday, although it also makes the operations more burdensome for term repos.

<sup>74</sup> Haircut calculations are based on a combination of changes in asset prices from duration and convexity calculations, interest rate volatility, credit spread volatility, and liquidity differences between marketable and nonmarketable assets. The amounts are re-evaluated every 12-18 months, or more frequently, if warranted. For further details, see pp. 3-14 to 3-15 in [www.federalreserve.gov/BoardDocs/Surveys/soma/alt\\_instrmnts.pdf](http://www.federalreserve.gov/BoardDocs/Surveys/soma/alt_instrmnts.pdf).

Table 3. Federal Reserve Bank Collateral Haircuts

| Collateral Category  | Lendable Value for Securities or Instruments with Market Prices /1<br>(% of Market Value) |          |     | Lendable Value for Securities or Instruments if Market Price Not Available<br>(% of Par or Outstanding Balance) | Lendable Value for Loans Individually Deposited at FRS/7<br>(% of Market Value) | Lendable Value for Loans Not Individually Deposited at FRS/8<br>(% of Outstanding Balance) |
|--|---|----------|-----|---|---|--|
|  | Duration Buckets  |          |     |   |   |  |
|  | 0 to 5  | >5 to 10 | >10 |   |   |  |
| <b>U.S. Treasuries and Fully Guaranteed Agencies:</b>  |   |          |     |   |   |  |
| Bills, Notes, Bonds, Inflation Indexes   | 98%   | 97%      | 93% | 90%   |   |  |
| Zero Coupons, STRIPS   | 98%   | 95%      | 90% |   |   |  |
| <b>Government Sponsored Enterprises:</b>   |   |          |     |   |   |  |
| Bills, Notes, Bonds, Inflation Indexes   | 97%   | 96%      | 92% | 85%   |   |  |
| Zero Coupons, STRIPS   | 96%   | 94%      | 89% |   |   |  |
| <b>International Agencies:</b>   |   |          |     |   |   |  |
| Bills, Notes, Bonds - US Dollar Denominated  | 97%   | 95%      | 93% | 80%   |   |  |
| Bills, Notes, Bonds - AAA - Foreign Denominated /2   | 92%   | 90%      | 85% |   |   |  |
| Zero Coupons, STRIPS   | 94%   | 92%      | 86% |   |   |  |
| <b>Brady Bonds- US Dollar Denominated</b>  | 95%   | 92%      | 88% | 60%   |   |  |
| <b>Brady Bonds - Foreign Denominated /2</b>  | 90%   | 87%      | 83% |   |   |  |
| <b>Foreign Governments - US Dollar Denominated</b>   | 97%   | 95%      | 90% | 75%   |   |  |
| <b>Foreign Governments - Foreign Denominated /2</b>  | 92%   | 90%      | 85% |   |   |  |
| <b>Foreign Government Agencies - US Dollar Denominated</b>                                   | 97%   | 95%      | 90% | 75%   |   |  |
| <b>Foreign Government Agencies - AAA - Foreign Denominated/2</b>                             | 92%   | 90%      | 85% |   |   |  |
| <b>Municipal Bonds - US Dollar Denominated</b>   | 97%   | 95%      | 92% | 75%   |   |  |
| <b>Municipal Bonds - AAA - Foreign Denominated /2</b>  | 90%   | 85%      | 80% |   |   |  |
| <b>Corporate Bonds -US Dollar Denominated</b>  | 97%   | 95%      | 93% | 80%   |   |  |
| <b>Corporate Bonds - AAA -Foreign Denominated /2</b>   | 92%   | 90%      | 85% |   |   |  |
| <b>German Jumbo Pfandbriefe - AAA - US Dollar Denominated</b>                                | 96%   | 92%      | 90% | 60%   |   |  |
| <b>German Jumbo Pfandbriefe - AAA - Foreign Denominated/2</b>                                | 92%   | 90%      | 85% |   |   |  |
| <b>Asset-Backed Securities - AAA (includes Collateralized Loan and Debt Obligations)</b>     | 98%   | 96%      | 93% | 85%   |   |  |
| <b>Asset-Backed Securities - non AAA (excludes Collateralized Loan and Debt Obligations)</b> | 97%   | 95%      | 92% | 80%   |   |  |
| <b>Commercial Mortgage-Backed Securities - AAA</b>   | 97%   | 95%      | 92% | 80%   |   |  |
| <b>Mortgage Backed Securities (includes agency and private label)</b>                        | 98%   | 96%      | 93% | 90%   |   |  |
| <b>Collateralized Mortgage Obligations - AAA (includes agency and private label)</b>         | 97%   | 95%      | 92% | 80%   |   |  |
| <b>Trust Preferred Securities</b>  | 94%   | 92%      | 90% | 70%   |   |  |
| <b>Mutual Funds (tcuux, tcudx, tcuxx) /5 /6</b>  |   | 90%      |     |   |   |  |
| <b>Government Sponsored Enterprise Stock (FNMA, FHLM) /6</b>                                 |   | 87%      |     |   |   |  |
| <b>Bankers Acceptances, Certificates of Deposit, and Commercial Paper</b>                    |   | 97%      |     | 95%   |   |  |
| <b>Commercial and Agricultural Loans:</b>  |   |          |     |   |   |  |
| Minimal Risk Rated /3  |   |          |     |   | 90%   | 80%  |
| Normal Risk Rated /4   |   |          |     |   | 87%   | 75%  |
| <b>Agency Guaranteed Loans</b>   |   |          |     |   | 93%   | 90%  |
| <b>Commercial Real Estate Loans</b>  |   |          |     |   | 87%   | 75%  |
| <b>Construction Real Estate Loans</b>  |   |          |     |   | 87%   | 75%  |
| <b>1-4 Family Residential Mortgages</b>  |   |          |     |   | 91%   | 85%  |
| <b>Home Equity</b>   |   |          |     |   | 89%   | 85%  |
| <b>Consumer Loans- Autos, Private Banking, Installment, Etc.</b>                             |   |          |     |   | 87%   | 80%  |
| <b>Consumer Loans- Credit Card Receivables, Student Loans</b>                                |   |          |     |   |   | 75%  |
| <b>Consumer Loans - SubPrime Credit Card Receivables</b>                                     |   |          |     |   |   | 60%  |

Source: Federal Reserve Bank

In terms of its counterparty risk assessment, the FRS regularly monitors its counterparties. To do so, it tracks capital ratios, supervisory exam ratings, and other regulatory information, much of which is available in automated systems.<sup>75</sup> Moreover, discount window officers and other staff typically maintain close contacts with other federal and state supervisors to exchange information that may not be reflected in the databases. Monitoring the financial well-being of potential and actual borrowers is important not just for risk management, but there are also legal restrictions. After the S&L crisis in the late 1990s, legislation was passed

<sup>75</sup> See [www.ffiec.gov](http://www.ffiec.gov) for further details.

that made it more difficult for troubled banks to access credit at the FRS's primary credit facility.<sup>76</sup> Now that banks' capital ratios are under pressure, the FRS will likely face critical decisions about providing credit to troubled banks, possibly increasing access at a much earlier stage than in the past.

### **Assessment of customer loans**

The process for assessing customer loans is similar to marketable collateral. As with any other collateral, an institution requesting funds from the discount window must have a reserve account. The borrower first initiates the request through their respective reserve bank, describes the nature of the funding shortfall, and indicates the amount and duration of the loan required. Then the discount officer determines whether the borrower has exhausted all reasonably available alternative sources of funds, and if so, then the bank proceeds with filing paperwork for the qualified loan review and internal risk rating, which the FRS then maps to its own risk rating system.<sup>77</sup> Even if a loan is rated by the major ratings agencies, the FRS relies on the pledging bank's internal risk ratings for commercial loans when converting to its own rating scale.

Once the institution has passed the qualified loan review, the FRS determines whether the collateral is acceptable. There is no minimum amount that is required to be pledged on bank loans, as is also the case for other types of collateral. In addition to having an acceptable risk rating, the loan must not be delinquent for more than 30 days and not be in arrears. Complex loan types may need further analysis and prior approval by a FRS Bank. The loans must be owned by the pledging institution. If the pledging bank did not originate the assets, they must be assigned. Many institutions that anticipate a periodic need to borrow often maintain a pool of collateral earmarked to secure discount window loans. This helps to reduce the amount of time to assess a borrower's collateral, which can then normally be completed the same day (longer in the case of more complex loans).

Once the collateral has been approved, the FRS then assigns a collateral value, taking into account margin specifications. Haircuts are up to 40 percent on consumer credit loans and 10-20 percent on bank loans, depending on whether the loan documentation is deposited at the FRS. The value will be based on several factors, including the timeliness of the collateral schedule submission, the outcome of on-site inspections, and industry-wide factors.

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<sup>76</sup> For details on the Federal Reserve's indemnity agreement with the FDIC, see *Federal Deposit Insurance Corporation Improvement Act of 1991* and James Clouse, "Recent Developments in Discount Window Policy," *Federal Reserve Bulletin*, November 1994.

<sup>77</sup> The FRS utilizes a system shared by most of the major regulators. Within the immediate domain of the Discount/Credit Risk part of the FRS System, a two-tier rating system is used, which classifies commercial loans as "normal risk" (loans rated B to BBB-) and "minimal risk" (loans rated BBB- and higher). Within each risk category, assets are categorized by maturity and a standard haircut is then applied to the book value of all assets in each risk and maturity category.



Then, once the loan is approved, an institution typically submits a promissory note through the borrower-in-custody program, which is reserved for institutions that prefer to maintain physical control of their loans or for pledges with a high volume of assets. It is the main way that banks pledge loans to the FRS, which allows banks in good standing to hold loans on their premises. Generally, secondary credit banks may not qualify to hold loans in an offsite arrangement.

Finally, confirmation occurs instantaneously, and the discount officer continues to monitor the collateral on a weekly or monthly basis, tracking such summary measures as discount window loans as a percentage of deposits and of reserves, and duration and frequency of past borrowing. Special attention is paid to efforts to obtain credit elsewhere. Many banks are able to view their collateral statements online through an application the New York Fed provides. There is a weekly or monthly collateral schedule, and the update generally takes place via fax, email or other electronic means (CD ROM).

### **Appendix 3. The Eurosystem Collateral Framework—Bank Loans**

The Eurosystem collateral framework includes a wide range of eligible assets, in order to support the smooth functioning of payment systems and ensure equal access of counterparties irrespective of their size and location to Eurosystem operations. With the replacement of the former two-tier collateral system with a single list of collateral in January 2007, the list of eligible assets has been expanded to include foreign marketable securities issued in euros by non-EEA G10 residents and nonmarketable collateral (bank loans) throughout the euro area. The possibility of using bank loans as collateral has thereby been given equal status to nonmarketable collateral and extended to all Eurosystem countries, while it was only available in a few countries (France, Germany, Austria, and Spain) in the former tier two list of collateral.

The inclusion of bank loans in the framework of eligible collateral involves a number of challenges that need to be overcome: lack of standardized documentation, scarcity of external credit ratings and absence of a secondary market. Credit claims are also more complex than marketable securities in legal as well as administrative terms. Specific safeguards and assessment procedures were needed to ensure the safety of using bank loans as collateral and to guarantee the Eurosystem ability to seize and realize the claims in the event of a counterparty default without being encumbered by restrictions or delays. Those NCBs that did not accept bank loans previously have taken different approaches to the transitional period, which lasts until 2012.<sup>78</sup>

#### **The rationale for accepting bank loans as collateral**

The design of the Eurosystem operational framework is very “collateral intensive” as all Eurosystem operations (including intraday credit) should be based on adequate collateral, while being equally accessible to a range of about 2,000 potential counterparties. Three hundred to 500 counterparties are regular participants in Eurosystem OMOs, and up to 1,700 counterparties are eligible, while Fed and BoE OMOs include a much smaller number of Primary Dealers/counterparties. The set of eligible counterparties for standing facilities is even broader (2,400 credit institutions) as some operational requirements of OMOs (such as the need for a direct account in the RTGS system) are lifted. To collateralize their operations, most NCBs rely on a single pre-deposited pool of collateral which is identical regardless of the type of operation;<sup>79</sup> the interest rate charged to counterparties is determined by the type of operation, not by the type of collateral used.

The possibility of restricting eligibility to duly marketable collateral was explored, but did not provide an adequate solution to fast growing collateral needs. The Eurosystem already

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<sup>78</sup> The first discussions as to whether and how bank loans could be accepted throughout the Eurosystem were held in 2002. Although all NCBs were ready in January 2007 to take bank loans, some do it only under fairly restrictive terms (e.g., a minimum size of 2 million euros) and will not shift to a broad-based acceptance until 2012.

<sup>79</sup> Note however that some countries also use an earmarking system, whereby individual underlying assets are associated with individual transactions.

accepts a very extensive range of marketable assets as collateral, including government securities, corporate bonds, covered bonds, MBS/ABS and some foreign securities.<sup>80</sup> The securitization of loans as an alternative to accepting bank loans was considered but this technique was not sufficiently widespread in Europe to support alone the expansion of the collateral list.<sup>81</sup> Due to the prevalence of bank-based financing (traditional financial intermediation) over market-based financing, bank loans were the single most important asset class on the balance sheets of euro-area banks. Given the current heterogeneity in the euro-area financial structures, financial market development and different legal frameworks, it is more difficult for the Eurosystem to steer the type of assets banks choose to hold on their balance sheets.

The acceptance of bank loans resulted in a more flexible collateral framework that adapts dynamically to financial market developments and to episodes of stress. A wide list of collateral reduces the need for extraordinary discretionary measures and promotes the principle of continuity. Drawbacks, however, include the relative complexity of the framework, a significant amount of resources dedicated to collateral assessment and management, and the emergence of a downward drift in the quality of collateral posted.

### **Bank loan eligibility criteria: what are the specifics?**

Bank loans are eligible for use in all Eurosystem operations (payment systems, OMOs and standing facilities) at the same rate as marketable assets. The details regarding the eligibility of bank loans (summarized in Table 4, below) are laid down in chapter 6 of the General Documentation on Eurosystem monetary policy instruments and procedures, available on the ECB website ([www.ecb.int/pub/pdf/other/pp75-87\\_mb200605en.pdf](http://www.ecb.int/pub/pdf/other/pp75-87_mb200605en.pdf)).

**Table 4. Eurosystem: Summary of Bank Loan Eligibility Criteria**

|                               |   |
|-------------------------------|---|
| Eligible claim                | Credit claim excluding overdraft, letters of credit, undrawn credit lines |
| Eligible debtor               | Nonfinancial corporation, Public Sector Entity                            |
| Minimum size of claim         | Until 2011 : choice of NCB<br>2012 and beyond: 500,000 EUR                |
| Debtor creditworthiness       | Minimum rating of A or equivalent   |
| Currency of denomination      | Euro  |
| Debtor location               | Euro area   |
| Maturity of claim             | No minimum or maximum   |
| Additional legal requirements | No restriction on transferability and realisation                         |
| Additional checks             | Existence checks, close financial links                                   |

Source: ECB

<sup>80</sup> Equities were—unusually—also eligible in Spain, but were eventually phased out in 2005 due to very low use.

<sup>81</sup> In addition, ABS/MBS raise other challenges in terms of valuation and complexity.

For efficiency reasons, the Eurosystem decided to impose a minimum size for bank loan eligibility of 500,000 EUR, thus alleviating the burden of assessing the smallest debtors. This threshold is already effective for the cross-border use of loans and will be effective in 2012 for the domestic use. In the meantime, some NCBs have chosen to apply a significantly higher minimum size (up to 2 million euros) to facilitate the phasing-in of bank loans, while other NCBs still apply no or low minimum size because of their legacy use of bank loans in the context of the two-tier system.

In turn, the criteria related to the type of debtor and the maturity were relaxed, increasing significantly the amount of eligible bank loans. Whereas prior to the Single List, debtors were required to be enterprises, eligibility has been extended to loans to Public Sector Entities (municipalities, local and regional government) which are easily assessed and are generally large in size. The requirement of a residual maturity no longer than two years (initially aimed at limiting the risk in case the central bank has to hold the loan until maturity) was also dropped.

Additional legal requirements are applicable to bank loans, including the absence of restrictions on the mobilization of the credit claim, and the absence of restrictions on its realization.<sup>82</sup> These provisions are necessary to protect the central bank as the use of bank loans as collateral is done under a pledge or an assignment, depending on the countries, and therefore does not entail the transfer of ownership of the claim. In some Eurosystem countries, NCBs have an unconditional preferential right in case of default of the counterparty allowing them to sell the bank loan, without consulting the counterparty or involving the courts.

The Eurosystem has devised a framework for checks on the existence on bank loans, implying a close coordination with banking supervisors. The framework, laid down in annex 7 of the General Documentation, relies on three minimum requirements: a one-off systematic on-site inspection to verify the procedures used by the counterparty, regular random checks and quarterly self-certification by the counterparty. The NCBs may resort to additional means for checking existence, such as the use of credit registries where they are available.

In the case of counterparty default, NCBs may use either bilateral procedures or an auction to realize the credit claim. Some NCBs have agreed ex-ante with their counterparties the modalities under which such an auction would take place. The NCB may also hold the loan until maturity if appropriate.

### **Specific credit assessment framework for bank loans**

Most bank loan debtors are not rated by international rating agencies, implying a need to resort to alternative credit assessment methods. To this end, the Eurosystem takes into account credit assessment information belonging to one of four sources: external credit assessment institutions (ECAIs), counterparties' internal ratings-based (IRB) systems, third-

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<sup>82</sup> For more details, see annex 7 of the General Documentation.

party providers' rating tools (RTs)<sup>83</sup> and NCBs' in-house credit assessment systems (ICASs). The minimum rating threshold is set at "single A" or equivalent.<sup>84</sup>

Those NCBs that have a tradition of using bank loans mainly rely on their in-house systems. These are generally resource intensive, but favor a broad use of bank loans. In France for instance, 120 regional branches of BdF are in charge of rating all enterprises with a turnover higher than 0.75 million euros or bank loans outstanding of more than 0.38 million euros, i.e., up to 5 million enterprises as at end 2007. In turn, bank loans represented 60 percent of the collateral used in France for Eurosystem operations in 2007.

The other NCBs rely on third-party assessments (with appropriate checks). It is foreseen in the future that internal ratings of banks (IRBs) will be used once they have been approved by supervisors in the context of Basle II implementation. There has been no practice so far as Basle II has come into force only early 2008. The Eurosystem has developed new rules for assessing Public Sector Entities (PSEs) by benchmarking against the sovereign rating according to the rules laid down in the CRD (Capital Requirement Directive). These rules have been used extensively by counterparties in 2007 for obtaining 67 billion euros of new credit against bank loans of PSEs, i.e., half of the total credit obtained against bank loans.

Since multiple sources are used, the Eurosystem laid down a set of rules to ensure comparability between the quality of different sources and avoid rating arbitrage. No pre-defined ranking is applied between the sources,<sup>85</sup> but each counterparty specifies a principal source of credit assessment, and has to stick to it for at least one year. The performance of the different sources is subject to continuous monitoring, as well as a yearly review assessing whether the observed default rate at a one-year horizon is in line with a maximum probability of default of 0.10 percent. In case of noncompliance, a procedure of correction of the accepted probability of default threshold for the noncompliant system is foreseen as a sanction.

### **Bank loan risk control framework**

Valuations are based either on face value or preferably on present value. Since valuation at face value is a simplified approach which is likely to significantly overvalue bank loans' net present value, the haircuts applied are higher in this case than for loans valued at present value.

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<sup>83</sup> RTs have been developed by the three main rating agencies (Moody's, S&P, Fitch) and are based on country specific tested quantitative models. They are not in use for assessing bank loan debtors as they have not been validated yet by the Eurosystem.

<sup>84</sup> Defined as corresponding to a probability of default no higher than 0.10 percent over a one-year horizon.

<sup>85</sup> There was however, a heated debate in the preparation phase as to whether international rating agencies ratings should take precedence over all other rating sources.

Because bank loans entail additional liquidity risk, the lowest haircut for bank loans has been set higher than the highest haircut for marketable collateral. Haircuts are derived from model-based calculations factoring the time to realization (liquidity risk) and whenever appropriate interest rate risk (fixed-rate loans). The haircut schedule ranges from 7 to 41 percent, depending on the valuation method, the type of interest rate (floating vs. fixed), and the residual maturity of the loan (Table 5). The level of haircuts is subject to a regular yearly review where haircuts may be adjusted depending on the outlook for interest rates and the changes in liquidity conditions.

**Table 5. Eurosystem: Haircut Schedule for Nonmarketable Collateral**  
(in percent)

| Residual Maturity (years) | Variable rate | Fixed rate and valuation at present value | Fixed rate and valuation at face value |
|---------------------------|---------------|---|--|
| 0-1                       | 7%            | 7%  | 9%                                     |
| 1-3                       |               | 9%  | 15%                                    |
| 3-5                       |               | 11%                                       | 20%                                    |
| 5-7                       |               | 12%                                       | 24%                                    |
| 7-10                      |               | 13%                                       | 29%                                    |
| >10                       |               | 17%                                       | 41%                                    |

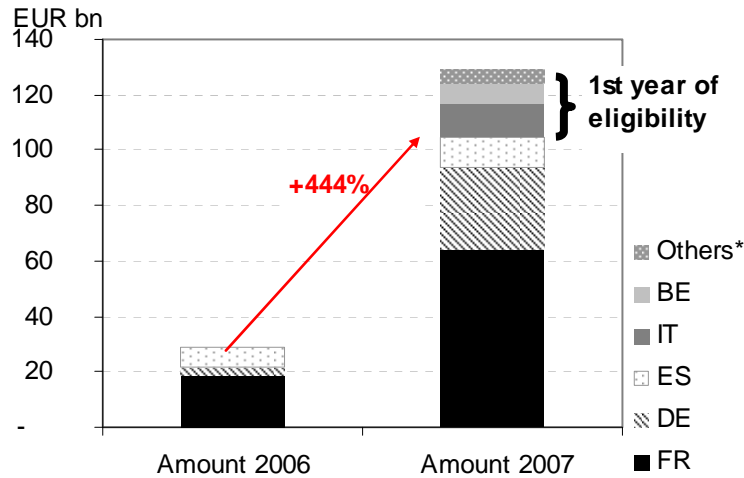
Source: ECB

Limits by counterparty or by debtor for the use of bank loans may in principle be applied, but they are not used by the Eurosystem at the current juncture. In some countries, bank loans may thus represent a large chunk of the collateral used (60 percent in France). While the absence of limits favors operational simplicity and equal access, it may be conducive to a gradual worsening of the liquidity and the quality of the collateral pool. Close financial links between the debtor and the counterparty are prohibited, and comprehensive checks are carried out to the extent possible. These checks, while they might be resource consuming, are necessary to ensure the effectiveness of the collateralization procedure, i.e., to avoid correlation between the risk of the debtor and the risk of the counterparty.

#### **Use of bank loans as collateral in 2007 and the impact of the turmoil**

Before the implementation of the Single List, the intensity of the use of bank loans was very diverse among the countries that accepted them. This diversity persists after the Single List but their use has significantly increased in all countries. From 2006 to 2007, the use has increased by 444 percent, from 29 to 130 billion euros (Figure 11). In countries where bank loans were used for the first time, they provided 5 billion euros of credit to counterparties, the bulk of credit still corresponding to countries where the use of bank loans was already well developed before 2007.

**Figure 11. Eurosystem Use of Bank Loans by Country before and after the Single List**



BE: Belgium; IT: Italy; ES: Spain; DE: Germany; FR: France; Others: also includes Austria, as the use is low in this country, despite the fact that bank loans have been accepted for collateral for a long time.

Source: ECB

The intensity of the use of bank loans depends primarily on the coverage of the in-house credit assessment system and the level of automation of the handling procedure. France and Germany, where the use is the highest, rate a high number of debtors and offer a proprietary system allowing the automation of bank loan handling. The degree of availability of alternative low-opportunity cost collateral, such as ABS or bank bonds, may also play a role. Among the countries that have used bank loans for the first time in 2007, the high use in Italy and Belgium is primarily explained by the pledging of loans of PSEs.<sup>86</sup>

The effects of the financial turmoil on Eurosystem collateral composition mainly consisted in an increase in the use of low opportunity-cost collateral such as bank loans and, most notably, ABS which had become illiquid in the private market. For bank loans, it is, however, delicate to disentangle precisely the effects of the turmoil from the expansion related to the implementation of the Single List. These developments have been mirrored by a sharp fall in the use of government bonds, which counterparties could use more effectively in the private market, as this was the only asset class that remained widely accepted as collateral in the market throughout the crisis.

<sup>86</sup> Italy and Belgium are the countries with the highest level of public debt as a percentage of GDP in Europe.

## **Appendix 4. United Kingdom Collateral Framework**

The collateral approach of the Bank of England focuses on high credit-quality, traded securities in order to protect the central bank against credit risk, liquidity risk and pricing risk (good market prices for well-traded securities should be readily available). A range of currencies are acceptable; and assets can be located in other jurisdictions, notably the European Economic Area (EEA, predominantly EU countries), the USA, Canada and Japan. As a rule, no distinction is drawn between securities eligible for OMO and for the credit standing facility (with the exception, since December 2007, of the 3 month OMO). The legal mechanism used for taking collateral is that of repo. Sovereign and supranational securities are subject to the requirement that the issuer be rated Aa3 (on Moody's scale) or higher by two or more of the ratings agencies (Moody's, Standard and Poor's, and Fitch).

Full information is available on the Bank of England's website at <http://www.bankofengland.co.uk/markets/money/eligiblesecurities.htm>.

Concentration limits apply to the use of securities issued by any particular group. Box 4 below is taken from the Bank of England's Operational Procedures (August 3, 2007).

### **Response to market pressure**

In response to the market turmoil from August 2007, the Bank of England announced (September 21) additions to the collateral list, for the purpose of three-month OMOs with a minimum rate set at that of the credit standing facility rate. In the event, no bids were received at the four auctions using these conditions: this may have reflected the cost. Subsequently, the collateral pool acceptable for the Bank of England's normal 3-month repo auctions from December 2007 was widened, but not as far as for the auctions offered in September and October. The two lists below (Box 5 below, and Table 6 for margin requirements) compare the collateral accepted in the different operations; note that single-name corporate commercial paper is included in the first, but not in the second. Auctions with the expanded collateral list met reasonable demand. The first allotted credit at interest rates up to 110bp above the prevailing policy rate, the maximum spread reducing at subsequent auctions.



#### Box 4. Bank of England Concentration Limits

(i) There is a limit on the amount, by Market Value, of securities from a single issuer (excluding HM Government and the Bank of England) that a Participant can use as collateral with the Bank at any one time. Such securities are only eligible if they fall within the limit.

(ii) If, at any time, the total securities provided by a single OMO Participant or CHAPS sterling settlement bank as collateral in OMOs (including both repos and Swap Transactions) and RTGS exceeds £1 billion, the institution must ensure that the securities of any single issuer (other than HM Government and the Bank of England) comprise no more than 25 percent by Market Value of the total securities delivered to the Bank. For CHAPS settlement banks that are also OMO Participants, two tests will therefore apply – first, to outstanding OMO securities (repo and Swap Transactions) held overnight and second, to the sum of outstanding RTGS and OMO securities held intra-day.

(iii) Also, in the case where an OMO Participant and a CHAPS sterling settlement bank are separate legal entities but members of the same group, the £1 billion threshold applies to the total value of all securities provided to the Bank by the two of them, in both OMO transactions (including fine tuning OMOs and long-term repos) and RTGS intra-day loans. Where the £1 billion threshold is exceeded, the OMO Participant and the CHAPS sterling settlement bank must each ensure that the total value of the securities of any single issuer (other than HM Government and the Bank of England) comprises no more than 25 percent of the total value of all securities provided by it alone.

(iv) The £1 billion threshold and the 25 percent limit are not applied to securities provided in the standing lending facility.

(v) The threshold and limit may be varied at the Bank's discretion.

(vi) The Bank conducts regular checks to monitor compliance with the 25 percent limit, and endeavors to inform Participants concerned of any breaches as soon as possible, but it is the responsibility of Participants to monitor and adhere to the concentration limit.

(vii) In the event of an OMO Participant's holdings of a particular issuer's securities exceeding the limit, the Participant must take immediate steps to rectify the situation. Any breach of the limit would attract a collateral interest charge on the Market Value of the securities over the 25 percent limit, at a rate equal to twice Bank Rate. The charge will be calculated from the day on which the breach first occurs up to (but not including) the day on which it is rectified. Any breach for a period of a day, or less than a day, will attract an interest charge for one day. Such interest charges are payable on demand. (The treatment of breaches of the limit in RTGS by CHAPS settlement banks is described in the RTGS Reference Manual.)

### Box 5. Bank of England Rules for Extended Collateral in 3-month OMOs

#### September-October , 2007—Special 3-month repo

Purchased securities may consist of marketable debt securities of the following types, in addition to securities that are currently eligible in the Bank's open market operations and standing facilities, as published on the Bank's website:

- Bonds issued by G10 or EEA sovereigns rated BBB/Baa or higher.
- Debt issued by government-guaranteed agencies rated A-/A3 or higher and located in G10 or EEA countries.
- Debt security issues of the Federal Home Loan Mortgage Corporation, the Federal National Mortgage Association and the Federal Home Loan Banking system.
- AAA tranches of U.K. , U.S. and EEA asset-backed securities (ABS) backed by credit cards; and tranches of U.K. and EEA residential mortgage-backed securities (RMBS) rated AA-/Aa3 or higher.
- UK and EEA covered bonds rated AAA. The issuer may not be part of the same Group as the institution entering into the repo.
- Single-name corporate commercial paper (CP) and senior corporate bonds rated A+/A1 or higher.

Securities must be denominated in sterling, euro, U.S. dollars, Australian dollars, Canadian dollars, Swedish krona, Swiss francs, and, in the case of Japanese Government Bonds only, yen.

Credit ratings as set out above or their equivalent must have been provided by two or more of Fitch, Moody's and Standard and Poor's.

#### December 2007 onwards: widening of collateral acceptable at normal 3-month repo auction

In the case of three-month repos, eligible collateral securities will consist, in addition to the securities routinely eligible in the Bank's OMOs and standing facilities as published on the Bank's website, of the following:

- Bonds issued by G10 sovereigns rated Aa3/AA- or higher (in addition to those currently eligible), subject to any settlement constraints.
- Bonds issued by G10 government agencies explicitly guaranteed by national governments, rated AAA.
- Conventional debt security issues of the Federal Home Loan Mortgage Corporation, the Federal National Mortgage Corporation and the Federal Home Loan Banking system, rated AAA.
- AAA-rated tranches of U.K. , U.S. and EEA asset-backed securities (ABS) backed by credit cards; and AAA-rated tranches of U.K. and EEA prime residential mortgage-backed securities (RMBS). Un-listed ABS and RMBS will not be eligible. The assets underlying ABS and RMBS must be cash, not synthetic.
- UK and EEA covered bonds rated AAA. The underlying assets may be either public sector debt or mortgages. Own-name covered bonds will be accepted.

Securities may be denominated in sterling, euro, U.S. dollars, Australian dollars, Canadian dollars, Swedish krona, and Swiss francs and, in the case of Japanese Government Bonds only, yen.

Credit ratings as set out above or their equivalent must have been provided by two or more of Fitch, Moody's and Standard and Poor's.

**Table 6. Margin Ratios for Wider Collateral Pool**

|   | Sovereign paper  | Government guaranteed agencies | US GSEs | Covered bonds | Credit card ABS | UK & EEA RMSB |
|---|------------------|--------------------------------|---------|---------------|-----------------|---------------|
| Credit rating   | Aa3/AA-or higher | AAA                            | AAA     | AAA           | AAA own-name    | AAA           |
| Floating rate/Fixed interest rate under 3 years to maturity | 1.010            | 1.03                           | 1.03    | 1.04          | 1.08            | 1.04          |
| Fixed interest rate 3-5 years to maturity                   | 1.015            | 1.04                           | 1.04    | 1.06          | 1.12            | 1.06          |
| Fixed interest rate, 5-10 years maturity                    | 1.030            | 1.08                           | 1.08    | 1.12          | 1.24            | 1.12          |
| Fixed interest rate, 10-30 years maturity                   | 1.055            | 1.16                           | 1.16    | 1.22          | 1.44            | 1.22          |

Additional notes: An additional 0.03 is added to margin ratios to allow for currency risk when securities are non-sterling.

Note on calculation: adjusted collateral value (post-haircut) = collateral value/margin ratio.

Source: Bank of England.

In the term auctions which the BoE held in September and October, provision was made to allow banks to use a portfolio of residential mortgages. No funds were provided in these auctions in the event, and the extension of the collateral pool to these assets was not continued, so that in practice it was never used. Nevertheless, some detail is included below (Box 6), as other central banks considering the use of residential mortgage portfolios may find the risk mitigation features to be of use.

#### Box 6: Bank of England Arrangements for Loans Secured Against Mortgages

##### Criteria for eligible mortgages

The Bank will lend against security in the form of prime U.K. residential mortgage loans. The mortgages must meet the following criteria:

- All mortgage loans must be denominated in sterling.
- The loan to value ratio (LTV), taking into account amounts originally advanced as increased or decreased from time to time shall be not greater than 95 percent.
- The mortgage portfolio charged to the Bank must have a weighted average LTV of 75 percent or less.
- A mortgage loan must not be in arrears of more than 2 months.
- All mortgage loans, and the mortgage portfolio collectively, should be seasoned (i.e., each mortgage loan must be older than 12 months, and the mortgage portfolio collectively must have an average seasoning of at least 24 months).

These criteria apply at inception and on a continuing basis.

### Appendix 5. Risk Control Measures (as of May 2008)

|                            | Federal Reserve Bank  | European Central Bank   | Bank of England   |
|----------------------------|---|---|---|
| <b>Haircuts</b>            |   |   |   |
| Range                      | Possibly 1-5 percent for OMO collateral; 2-40 percent on discount window collateral; haircuts available upon request for TSLF and PDCF; discount window haircuts apply for TAF  | 0.5-25 percent for marketable assets; 7-41 percent for nonmarketable assets; 17 percent margin to cover foreign exchange risk for TAF-related cross-currency swaps  | 0.5-10 percent for regular OMOs; 1-17 percent for 3-month term auctions; up to 22 percent for SLS (+3pp for foreign currency securities, +5pp for no observable price, +5pp for own-name paper) |
| Re-evaluation              | 12-18 months (or as warranted)  | 12 months (or as warranted)   | As warranted  |
| Valuation                  | Based on changes in asset prices from duration and convexity calculations, interest rate volatility, credit spread volatility, and liquidity differences between marketable and nonmarketable assets. Nonmarketable asset valuations are based on characteristics of the specific collateral, such as credit quality, interest rate, maturity, liquidity. | Based on asset price volatility and the total time required for an orderly liquidation of a large asset position. Volatility estimates are based on historical and simulated scenarios for government bond yield changes and include a baseline stress scenario. Total liquidation time is based on a valuation, grace, and realization period. <sup>1/</sup> | N/A   |
| <b>Margining practices</b> |   |   |   |
| Mark to market             | Daily   | Daily   | Daily   |
| Margin call                | Yes   | Yes   | Yes   |
| Call trigger               |   |   | Currently set at £1,000,000   |
| Pricing source             | Market prices or if unavailable, the outstanding principal amount; valuation for TSLF and PDCF provided by the clearing bank acting as the PD's agent   | Market prices (the lowest if more than one) or if unavailable, a theoretical price based on present-value discounting of future cash flows  | Market price, or if unavailable, a theoretical price, while applying a higher haircut   |
| <b>Limits</b>              | No limits on regular OMOs and discount window loans; borrower limits on TAF and TSLF  | Not currently applied   | Borrower and issuer limits on OMO collateral; no limits for standing facility   |

<sup>1/</sup> See European Central Bank, Monthly Bulletin (May 2004), pp. 76, 78 for further technical details.

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