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Central Bank Responses to the Money Market Turmoil Stemming from Subprime Woes:

Review of the Initial Phase from August 2007 until July 2008

Financial Markets Department
Bank of Japan

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Contents

[*] This is an English translation of the Japanese original released in July 2008. The paper reflects information available up to July 2008 but the charts in the paper use data available at the end of June 2008, unless otherwise stated.

1. Introduction

The monetary operations of central banks generally consist of the following three components: reserve requirements, open market operations,[1] and standing facilities. However, details differ depending on operating targets, financial market environments and historical factors. Subject to the reserve requirements, financial institutions are required to maintain a certain amount of reserves at a central bank during a certain period. This creates a demand for reserve balances that is stable relative to a financial institutions' fluctuating daily demand for settlement balances. The liquidity gap between total supply and demand for reserve balances fluctuates along with autonomous factors including banknote and treasury fund variations. A central bank fills this liquidity gap through their market operations and guides a market interest rate, generally an overnight rate, to a level consistent with its policy interest rate. Standing facilities lend funds and receive deposits at predetermined rates in response to requests from financial institutions. This helps control interest rates through market operations by setting upper and lower bounds for the market rate, when it is highly variable, and by promoting the view to market participants that those facilities are always available.

Basic framework of market operations is common among central banks, but management schemes differ among countries. They depend on the level, range and predictability of the underlying liquidity gap, which are affected by demand for banknotes and the administrative schemes that manage treasury funds (Chart 1). For instance, against a large fluctuation in liquidity gaps, the Bank of Japan (BoJ), which has a variety of operational tools at its disposal, conducts operations with various maturities at various times, while central banks in the United States and Europe, where the fluctuations are relatively small, conduct their market operations regularly.

Since August 2007, central banks have been required to adjust their management of monetary operations to address money market turmoil stemming from subprime woes. U.S. and European central banks, in particular, have attempted to stabilize markets and

[1] Market operations refer to transactions between a central bank and its counterparty financial institutions, such as outright purchases/sales of financial assets and funds lending. Those operations are divided into permanent and temporary operations. The former indicates long-term operations to provide long-term liquidity, such as outright purchases of government securities. These are balanced with a central bank's liabilities, including banknotes. The latter indicates short-term operations to fill a temporary gap in liquidity, such as short-term repos (that is, the purchase or sale of securities with a repurchase agreement) and secured lending. Successful bid prices or rates are usually determined by competitive bidding (a variable rate tender) but often determined at fixed rates specified by a central bank.

strengthen their ability to provide liquidity. They have not only conducted market operations in a timely and flexible manner while using conventional frameworks, but they have also introduced new measures for market operations. In addition, the U.S. and European five central banks made an unprecedented move to coordinate actions with regard to their market operations in December 2007 and March 2008. Central banks in the United States, the euro area and Switzerland took further coordinated actions in May 2008.

This paper reviews the response and management of central banks, including the Federal Reserve System in the United States, the European Central Bank (ECB) in the euro area, and the Bank of England (BoE) in the United Kingdom, with regard to their market operations after August 2007. The paper also briefly outlines the BoJ's responses while comparing those of other central banks.[2]

2. Money market tightening and related issues on monetary operations

Since the subprime woes emerged in August 2007, the turmoil has spread from the securitization markets to money markets in the United States and Europe.[3] This is due to the tightening of credit conditions in money markets which resulted from a confluence of the following three factors:

(i) Financial institutions had to raise additional funds to finance their expanded balance sheets due to a re-intermediation of risk under the impaired functioning of securitization markets. This re-intermediation of risk occurred in several ways: the provision of liquidity support to affiliated investment vehicles, such as asset-backed commercial paper (ABCP) conduits and structured investment vehicles (SIVs); the purchase of assets of those vehicles; and the involuntary accumulation of loan assets, such as residential mortgages, commercial mortgages, and leveraged loans which failed to be securitized (Chart 2);

(ii) Increase in subprime-related losses raised concerns about the financial condition and

[2] See Bank for International Settlements [2008] for responses of central banks in Australia, Canada, and Switzerland as well as those of the four central banks.

[3] See Bank of Japan, Financial Markets Department [2008c], and Imakubo, Kimura and Nagano [2008] for the subprime woes in global financial markets and those effects on money markets.

creditworthiness of financial institutions. This raised concerns about counterparty credit risk; and

(iii) Under heightened uncertainties about funding, financial institutions increased their precautionary demand for liquidity.

As a result, U.S. and European central banks faced the following five issues related to their monetary operations (refer to Box 1 for developments in their market operations before summer 2007).

First, the volatility of overnight interest rates, which are the operating targets of monetary policy, increased. Financial institutions usually limit, in the very short run, their short positions to their fund and collateral constraints in case of a sudden liquidity shortage. Since August 2007, the above-mentioned factors (i)-(iii) have made financial institutions acutely concerned about the uncertainties surrounding the required and available amounts of short-term funding. This led to more upward pressure on the overnight rates, relative to the period before summer 2007, and daily fluctuations in the rates became larger. Intraday volatility of the overnight rates also increased. They hovered at higher levels in the early morning due to heightened funding pressures from conservative banks, which preferred to secure liquidity earlier. The rates declined rapidly in the afternoon when most of the banks completed their funding (see Chart 3 for U.S. developments in August and September 2007). Central banks were therefore required to arrange more flexible and fine-tuning operations to encourage the overnight rates to be stable at around their target levels. Daily volatility in the U.S. and European overnight rates, on a weighted average basis, increased substantially after summer 2007 (Chart 4).

Second, the term premium, which is the difference between the overnight and term funding rates with maturities of 1-week, 1-month or so, increased. Since summer 2007, the interbank term rates of major currencies have remained high compared with the corresponding treasury/financial bill rates or overnight index swap (OIS) rates,[4] accurately reflecting liquidity and credit risks (Chart 5). This is because, under strong uncertainties about funding, borrowers had an incentive to expand the maturity and size of funding on the one hand, while lenders became reluctant to provide longer-term liquidity on the other. Although central banks do not necessarily intend to keep term

[4] Overnight index swaps are interest rate swaps which exchange the overnight interest rate (floating rate) over a specified period and a corresponding term funding rate (fixed rate).

rates in line with their policy rates,[5] persistent difficulties in term funding may lead to tensions in overnight money markets. As well, volatile term rates, which are important pricing benchmarks for a wide range of financial transactions, may impair the monetary transmission mechanism in a long run. Longer-term liquidity-providing operations were effective in controlling the overnight rates in order to counter increases in term premiums.

Third, the money market turmoil spilled across borders. Overseas financial institutions increased their presence in major money markets. Those institutions, which do not necessarily have stable funding sources, such as local currency-denominated deposits, raised funds not only through the interbank money markets but also from foreign exchange swap markets. For instance, European financial institutions actively converted euros into U.S. dollars through foreign exchange swaps to secure U.S. dollar funding. Because of that, the tightening of the U.S. dollar money market spread into euro money markets, leading to upward pressure on euro funding. Since summer 2007, large demand/supply imbalances have arisen in foreign exchange swap markets - or cross-currency swap markets with a longer maturity - in which other currencies are converted into U.S. dollars. U.S. dollar funding premiums were consistently observed in those markets (Chart 6).

Fourth, the functioning of secured funding was significantly impaired. Financial institutions usually trade funds in secured money markets without major concerns about counterparty credit risk even when they are cautious about unsecured lending. In the U.S. repo market, however, mortgage-backed security (MBS) repo rates rose sharply and those spreads over Treasury security repo rates increased after summer 2007, especially in February and March 2008 (Chart 7). This is because financial institutions fled to the safety of Treasury securities, and they became concerned about the possibility of a decline in MBS prices (i.e. risk of decline in its collateral values). Measures such as haircuts and margin calls,[6] which are generally built into repo agreements to guard against those risks, do not completely reduce risk in cases of a sharp decline in collateral asset prices. During the period, liquidity in repo markets declined not only against MBS collateral but also against a wide range of financial

[5] The Swiss National Bank adopts a term rate, 3-month Libor, as its policy and target rates.

[6] Haircut implies the collateral value of underlying assets as the market value of the assets reduced by a certain percentage. Margin call implies that if the collateral value of underlying assets falls below a certain level, a fund lender requires its counterpart to supply additional collateral. Similarly, if the collateral value exceeds a certain level, a fund borrower may ask its counterpart to return the excess assets.

assets. Impaired functioning of secured money markets raised uncertainties about the funding for financial institutions, and further heightened instability in short-term rates.

Last, an acute reluctance to use standing lending facilities was observed. In stressed market conditions, borrowing from a central bank's lending facility is likely to send an adverse signal about difficulties in funding. Financial institutions were wary about such a risk to their reputation. As mentioned in the Introduction, standing lending facilities are one of the measures used in monetary operations. They were originally developed to facilitate the control of a market interest rate by setting its upper boundary. In highly stressed situations, however, those facilities did not play a sufficient role initially envisaged. Such a reluctance to use lending facilities is referred to as a "stigma."

Box 1 Market operations of central banks before summer 2007

Before the money market turmoil stemming from the subprime woes, market operations conducted by central banks worked as follows (Box 1 Chart 1).[7]

The Federal Reserve accumulated long- and short-term Treasury securities, which were balanced with an increase in outstanding banknotes. Because of that, long- and short-term Treasury securities accounted for 90 percent of its assets, whereas the amount outstanding of short-term liquidity provision (¥2-3 trillion) accounted for only 5 percent (Box 1 Chart 2). This is because the seasonal volatility in the liquidity gap affected by autonomous factors was small on average. Such a small percentage of the amount outstanding of short-term liquidity provision was enough for the Federal Reserve to fill the gap. The liquidity-providing operations matured on 14-day and less-than-14-day (mostly overnight) schedules. These were shorter than those of other central banks. On the other hand, the Federal Reserve frequently used overnight liquidity-providing operations for fine-tuning in response to daily fluctuations in a liquidity gap because current account balances accounted for a small percent of its liabilities. There was limited use of liquidity-absorbing operations.

The Eurosystem did not use permanent liquidity-providing operations

[7] See Bank of Japan, Monetary Affairs Department [2006] and BIS [2007] for a market operation framework of each central bank.

corresponding to outright purchases of government securities partly because the ratio of gold and claims on non-euro area residents to its assets reached 30 percent, a relatively high level.[8] As a result, the amount outstanding of short-term liquidity-providing operations (about $70 trillion) accounted for 40 percent of its assets, which was greater than in the Federal Reserve and the after-mentioned BoJ (Box 1 Chart 3). Besides that a liquidity gap at the ECB was as less volatile as at the Federal Reserve, the ECB had a high ratio of current account balances to liabilities. Under such a situation, 1-week and 3-month liquidity-providing operations, held on weekly and monthly timetables respectively, were arranged in a regular manner in terms of the size and frequency, and the amount outstanding of operations was stable. There was limited use of overnight fine-tuning operations for liquidity provision and absorption.

In May 2006, the BoE reformed its operational framework and established the current framework, which consists of three instruments: a reserve-averaging scheme, standing facilities, and market operations. Unlike the Federal Reserve, the ECB and the BoJ, which have adopted statutory reserve requirements, the BoE's reserve requirements are voluntary. Its counterparties are required to maintain reserve balances at target levels, which they choose themselves, during the maintenance period. The amount outstanding of liquidity-providing operations with a maturity of less than 1-week at the fixed rate was small, about ¥10 trillion. But the percentage to its assets exceeded 50 percent, a high level (Box 1 Chart 4). Liquidity-providing operations mainly comprise 1-week operations conducted weekly, and 3-, 6-, 9- and 12-month operations conducted monthly. There was limited use of overnight operations for liquidity provision and absorption. The BoE and the ECB had some similarities in their operations, including: the share of 1-week operations reached more than half of the amount outstanding of liquidity-providing operations; operations were conducted in a regular manner in terms of the size and frequency; and the amount outstanding of operations was stable because of a less volatile gap in liquidity. In January 2008, the BoE started outright purchases of U.K. Treasury bonds in line with the amount outstanding of banknotes, but the purchase amount has so far been rather limited.

Unlike those three central banks, the BoJ have been operational flexibility to choose types of operations from a variety of operational tools, maturities, and settlement

[8] The Eurosystem comprises the ECB and the national central banks of those EU Member States that have adopted the euro. Transaction types of market operations are different among national central banks, and are either repos or secured lending. The ECB decides and announces tender conditions and allotments containing the size and maturity of operations, and the national central banks conduct the rest of procedures.

dates. This is because it has been necessary for the BoJ to secure operational flexibility and to conduct operations in a timely manner in order to address a large fluctuation in autonomous factors, such as treasury fund and banknote variations (Box 1 Chart 5). For instance, if it is difficult to meet liquidity needs by using overnight liquidity-providing operations, the BoJ offers longer-term liquidity-providing operations in advance and offers short-term liquidity-absorbing operations for fine-tuning at the same time. The BoJ has continued to reform operational tools to provide large amounts of liquidity to a wide range of counterparties under the financial systemic risk in the last half of 1990s and the BoJ's quantitative monetary easing policy.[9]

3. Measures of central banks: an overview

Since summer 2007, central banks have taken various steps with regard to monetary operations to address the five issues mentioned in section 2.

First, both the frequency and size of overnight operations increased in response to the heightened volatility of overnight interest rates. The Federal Reserve, which frequently conducts overnight operations, provided far larger amounts of overnight liquidity in August 2007 than usual. It also provided relatively large amounts of overnight liquidity on September 17 and November 15, on which the federal funds rate rose substantially. The ECB and the BoE, which had not made use of overnight operations before, began conducting frequent overnight operations to provide and absorb liquidity.

Second, the maturity of operations was intended to increase and change flexibly. The Federal Reserve, the ECB and the BoE seemingly intended not to keep term rates in line with their policy targets, but decided to address an increase in term premiums. The persistent instability of term rates and concerns among financial institutions about funding could not only lead to difficulties in the ability of central banks to control market rates, but could also impair the functioning of a wide range of financial markets. The Federal Reserve, for instance, emphasized in its statements on exceptional operations and the Term Auction Facility, described hereafter, that those measures were "in response to heightened pressures in money markets for funding through the year

[9] See Bank of Japan, Financial Markets Department [2008a] for the BoJ's market operations.

end" and addressed "heightened pressures in term funding markets" (see Chart 8 for statements made by each central bank).

If a central bank does not absorb liquidity in a fashion that matches an increase in funds provided through longer-term operations, excess supply in very short-term liquidity will affect the control of market rates, and the overnight rate may decline more than necessary. To prevent the overnight rate from rising or declining, central banks seek to make their reserve balance level neutral, on average, during a certain period through the provision of shorter-term liquidity, a reduction in government security holdings, and the absorption of liquidity.[10] When expanding the maturity of liquidity-providing operations or increasing the amount offered, central banks announced that corresponding liquidity-absorbing operations would be planned.

Third, the ECB and the Swiss National Bank (SNB) provided the foreign currency-denominated funds, U.S. dollars, against collateral eligible for their own operations, and the Federal Reserve provided those funds via foreign exchange swaps. These measures are thought to have addressed the global market turmoil within developing cross-border linkage. The ECB and the SNB explained that this measure was intended to provide U.S. dollar funding to their eligible counterparties.

Fourth, the range of collateral eligible for market operations was expanded. It is believed this was designed to address the impaired functioning of secured money markets, excluding the markets secured by government securities. Renewed measures were not introduced at the ECB, which accepts a wider range of collateral, but were introduced at the Federal Reserve and the BoE. The latter two expanded the range of eligible collateral from Treasury and agency securities to some structured products. In addition, the Federal Reserve and the BoE established securities lending facilities to lend Treasury securities against market-illiquid structured products. In their statements, those were said to "improve the ability of primary dealers to provide financing to participants in the securitization markets," "promote liquidity in the financing markets for Treasury and other collateral," and thus "foster the functioning of financial markets more generally."

Fifth, various measures were taken to promote the use of standing lending

[10] If the reserve balances on that day equal the remaining required reserves, the situation is referred to as reserve-neutral. If the former exceeds the latter, the difference is called an excess reserve. Central banks can accelerate the pace of reserve accumulation by creating excess reserves through their operations and thus reduce demand for required reserves in the remaining maintenance period.

facilities. The Federal Reserve and the BoE encouraged financial institutions to use the facility on various occasions in order to address the stigma associated with the facility. The Federal Reserve reduced the primary credit rate to narrow the spread between it and the target federal funds rate to 25 basis points from 100 basis points. It also increased the maximum maturity of primary dealer credit loans to 90 days from overnight. In the euro area, however, the ECB did not take these steps because the facility was used as frequently as before summer 2007 and the stigma associated with it appeared to be less of an issue.

Last, the Federal Reserve expanded the range of counterparties for its liquidity provision. In addition to the existing primary credit facility for depository institutions, a renewed credit facility was established for primary dealers. As for market operations, a term auction facility was established for depository institutions and was based on competitive bidding, while the existing operations were offered only to primary dealers. Under the impaired functioning of interbank lending caused by credit deterioration, an expansion in the range of counterparties for market operations and standing facilities allowed a central bank to enhance its ability to provide liquidity and to respond to market stress.

The rest of the paper reviews the responses of each central bank. It covers market operations and liquidity management policies in section 4, standing facilities in section 5, and eligible collateral in section 6.

4. Measures of central banks: market operations

(1) Federal Reserve (Chart 9)

The subprime woes first spilled over into money markets in early August 2007. Major European financial institutions temporarily suspended the calculation of net asset values and redemptions for their affiliated hedge funds, and some U.S. ABCP programs exercised options to extend the maturity of their paper. This triggered strong funding pressure.

The first action taken by the Federal Reserve was to provide a massive amount of liquidity through overnight operations. In money markets, financial institutions sharply increased their demand for liquidity in order to provide liquidity support to ABCP

programs. At the same time, they became exceptionally cautious of interbank lending. During this period, ABCP investors suddenly fled to safe assets such as Treasury bills. This then led to a surge in interbank term and overnight rates. The massive liquidity-providing operations were intended to address those changes in the demand/supply gap in money markets.

On the day after August 9, 2007, on which the market turmoil emerged, the Federal Reserve conducted extraordinary liquidity-providing operations on three occasions and announced that it would be ready to arrange further operations as needed. On all subsequent days through August 16, overnight liquidity-providing operations were arranged. The daily maximum amount ($38.0 billion on August 10) and the average amount ($14.2 billion) offered in overnight operations were much larger than those offered from July 2006 to June 2007, during which the maximum was $15.8 billion and the average was $6.8 billion. Because of that, large excess reserves (relative to the required reserves) contributed substantially to pushing the federal funds rate under the policy target of 5.25 percent. Hourly developments of overnight U.S. dollar funding rates show an intraday pattern in the rates (Chart 3). The rates exceeded the policy target in the early morning (especially European trading time in the Eurodollar market) when some financial institutions tried to cover their short positions while increasing their bid rates. The rates then plunged in the afternoon when liquidity needs declined followed by the Federal Reserve's overnight liquidity-providing operations. The excess reserves were effective in easing funding concerns but made the average level of the federal funds rate lower than the policy target during the current and following maintenance periods.[11]

From late August, the Federal Reserve attempted to increase the amount of term liquidity provision by regularizing 1-week operations, which had been arranged in an irregular manner. Increases in the amount outstanding and frequency of operations allowed the Federal Reserve to respond to changes in the liquidity gap in a flexible manner and then provide financial institutions with assurances about funding.

In conjunction with those actions, the Federal Reserve's System Open Market Account (SOMA) did not roll over maturing holdings but redeemed Treasury bill holdings on August 23 and 30,[12] and then contracted the SOMA holdings. Those

[11] The Federal Reserve's reserve requirements allow financial institutions to carry over some excess (or deficiency) of their required reserves in the one maintenance period to the following.

[12] The SOMA contains assets acquired via market operations conducted by the Federal Reserve Bank of New York.

actions were designed to offset the increase in the amount outstanding of liquidity-providing operations by decreasing Treasury bills. This kept the net supply of reserves unchanged and thereby maintained the overnight rate in line with the policy target. After that, the Federal Reserve redeemed and contracted Treasury bill holdings along with an increase in the amount outstanding of liquidity-providing operations. From March 7, 2008, the Federal Reserve sold Treasury bills outright in addition to redeeming them. It also further contracted Treasury bill holdings through end-March. The actions taken by the Federal Reserve were effective in increasing the amount of Treasury bills distributed in the secondary market. They also accommodated demand for Treasury bills amid the tightening of the demand/supply condition due to the flight to quality. In this connection, the Federal Reserve decreased the minimum fee rate to 0.5 percent from 1.0 percent for the Securities Lending Program (SLP) in late August 2007 and temporarily relaxed requirements for the securities lending in late November.[13]

In November and December 2007, concerns heightened about funding through the year-end. On November 28, in response to the heightened concerns, the Federal Reserve conducted a term repurchase agreement that extended into the new year with a 43-day maturity, which was longer than that of regular operations. It also announced a plan to provide sufficient reserves to resist upward pressures on the federal funds rate above its policy target around the year-end. On December 12, the Federal Reserve, together with other major central banks, announced the establishment of a temporary Term Auction Facility (TAF) and foreign exchange swap lines with the ECB and the SNB (Chart 10).[14] The TAF has the following characteristics: (1) it targets depository institutions that are judged to be in generally sound financial condition by their local Reserve Bank and that are eligible to borrow under the primary credit discount window program; (2) a wide range of collateral eligible to the discount window program is acceptable.[15] The foreign exchange swap line arrangements have allowed the ECB and

[13] The temporary changes were the following: (1) primary dealers would be limited to 25 percent of the amount available for borrowing with a maximum of $750 million per issue, versus the prior limit of 20 percent with a maximum of $500 million per issue; (2) the supply available for borrowing each day was increased from 65 percent of an individual issue to 90 percent of an individual issue; and (3) all securities with maturities of greater than 6 days would be available for borrowing versus the previous 13 days.

[14] On December 12, 2007, the Bank of Canada, the BoE, the ECB, the Federal Reserve, and the SNB announced measures designed to address elevated pressures in short-term funding markets. The BoJ and the Swedish Riksbank welcomed these measures.

[15] The TAF auctions were conducted on December 17 and 20, 2007, and then rolled over on a regular basis.

the SNB to address demand for U.S. dollars among European financial institutions. The ECB and the SNB have converted euros and Swiss francs to U.S. dollars by means of the arrangements with the Federal Reserve, and then conducted U.S. dollar liquidity-providing operations for their counterparties. The counterparties eligible for the ECB and the SNB operations, through the auctions offered by these two central banks, have been able to secure U.S. dollars against ECB- and SNB-eligible collateral. The arrangements can be seen as complementing foreign exchange swap markets where market liquidity declined due to the U.S. dollar funding pressure from European financial institutions.

Market tensions somewhat calmed during the end of 2007 until the beginning of 2008 due to the abovementioned measures. But they intensified once again from end-February to March. Concerns widened about the financial soundness of monoline bond insurers and of U.S. government-sponsored enterprises. The yield spreads increased on agency securities, agency MBSs and municipal bonds, all of which had been considered relatively safe products. This trend impaired the functioning of secured money markets. Primary dealers who depended on MBS repo markets for funding faced a sharp tightening of funding conditions.[16] Actions taken by the Federal Reserve in March were intended to further strengthen liquidity-providing measures (by increasing the size and maturity) and to expand liquidity-providing measures directly to primary dealers (Chart 11).

On March 7, 2008, the Federal Reserve decided to increase the amount outstanding in the TAF (to $50 billion from $30 billion for each auction) and initiated a series of 28-day term repurchase transactions (which were expected to cumulate to $100 billion via weekly tenders) with a longer maturity than that of regular operations. On March 11, as part of the second round of coordinated actions taken by five major central banks after December 2007, the Federal Reserve authorized an increase in its existing temporary reciprocal currency swap lines with the ECB and the SNB (to $36 billion from $24 billion in total). It also introduced a Term Securities Lending Facility (TSLF)

[16] The impaired functioning of MBS repo markets was attributed to price declines in collateral securities. To address the situation, the Office of Federal Housing Enterprise Oversight (OFHEO) permitted up to $200 billion of the OFHEO-directed capital surplus of the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) to be invested in MBSs. The Federal Housing Finance Board authorized the Federal Home Loan Banks (FHLBs) to increase their purchases of agency MBSs and to provide in excess of $100 billion in additional liquidity.

for primary dealers.[17] The TSLF lent up to $200 billion of Treasury securities held by the Federal Reserve for a term of 28 days against a pledge of other securities including agency MBSs that were difficult to finance via repos, and was intended to foster the impaired functioning of repo markets. On March 16, the Federal Reserve established a Primary Dealer Credit Facility (PDCF), essentially a discount window program for primary dealers, "to improve the ability of primary dealers to provide financing to participants in the securitization markets."[18] In addition, on March 14, the Federal Reserve provided secured funding through JPMorgan Chase to Bear Stearns, a prominent investment bank facing difficulties in continuing its operations. On March 16, it also agreed to establish a term funding facility to a limited liability company to facilitate the purchase.

Those measures were effective in alleviating to some extent strains in U.S. money markets. Nonetheless, market functioning continued to be impaired: Libor-OIS spreads reflecting premiums of credit and liquidity risks remained high. Also, the yield spreads of repo rates with MBSs and agency securities over Treasury repo rates increased (Charts 12 and 13). On May 2, in response to the situation, the Federal Reserve, together with the ECB and the SNB, announced an expansion of their liquidity measures. This included: (1) an increase in the amounts auctioned under the TAF (to $75 billion from $50 billion for each auction); (2) further increases in the existing temporary reciprocal currency swap lines with the ECB and the SNB (to $62 billion from $36 billion in total); and (3) an expansion of the collateral that can be pledged in the TSLF auctions (to include AAA-rated asset-backed securities). The first two measures were intended to address "the persistent liquidity pressures in some term funding markets," and the third "promoted improved financing conditions in a broader range of financial markets."

As a result of those measures, there was a large change in the asset structure of the Federal Reserve's balance sheet compared with that of summer 2007 (Box 1 Chart 2). It included an increase in the amount outstanding of short-term liquidity-providing operations (to $121.6 billion at end-June 2008 from $18.7 billion at end-July 2007), a

[17] While the existing Securities Lending Program offers specific Treasury securities that are illiquid in the markets for loan against Treasury general collateral, the TSLF offers Treasury general collateral. As for repos with agency securities and agency MBSs, financial institutions have incentives to bid in the TSLF to exchange those securities for Treasury securities rather than to finance them in the markets, as long as the spreads of those repos over Treasury repo rates above the minimum bid rate that is 0.1 or 0.25 percent.

[18] PDCF loans will be limited to the amount of margin-adjusted eligible collateral pledged.

large decrease in the amount of Treasury bills (to $21.7 billion from $277.0 billion), a decrease in the amount of Treasury bonds (to $457.0 billion from $513.6 billon) and an increase in the amount outstanding of securities lending (to $112.4 billion from $4.6 billion).

(2) European Central Bank (Chart 14)

When the subprime woes first spilled over into money markets, similar to the United States, the same money market tightening that put strong upward pressure on overnight rates was observed. To address the situation, the ECB arranged a series of overnight liquidity-providing operations, between August 9 and 14, 2007, which were normally conducted only once or twice a year. The ECB attempted to keep the overnight rate stable by increasing excess reserves. The overnight liquidity-providing operation conducted on August 9 recorded the largest amount allotted in a day (€94.8 billion) because the ECB allotted 100 percent of the bids it received at its policy rate of 4.00 percent. On August 14 and 21, the allotment amounts of weekly 1-week liquidity-providing operations were increased. On August 23 and September 12, supplementary 3-month liquidity-providing operations were conducted - in normal times they are offered monthly - to "support the normalization of the functioning of the euro money market." They were rolled over thereafter.[19] Excess reserves were temporarily accumulated since the timing did not match the increase in the amount offered in 3-month operations and the corresponding decrease in the amount offered in the 1-week operations. Fluctuations in reserve balances increased in August and September.

In response to the situation, the ECB announced its liquidity management policy (or the market operation policy) to share the view with market participants that: (1) the ECB would allocate more liquidity than the benchmark amount in regular 1-week liquidity-providing operations to accommodate the demand of counterparties early within the maintenance period; (2) the difference between the allotted and the benchmark amount was envisaged to decline gradually in the course of the maintenance period, and the ECB still aimed at balanced liquidity conditions at the end of the maintenance period; and (3) the ECB would steer liquidity toward more balanced

[19] The amount of €40 billion allotted on August 23 was rolled over with an increase adjustment to the amount of €60 billion allotted on November 22, and the amount of €75 billion allotted on September 12 was rolled over with a decrease adjustment to the amount of €60 billion allotted on December 11. Those two allotment amounts were rolled over in February and March 2008, respectively.

conditions during the maintenance period. As a result, fluctuations in both reserve balances and overnight rates declined somewhat after the October maintenance period, but jumped again when market strains increased around the year-end.

On November 30, the ECB announced another liquidity management policy to address revived market strains for year-end funding: (1) the ECB would lengthen the maturity of 1-week liquidity-providing operation, which was offered on December 18, to two weeks covering the year-end, and the amount allotted in this operation (€348.6 billion) would be aimed at satisfying liquidity needs; and (2) the ECB continued to monitor liquidity conditions and stood ready to steer liquidity toward more balanced conditions if needed. On December 12, as mentioned above, the ECB arranged the temporary reciprocal swap line with the Federal Reserve and conducted two U.S. dollar providing operations of $20 billion ($10 billion for each) to address the heightened pressure on U.S. dollar funding of European financial institutions.[20]

In March 2008, when financial market tensions intensified again, the ECB, on March 11, increased the swap line with the Federal Reserve (to $30 billion from $20 billion). It launched a 5-day liquidity-providing operation (of €15 billion) on March 20, and decided to conduct supplementary 6-month liquidity-providing operations on March 28.[21] It also renewed the supplementary 3-month liquidity-providing operations arranged in August, 2007. In May, in view of the persistent liquidity pressures in some term funding markets, the ECB further increased the swap line with the Federal Reserve (to $50 billion from $30 billion) and extended the arrangement once again through January 30, 2009.

(3) Bank of England (Chart 15)

At the first stage in early August 2007, faced with upward pressure on interest rates, the BoE did not expand its normal market operation procedures but encouraged the use of

[20] The ECB rolled over the entire amount in January 2008. The SNB provided $4 billion in December 2007 and rolled over the entire amount next month. Both the ECB and the SNB suspended those operations in February 2008 but restarted in March following an increase in the temporary reciprocal swap lines with the Federal Reserve: the ECB provided $15 billion each (once in March and twice in April); and the SNB provided $6 billion each (once per month in March and April). The swap lines were further increased in May, and the ECB and the SNB provided for each auction $25 billion (twice per month) and $6 billion (twice per month), respectively.

[21] The two supplementary 6-month operations with a preset of €25 billion each (€50 billion in total) were allotted in April and July. A part of the increment was offset by decreases in the supplementary 3-month operations (to €50 billion each from €60 billion each).

the standing facilities to control the interest rate. In response to the persistent upward pressure on overnight rates, however, the BoE expanded its liquidity-providing operations in a phased manner beginning in September.

The BoE first said if the interest rate for secured overnight borrowing continued to exceed the policy rate by more than the usual amount, it would "offer to supply additional reserves up to 25 percent of the aggregate reserves target." In connection with the announcement, in mid-September, the BoE relieved its reserve requirements imposed to financial institutions in order to accommodate their reserve management and to reduce upward pressure on interest rates. This included widening the specified range between the reserve target and the reserve holding (within which reserve holdings are remunerated at the policy rate),[22] and offering the corresponding additional liquidity.

The U.K. financial institution Northern Rock faced difficulty in funding, which triggered money market tensions to intensify. To address the situation, the BoE provided a liquidity support facility to Northern Rock on September 14 and arranged an exceptional 2-day liquidity-providing operation on September 18. On September 19, the BoE announced a plan to conduct four 3-month term auctions against a much wider range of collateral including MBSs as well as collateral that is eligible in regular operations. No bids were received in any of the auctions since the minimum bid rate was set to the standing lending facility rate, which equaled the policy rate plus 100 basis points and was higher than the prevailing market rates. Offering an opportunity to secure funding against a wider range of collateral can be seen as providing assurance to markets.

On December 6, the BoE conducted a 5-week liquidity-providing operation covering the year-end to alleviate concerns that money market conditions would be particularly tight over the year-end. As parts of the aforementioned coordinated actions taken by five central banks (on December 12), the BoE widened the range of collateral accepted for funds advanced and expanded the total amount of reserves offered (to £10.0 billion from £2.5 billion) for its regular 3-month liquidity-providing operations.

In response to intensified money market tensions in March and April 2008, the BoE expanded its liquidity-providing measures. It arranged an exceptional 3-day

[22] The excess reserves above the specified range are remunerated at the policy rate but are also subject to interest penalties at the policy rate, meaning that those are not substantially remunerated. The specified range between the reserve target and the reserve holding was changed from +/-1 percent to +/-37.5 percent (on September 13) to +/-60 percent (on September 20) to +/-30 percent (on October 4).

liquidity-providing operation on March 17, and re-offered the corresponding additional reserves in weekly 1-week liquidity-providing operations for the remainder of the maintenance period (from March 20 to April 9). On April 8, the BoE further increased the amount offered in the 3-month liquidity-providing operations to £15.0 billion following the increase in December 2007.[23] On April 21, the BoE announced it would launch the securities lending facility, the Special Liquidity Scheme (SLS), similar to the Federal Reserve's TSLF. It aimed "to improve the liquidity position of the banking system and to increase confidence in financial markets" by allowing banks to swap an overhang of assets including MBSs on their balance sheets for U.K. Treasury bills. The scheme has three unprecedented features: each swap would be for a period of 1 year (and may be renewed for a total of up to 3 years); usage of the scheme would depend on market conditions; and the government would supply the BoE with the necessary Treasury bills offered for loan.

(4) Bank of Japan (Chart 16)

U.S. and European money market tensions spilled over into Japan to some extent. This happened because: (1) heightened concerns about an increase in losses at foreign financial institutions prompted worries about the deterioration of their credit condition. This caused some financial institutions in Japan to become cautious in their interbank lending; (2) U.S. dollar market strains stimulated demand for yen funds through an increase in foreign exchange swap transactions to convert yen to U.S. dollars; and (3) from March 2008, market liquidity declined globally in both government bond and money markets. This destabilized demand/supply conditions in Japan's government bond and repo markets. Nervousness was observed and market tensions intensified especially around the calendar and fiscal year-ends.

The BoJ closely monitored the situation in financial markets at home and abroad, while communicating closely with other major central banks. The BoJ carefully responded to daily fluctuations in the liquidity gap by using a variety of operational tools (with a variety of settlement dates of from T+0 to T+4 day and a variety of maturities from overnight up to 1 year).[24] As the repo markets tightened and upward pressure on the uncollateralized overnight call rate increased, the BoJ purchased

[23] As a result, the amount offered in long-term liquidity-providing operations with 3-, 6-, 9-, and 12-month maturities increased from £2.85 billion to £11.35 billion in December and to £16.35 billion in April 2008.

[24] In practice, the BoJ often used the operations with overnight to 4-month maturities starting in T+0 to T+2 day.

Japanese government bonds with repurchase agreements in greater numbers than it had before summer 2007. After the August maintenance period in 2007, the BoJ responded to changes in the liquidity gap in a timelier manner, decreasing the amount in operations starting in T+2 day and increasing that in T+1 day. To encourage the smooth funding of financial institutions, the BoJ started providing liquidity covering the year-end on October 3 and liquidity covering the fiscal year-end on January 17, 2008, a few weeks earlier than in the previous year. As a result, the uncollateralized overnight call rate was stable at around the policy target of 0.5 percent.[25]

The BoJ usually uses a variety of operational tools and arranges operations in a flexible manner. Therefore, the BoJ responded to the situation so far without changing the existing framework of its market operations. Meanwhile, the BoJ welcomed the aforementioned coordinated actions by five central banks.[26]

5. Measures of central banks: standing facilities

As long as a total liquidity gap is adequately filled, liquidity gaps faced by individual financial institutions can be adjusted via interbank transactions. The adjustment, however, does not necessarily function smoothly under all circumstances. Especially in overnight funding markets, financial institutions are likely to be forced to substantially raise bid rates for funding in order to secure liquidity for payments to be settled within the day. In contrast, financial institutions that have reserves above required settlement and reserve balances are likely to manage the excess reserves at the expense of substantially reducing offered rates. It is possible that those actions, if taken by many institutions, may drive overnight rates away from operational targets. Each central bank,

[25] See Bank of Japan, Financial Markets Department [2008b] for market operations arranged by the BoJ in fiscal 2007.

[26] The statements said: "the Bank of Japan welcomes these measures and hopes that they will contribute to maintaining the functioning of the international financial markets. Meanwhile, Japan's money markets function well and the Bank will continue to conduct money market operations so appropriately as to maintain market stability, including supplying sufficient fund over the year-end" (as of December 12, 2007); and "the Bank of Japan welcomes these measures and hopes that they will contribute to maintaining the functioning of the international financial markets. Amidst the turmoil in international financial markets, Japan's money markets continue to function relatively well thus far. The Bank will continue to conduct money market operations so appropriately as to maintain market stability, including supplying sufficient fund over the fiscal year-end" (as of March 11, 2008).

therefore, has a facility to complement liquidity-providing/absorbing operations and to thereby stabilize market rates. It lends funds and receives deposits at predetermined rates in response to requests from financial institutions. Such a facility is referred to as a standing facility. While a standing lending facility is available at the Federal Reserve and the BoJ, standing facilities for both lending and deposit are available at the ECB and the BoE.

For interest rates applicable to standing facilities, a lending rate is set higher than the policy target and a deposit rate is set lower than the policy target. Such settings create incentives for financial institutions to make market trades for funding and lending, as long as overnight market rates move in the range between lending and deposit rates. If, for some reason, the market rate exceeds the lending rate, financial institutions use the lending facility against their available and eligible collateral. In contrast, if the market rate falls below the deposit rate, they use the deposit facility. Thus, the facility lending and deposit rates create a corridor system for market rates. The system is expected to complement the control of the market rate through market operations.

After summer 2007, however, standing facilities, especially standing lending facilities, did not necessarily work as expected to stabilize market rates. It was remarkable at the Federal Reserve and the BoE largely due to the so-called stigma. In a stressed situation, financial institutions became nervous about risks to their reputations. News about the usage of a standing lending facility could spread to markets and send the wrong signal that the bank could not raise funds from any counterparty other than a central bank. Especially at the Federal Reserve and the BoE, the stigma associated with standing lending facilities became acute because there had been limited use of those facilities during normal times, at least until summer 2007. To address the situation, the Federal Reserve and the BoE made efforts to encourage financial institutions to use the standing lending facilities. Nevertheless, the stigma seems to persist. Meanwhile, the stigma was less of an issue at the ECB, whose standing lending facility had been frequently used during normal times.

On August 17, 2007, the Federal Reserve approved a reduction in the primary credit rate to 5.75 percent from 6.25 percent. It narrowed the spread between the primary credit rate and its target federal funds rate to 50 basis points, and increased the maximum maturity of primary credit loans to 30 days from overnight.[27] This can be

[27] The Federal Reserve further increased the term of primary credit loans to 90 day on March 16, 2008.

seen encouraging the usage of the primary credit facility by changing the usual practices.[28]

Nevertheless, there was still limited use of the primary credit facility (Chart 17). This was attributed not only to the market stigma, but also to the fact that the lending of the Federal Home Loan Banks (FHLBs) was more preferable in markets. The FHLBs provided liquidity against as a wide range of collateral as the primary credit collateral, at a lower rate than the primary credit rate, and with a longer-term maturity.[29] The TAF established by the Federal Reserve in December can be also seen as a complement to the primary credit facility in response to the reluctance of depository institutions to use the primary credit facility. On March 16, 2008, the Federal Reserve established the PDCF, a lending facility to primary dealers (and available for business from March 17), and lowered the spread of the primary credit rate over its target federal funds rate to 25 basis points. The PDCF was actively used soon after its establishment.

There was a strong stigma also at the BoE, where only about 60 counterparties were eligible for the standing lending facility. Financial institutions seemed to be concerned about being exposed as users of the facility and therefore were reluctant to take part. The BoE announced that "the bank's standing facilities have been, and continue to be, available every day throughout the day to all participating banks, against eligible collateral and at a penalty rate of interest. Together with other features of the framework, these facilities were designed to help the system cope with stressed market conditions" on August 13, 2007 and encouraged the usage of its standing lending facility when the money market turmoil occurred in summer 2007. Despite the promotion, there was still limited use of the facility partly because the spread of the lending rate over the policy target was left at 100 basis points (Chart 18). Meanwhile, the securities lending facility, the SLS, launched in April, also offered lending in response to requests from financial institutions. The BoE indicated a complete privacy policy and agreed not to publish the total outstanding value of Treasury bills lent under the scheme until the end of the drawdown period.

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[28] In addition, the Federal Reserve took other measures to promote the usage of its primary credit facility. On August 23, the Federal Reserve updated its frequently asked questions and made clear a range of eligible collateral including structured products: (1) ABCP is viewed as a particular type of commercial paper and thus is eligible for consideration; (2) debt obligations containing subprime mortgages are acceptable as collateral, AAA-rated collateralized debt and mortgage obligations are examples of eligible structured debt obligations.

[29] The increase in the FHLBs lending corresponded approximately to the decrease in the amount outstanding of ABCP and seemed to ease liquidity strains to some extent. See Bank of Japan, Financial Markets Department [2008c].

On the other hand, the standing deposit facilities offered by the BoE and the ECB were effective in restricting the lower bound of market rates (Charts 18 and 19).

At the BoJ, less of stigma was associated with the use of the complementary lending facility than at the Federal Reserve and the BoE. This was both because the spread of the basic loan rate, a lending rate, over the policy target was only 25 basis points, and because the BoJ suspended the restriction on the maximum number of days for use and maintained the temporary waiver of add-on rates for frequent users of the facility. It is also because the BoJ encouraged financial institutions to borrow without hesitation. As a result, there were no major changes in the use of the facility after summer 2007. The facility was used when market rates jumped and was thereby effective in constricting the upper bound of the market rate (Chart 20).

6. Measures of central banks: eligible collateral

Measures taken by central banks can be sorted into the terms of their collateral policies, as follows (Chart 21).

Before the market turmoil started in summer 2007, the Federal Reserve and the BoE had accepted a limited range of risk assets as eligible collateral. The Federal Reserve had restricted eligible collateral (that is, purchased assets with a repurchase agreement) to Treasury securities, agency securities and agency MBSs for its liquidity-providing operations. However, it had accepted a wide range of collateral for its lending facility. The BoE only accepted safe assets such as U.K. Treasury securities (including those denominated in foreign-currency) and government bonds issued by euro area countries for its liquidity-providing operations and standing lending facility.

On the other hand, the ECB and the BoJ have accepted a wide range of assets including private debts for their liquidity-providing operations and standing lending facilities.[30]

[30] According to a cross-county comparison by the ECB [2007], highly liquid and safe assets are preferable as eligible collateral but the range of collateral differed depending on (1) the size of market operations and facility lending, (2) the range of counterparties, (3) the institutional perspective, and (4) the size of collateral markets. In the case of the Federal Reserve's market operations, a small size of its operations (excluding outright purchase of Treasury securities) and a small range of counterparties, about 20 primary dealers, have caused its range of collateral

Since summer 2007, the Federal Reserve and the BoE have expanded their relatively limited range of eligible collateral. Under the Federal Reserve's TAF, the range of eligible counterparties was expanded to depository institutions and the range of eligible collateral was widened to cover the primary credit collateral. The TSLF can be seen as providing to primary dealers collateral that can be financed in markets, by exchanging Treasury securities and asset-backed securities that became difficult to finance via repos.[31]

The BoE expanded the range of collateral to some structured products such as MBSs when offering special 3-month term auctions in September 2007. In December, it accepted the same range of collateral for regular 3-month liquidity-providing operations as had been accepted for the special auctions. Under the SLS established in April 2008, the assets that could be used, such as AAA-rated MBSs, were largely the same as those accepted for the special 3-month operations.

After summer 2007, especially in February and March 2008, market liquidity for financing structured products (such as MBS repos) declined in the United States. The liquidity-providing operations of central banks against the broad range of eligible collateral contributed directly to alleviating the funding pressure faced by financial institutions and brought relief to the markets. This then supported the normalization of market functioning. The spread of MBS repos over Treasury repo rates in the United States sharply increased in February and March but decreased following the establishment of the Federal Reserve's TSLF and PDCF.

During this period, the unprecedented difference between successful bid rates against Treasury collateral tranche and agency/MBS collateral tranches was frequently observed at the Federal Reserve (Chart 22). Amid dropping market liquidity of repos with risk assets, such as MBSs, it became difficult to finance those assets in markets. Instead, the financing pressure on those assets via market operations increased (refer to Box 2 for liquidity premium developments in money markets). While the percentage of Treasury collateral tranche decreased substantially after mid-August 2007, the percentage of agency/MBS collateral tranches increased. In the liquidity-providing operations covering the year-end, successful bids were all propositions against MBS

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to be limited.

[31] In May 2008, the Federal Reserve expanded the collateral that can be pledged in the TSLF auctions. Primary dealers may now pledge AAA-rated asset-backed securities, in addition to eligible residential- and commercial-mortgage-backed securities and agency collateralized mortgage obligations.

collateral tranche, implying that the operation complemented the market liquidity of repos.

Box 2 Money market liquidity indicators

To examine recent trends in money market liquidity before and after the money market turmoil, the Box shows area-based indicators of market liquidity composing the absolute value of spreads between overnight and policy rates and spreads between interbank term funding and OIS rates (Box 2 Chart).[32] The results show that liquidity indicators have largely increased since August 2007, implying that market liquidity decreased in every money market. The largest increase in the indicator is observed in the United States, which was the center of the turmoil, followed by that in the euro area and the United Kingdom, where financial institutions active in the United States are based.

The liquidity indicators suggest that money market tensions alternately intensified and calmed down. In mid-September 2007, credit conditions showed signs of temporarily subsiding, and the overnight rates became stable relative to the peak of the summer. This reflected the active provision of liquidity by each central bank and large cuts the Federal Reserve made in its policy rate. In November, the liquidity indicators increased again, exacerbated by year-end funding needs. But they decreased through February 2008, partly because of the coordinated actions taken by five central banks in mid-December and because of a dissipation of premiums on trades covering the year-end (which started in 2007 and ended in the next year). The liquidity indicators increased again as the creditworthiness of assets previously considered safe deteriorated and market liquidity of repos declined sharply against those assets. A series of market stabilization efforts conducted by central banks once stopped an increase in the liquidity indicators.

After the failure of Lehman Brothers in September 2008, the liquidity indicators jumped to their new peak level. Money market liquidity quickly evaporated on increased concerns over counterparty risk, prompting market participants to become extremely cautious in interbank lending and funding. Due to a series of measures taken

[32] See Bank of Japan, Financial Markets Department [2008c] for market liquidity in global financial markets of major countries.

by central banks and governments, conditions improved somewhat in global money markets. However, the level of the indicators remained higher than normal and concerns about money market liquidity still persist.

7. Concluding remarks
-- subsequent market developments and central bank actions --

The paper reviewed the initial actions of central banks in response to the money market turmoil stemming from the subprime woes.

Monetary operations aim at maintaining short-term rates, generally overnight rates, at around policy targets by filling a daily gap of total liquidity (affected by autonomous factors such as treasury fund and banknote variations). Under the circumstance in which necessary liquidity is injected into money markets, it is expected that financial institutions with short positions can raise funds from other institutions with long positions at market rates near policy targets.

Before the turmoil, U.S. and European central banks had achieved the stable control of market rates by using limited types of operations conducted in a regular manner. This came against a backdrop of a less volatile gap of total liquidity. Since summer 2007, however, market functioning of interbank lending has been substantially impaired. Central banks faced difficulties in controlling the market rate by simply adjusting the total liquidity gap. The series of operational measures taken by U.S. and European central banks - i.e. more flexibility in terms of frequency and maturity of their operations and the expansion of a range of collateral and counterparties - can be considered as complementing financial market intermediation. It was necessary to support market functioning to stabilize financial markets and achieve consistent control over overnight rates. It was also important for a central bank to share with market participants its perspective and operational policy when implementing extraordinary measures. As mentioned above, U.S. and European central banks took various actions in terms of communication. Liquidity provision measures taken by the Federal Reserve and other central banks calmed concerns over financial soundness of financial institutions in April and May 2008, but markets remained unstable with the effects of an adverse feedback loop between financial sector and real economy.

In September 2008, tensions in global financial markets led to a widespread

financial crisis, triggered by the deterioration of financial conditions of government-sponsored enterprises and by the failure of Lehman Brothers. Global money markets suffered markedly increased strains, with liquidity drying up in financial markets particularly for term funding and with the function reducing across markets. Japan's money markets also experienced further strains after the failure of Lehman Brothers. Interest rates came under upward pressure reflecting a rise in concerns over counterparty risk. It was also because Japanese banks became reluctant to provide funds in interbank markets in their response to increased reliance of firms on bank borrowing.

To address the situation, central banks reduced their policy rates and expanded liquidity provision by implementing various market operations. Central banks as well as governments implemented further measures such as asset purchases to restore liquidity to deteriorated markets. The BoJ not only addressed the situation within a conventional framework, but also introduced a series of extraordinary measures regarding its market operations with a view to facilitating corporate financing.

Major central banks including the BoJ have continued their unprecedented monetary operations.[33] It is necessary to continue to closely monitor how central banks will adjust their market operations and how their actions will impact financial markets during this extraordinary situation.

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Charts

Chart 1

Changes in central banks' current account balances during 2007

(1) Changes in autonomous factors affecting current account balances

¥ billions

	United States		Euro area		Japan	
	Average	Maximum	Average	Maximum	Average	Maximum
Banknotes	108.6 (7%)	386.5 (25%)	n.a. -	n.a. -	166.8 (4%)	765.5 (16%)
Treasury funds	108.2 (7%)	2,802.1 (178%)	n.a. -	n.a. -	948.6 (20%)	9,309.5 (196%)
Total	212.0 (13%)	3,324.9 (211%)	611.4 (2%)	3,404.0 (11%)	965.5 (20%)	9,095.9 (192%)

(2) Differences between the actual size of autonomous factors and projection

¥ billions

	United States		Euro area		Japan	
	Average	Maximum	Average	Maximum	Average	Maximum
Total	77.3 (4.9%)	441.6 (28.1%)	163.4 (0.5%)	610.7 (2.0%)	50.9 (1.1%)	238.2 (5.0%)

Notes: 1. Treasury fund variation for the BoJ in (1) include other factors.

2. (2) shows the daily difference for the Federal Reserve and the BoJ, and the weekly difference for the ECB.

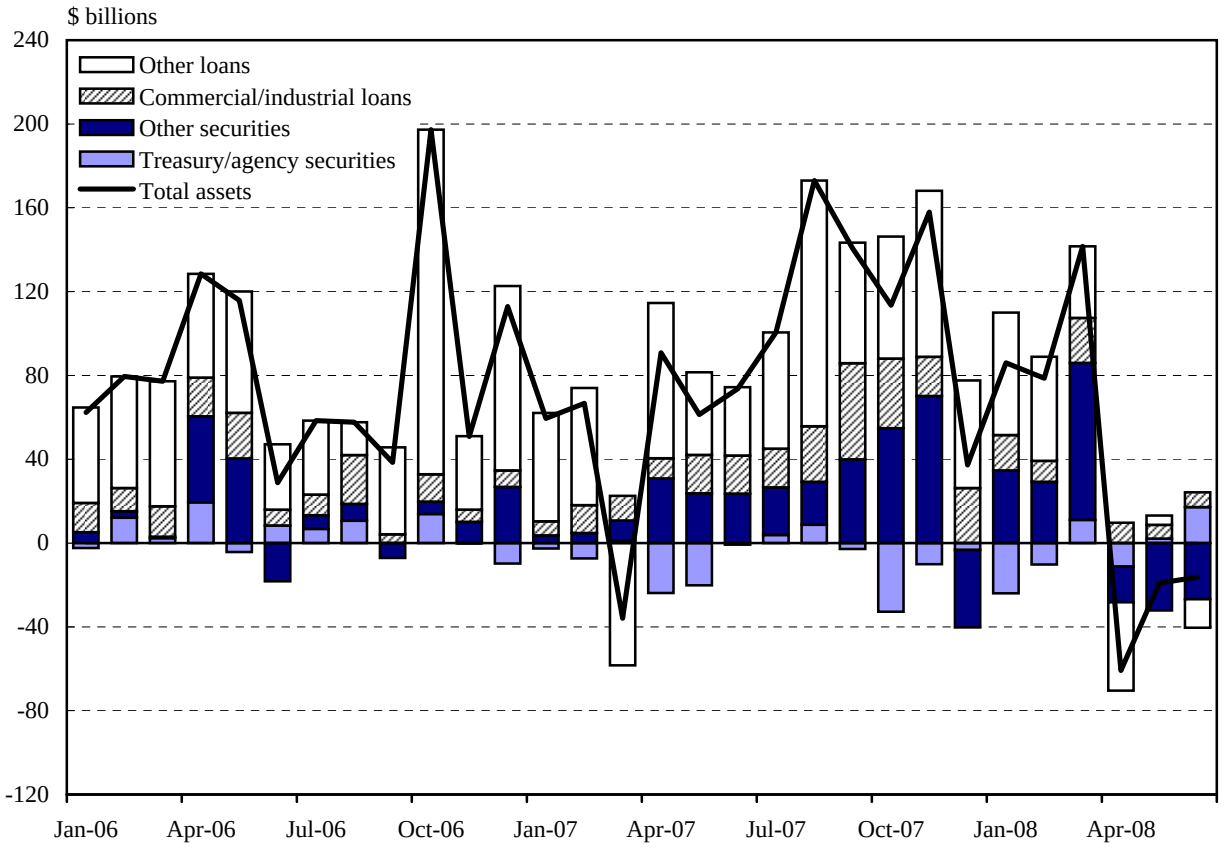
3. Denominated in Japanese yen using the 2007 average foreign exchange rates $1=€0.7297 =¥117.78).

4. Figures in ( ) indicate the ratios to required reserve balances (including required clearing balances for the Federal Reserve).

Sources: Federal Reserve; European Central Bank; Bank of Japan.

Chart 2

Monthly changes in U.S. banks' assets



Notes: 1. Seasonally adjusted.

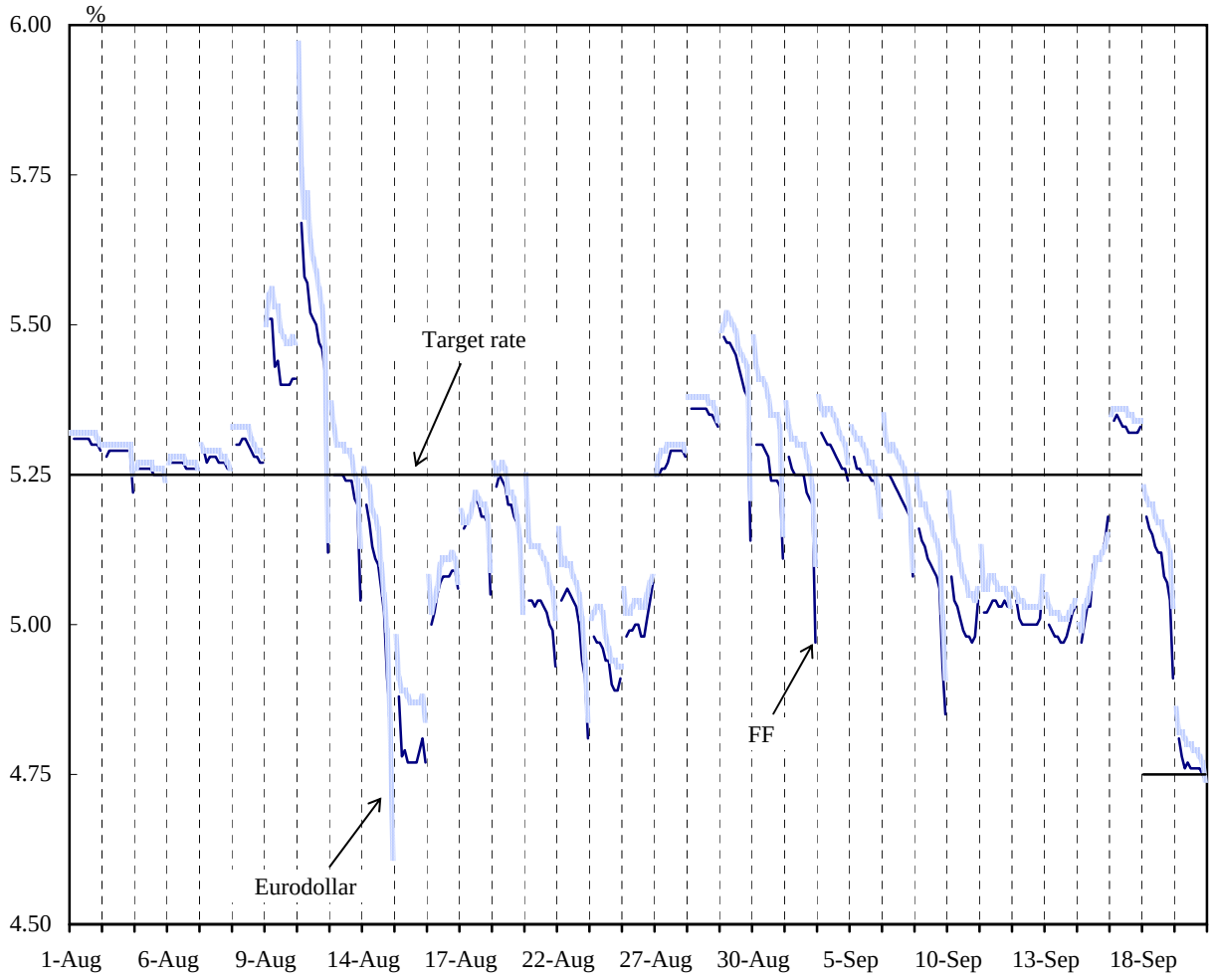
2. Increases in "other securities" from summer 2007 onward reflect that U.S. banks took the assets of their affiliated ABCP conduits and SIVs onto their own balance sheets. Similarly, increases in "commercial/industrial loans" reflect banks' provision of liquidity support to their affiliated ABCP conduits and SIVs and extension of bridge loans to finance LBOs.

3. Decreases in April 2008 reflect that some commercial banks adopted FAS 159, the Fair Value Option for Financial Assets and Financial Liabilities.

Source: Federal Reserve.

Chart 3

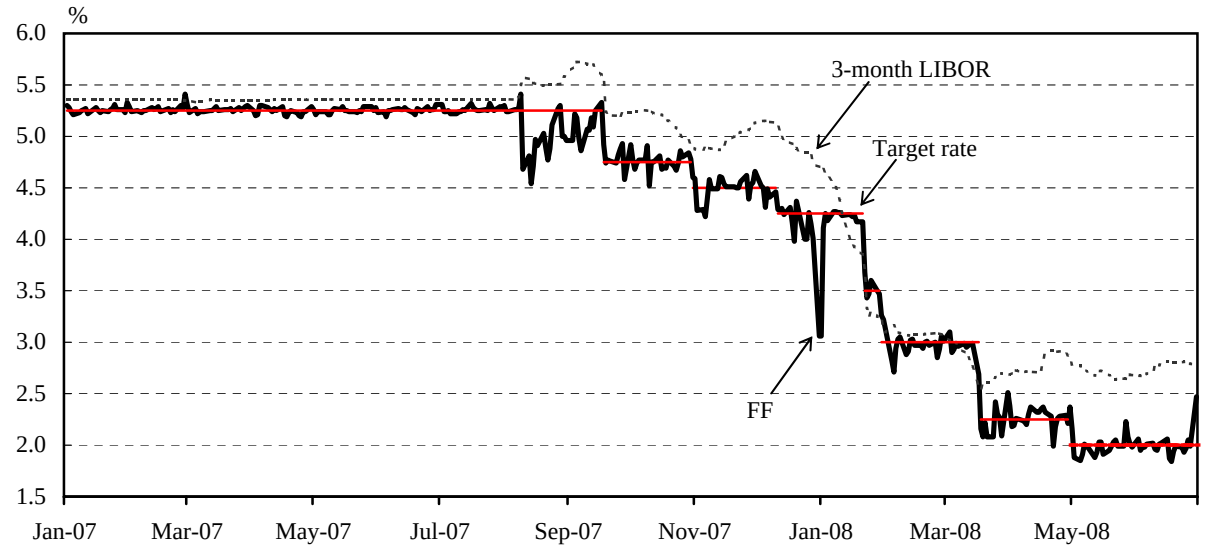
Intraday development in U.S. overnight interest rates



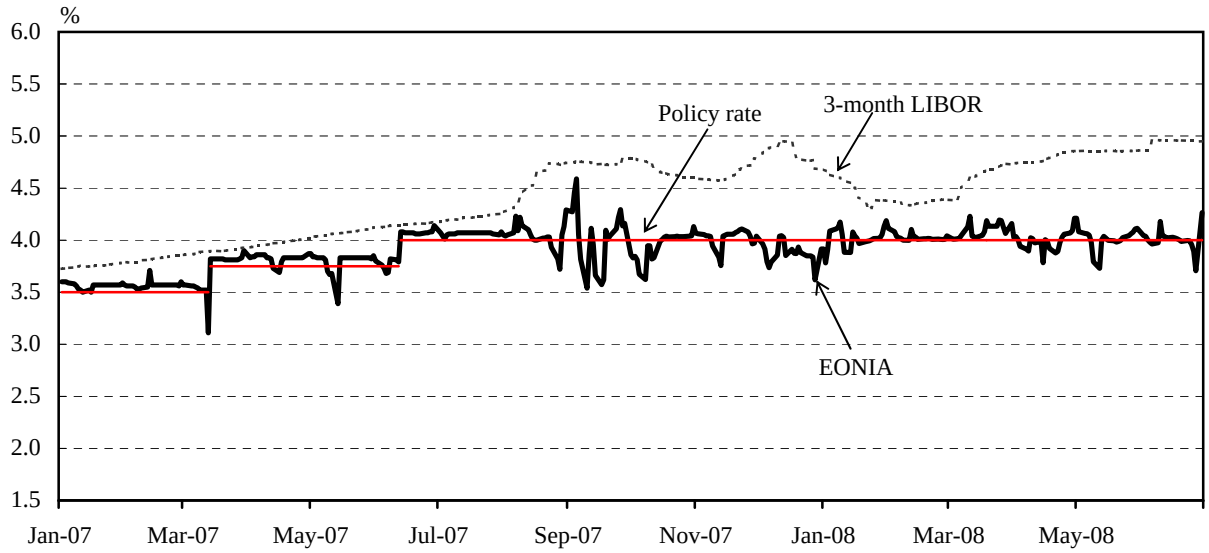
Note: Data cover the period between August 1, 2007 and September 19, 2007.
Daily data start at 8:00 and end at 18:00 in the U.S. Eastern Standard Time.
Source: ICAP.

Short-term interest rates

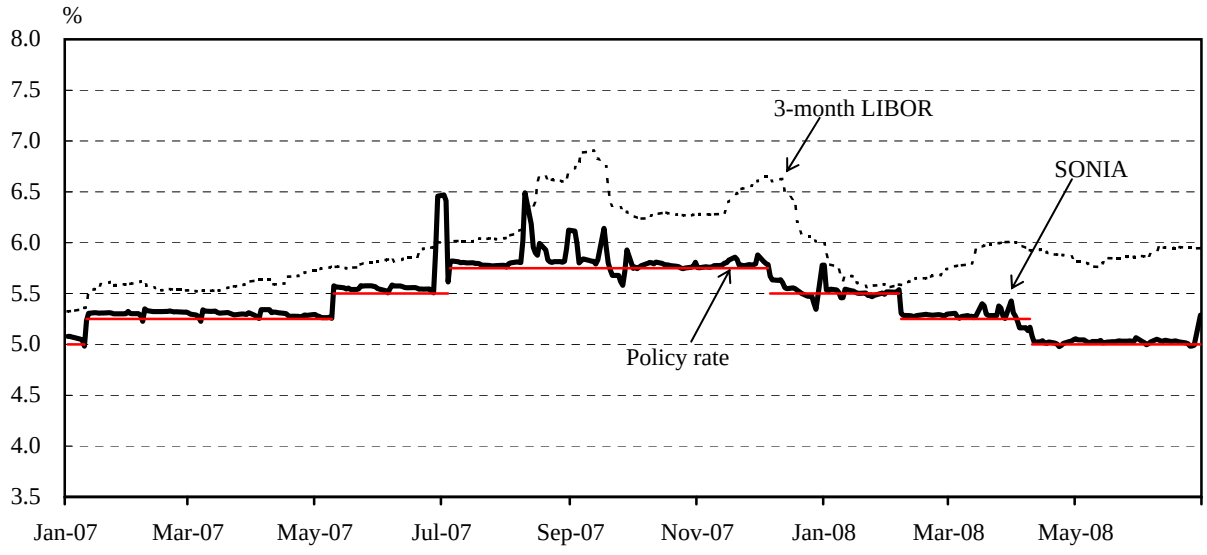
(1) U.S. dollar



(2) Euro



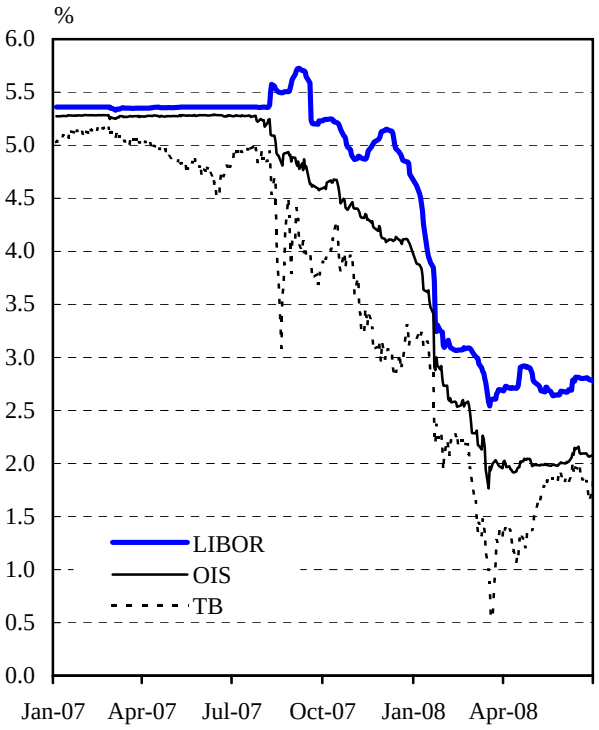
(3) Pound Sterling



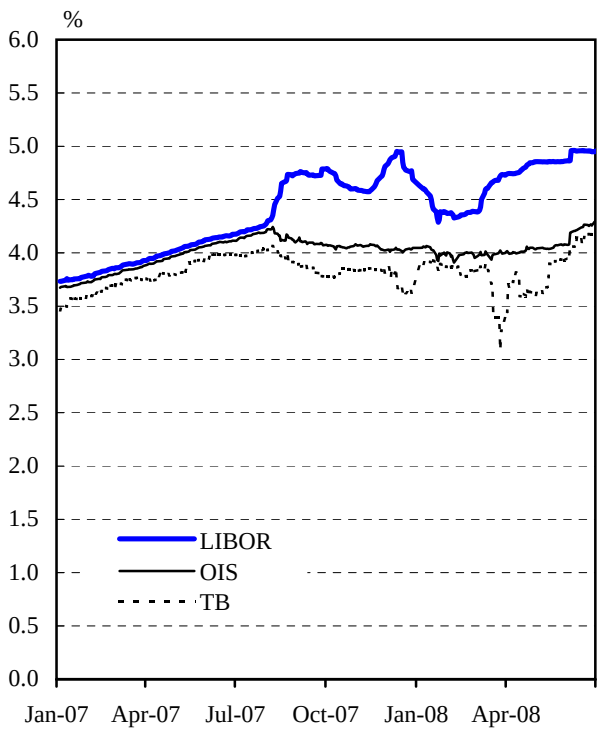
Source: Bloomberg.

3-month interest rates

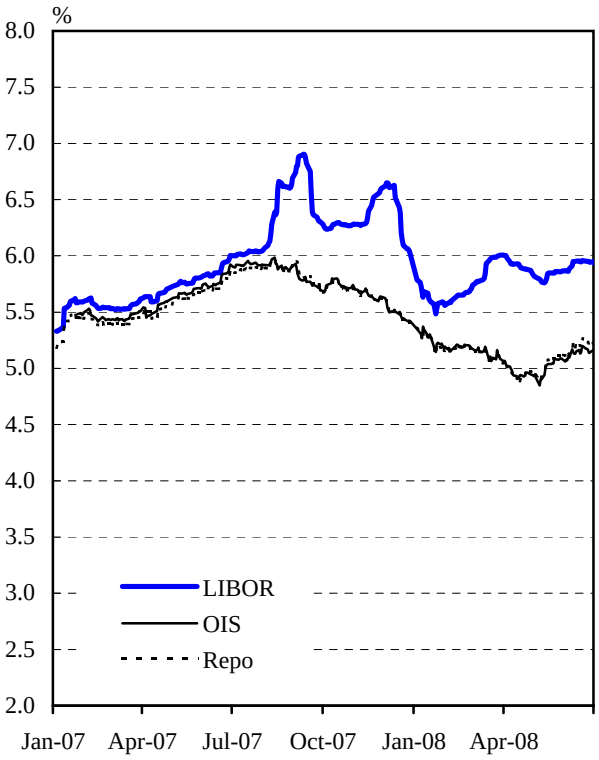
U.S. dollar



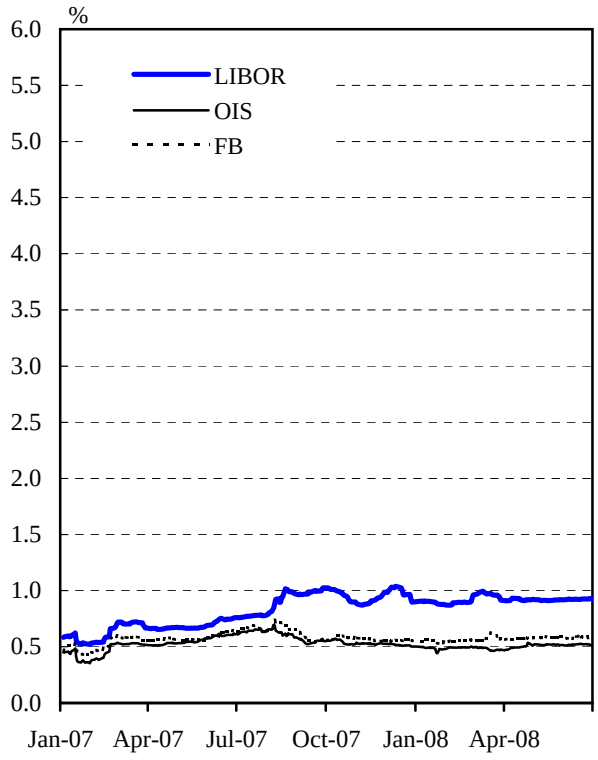
Euro



Pound Sterling



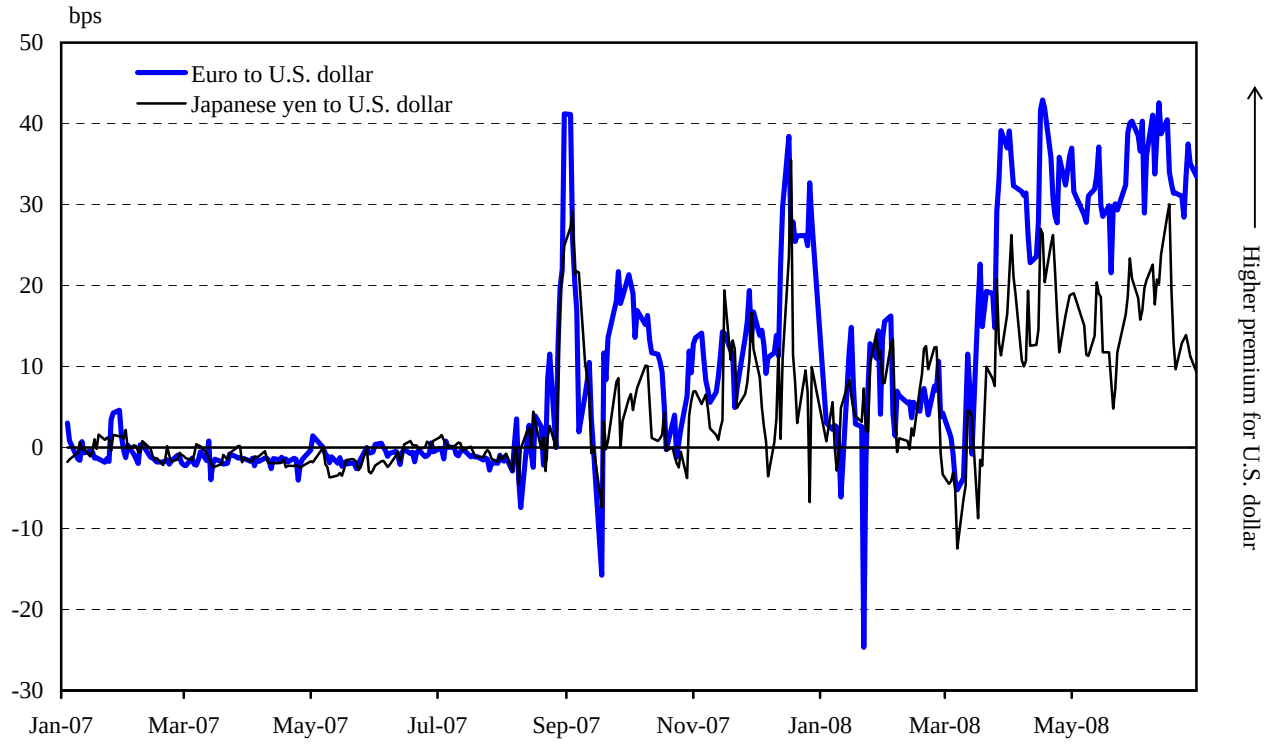
Japanese yen



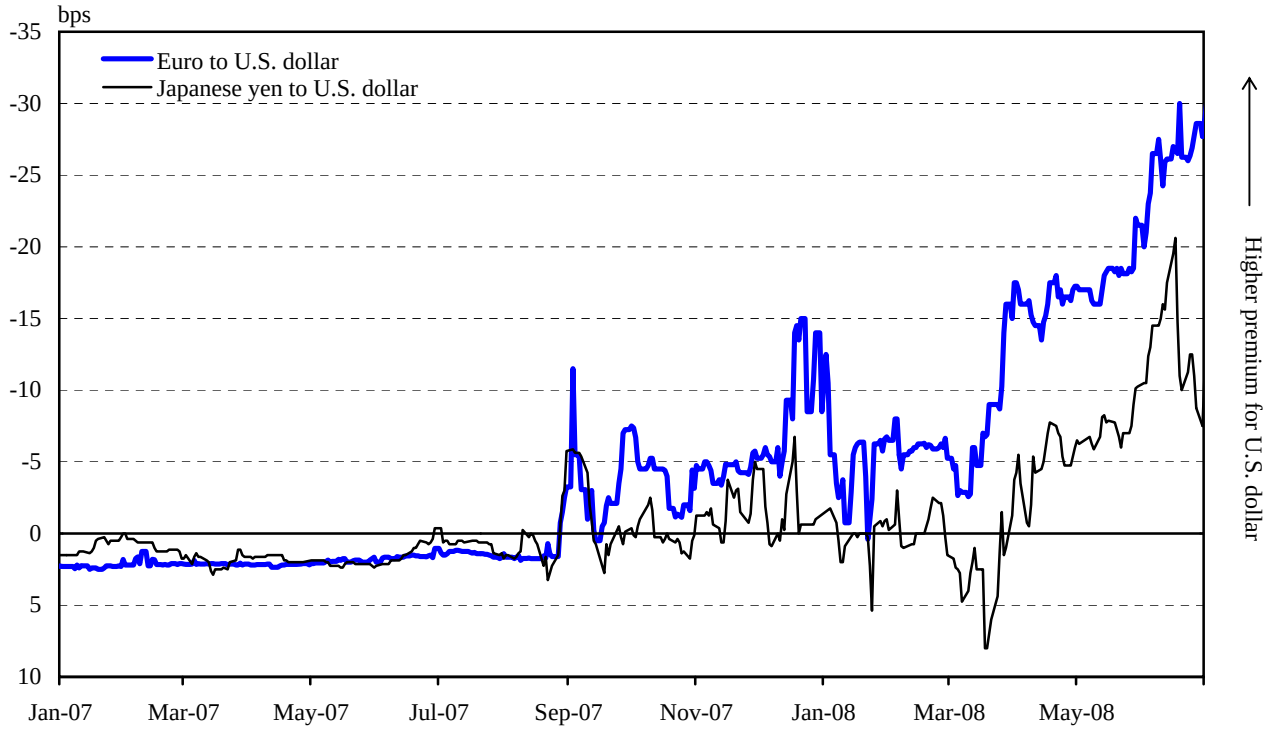
Sources: Bloomberg; Meitan Tradition; Japan Bond Trading.

U.S. dollar funding premiums

(1) 3-month foreign exchange swaps



(2) 1-year basis swaps

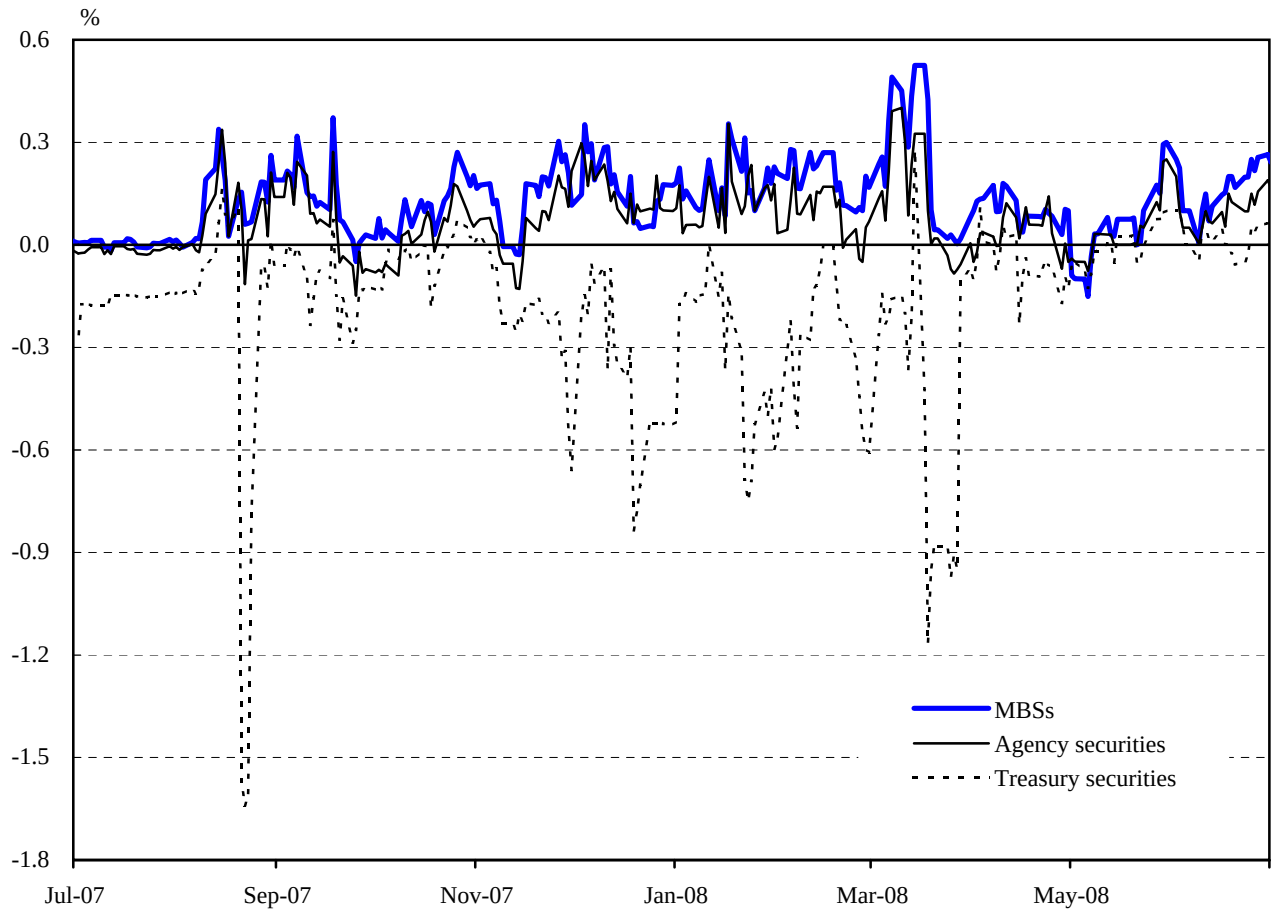


Notes: 1. (1) indicates differences between foreign exchange swap implied dollar rates and U.S. dollar LIBOR.
2. (2) indicates premiums added on the counterpart currency LIBOR exchanged with U.S. dollar LIBOR during a contract period.

Sources: Bloomberg; Meitan Tradition; QUICK.

Chart 7

U.S. repo-OIS spreads by collateral type



Note: 2-week maturity.
Sources: Bloomberg; Reuters.

Chart 8

Selected statements made by central banks

Federal Reserve

- **Overnight mass supplying (August 10, 2007)**: The Federal Reserve is providing liquidity to facilitate the orderly functioning of financial markets. The Federal Reserve will provide reserves as necessary through open market operations to promote trading in the federal funds market at rates close to the Federal Open Market Committee's target rate of 5-1/4 percent.
- **Modification to lending facility (August 17)**: To promote the restoration of orderly conditions in financial markets, the Federal Reserve Board approved temporary changes to its primary credit discount window facility. [snip] These changes are designed to provide depositories with greater assurance about the cost and availability of funding.
- **Major banks' endorsement (August 17)**: At the request of the President of the Federal Reserve Bank of New York, The Clearing House convened telephonic meeting this morning of The Clearing House members and major investment banking firms. [snip] The Vice Chairman of the Board of Governors of the Federal Reserve System also participated. [snip] The participants on the call welcomed and expressed strong support for the Federal Reserve actions. They reacted very positively to comments by the New York Reserve Bank President and the Board of Governors Vice Chairman that both encouraged use of the discount window and recognized such use as a sign of strength.
- **Operation covering year-end*** **(November 26)**: In response to heightened pressures in money markets for funding through the year-end, the Federal Reserve Bank of New York's Open Market Trading Desk plans to conduct a series of term repurchase agreements that will extend into the new year. [snip] In addition, the Desk plans to provide sufficient reserves to resist upward pressures on the federal funds rate above the FOMC's target rate around year-end.
- **System Open Market Account activity*** **(December 3)**: On Thursday, December 6, 2007, the Federal Reserve's System Open Market Account will redeem $5 billion of Treasury bill holdings. This action is designed to give the Federal Reserve Open Market Desk greater flexibility in the day-to-day management of reserve levels. The Desk will continue to evaluate the need for the use of other tools to add flexibility to its open market operations. These may include further Treasury bill redemptions, reverse repurchase agreements and Treasury bill sales.
- **Term Auction Facility (December 12)**: By allowing the Federal Reserve to inject term funds through a broader range of counterparties and against a broader range of collateral than open market operations, this facility could help promote the efficient dissemination of liquidity when the unsecured interbank markets are under stress.
- **Increase in the size of TAF and 28-day repo (March 7, 2008)**: The Federal Reserve on Friday announced two initiatives to address heightened liquidity pressures in term funding markets. [snip] The Federal Reserve will increase these auction sizes further if conditions warrant. To provide increased certainty to market participants, the Federal Reserve will continue to conduct TAF auctions for at least the next six months unless evolving market conditions clearly indicate that such auctions are no longer necessary. [snip] As with the TAF auction sizes, the Federal Reserve will increase the sizes of these term repo operations if conditions warrant.
- **System Open Market Account activity*** **(March 7)**: The Federal Reserve's System Open Market Account will sell $10 billion of Treasury bill holdings for settlement on Monday, March 10. This action is being conducted by the Federal Reserve Open Market Trading Desk in conjunction with the series of term RP transactions announced earlier today in order to maintain a level of reserves consistent with trading at rates around the operating objective for the overnight federal funds rate. The Desk will continue to evaluate the need for the use of other tools to add flexibility to its open market operations. These may include further Treasury bill sales, reverse repurchase agreements, Treasury bill redemptions and changes in the sizes of conventional RP transactions.
- **Term Securities Lending Facility (March 11)**: The TSLF is intended to promote liquidity in the financing markets for Treasury and other collateral and thus to foster the functioning of financial markets more generally.

* indicates statements made by the Federal Reserve Bank of New York.

Federal Reserve (continued)

- **Primary Dealer Credit Facility (March 16)**: The Federal Reserve Board voted unanimously to authorize the Federal Reserve Bank of New York to create a lending facility to improve the ability of primary dealers to provide financing to participants in securitization markets.
- **Increase in the size of TAF (May 2)**: In view of the persistent liquidity pressure in some term funding market, the European Central Bank, the Federal Reserve, and the Swiss National Bank are announcing an expansion of their liquidity measures. [snip] The wider pool of collateral should promote improved financing conditions in a broader range of financial markets.

European Central Bank

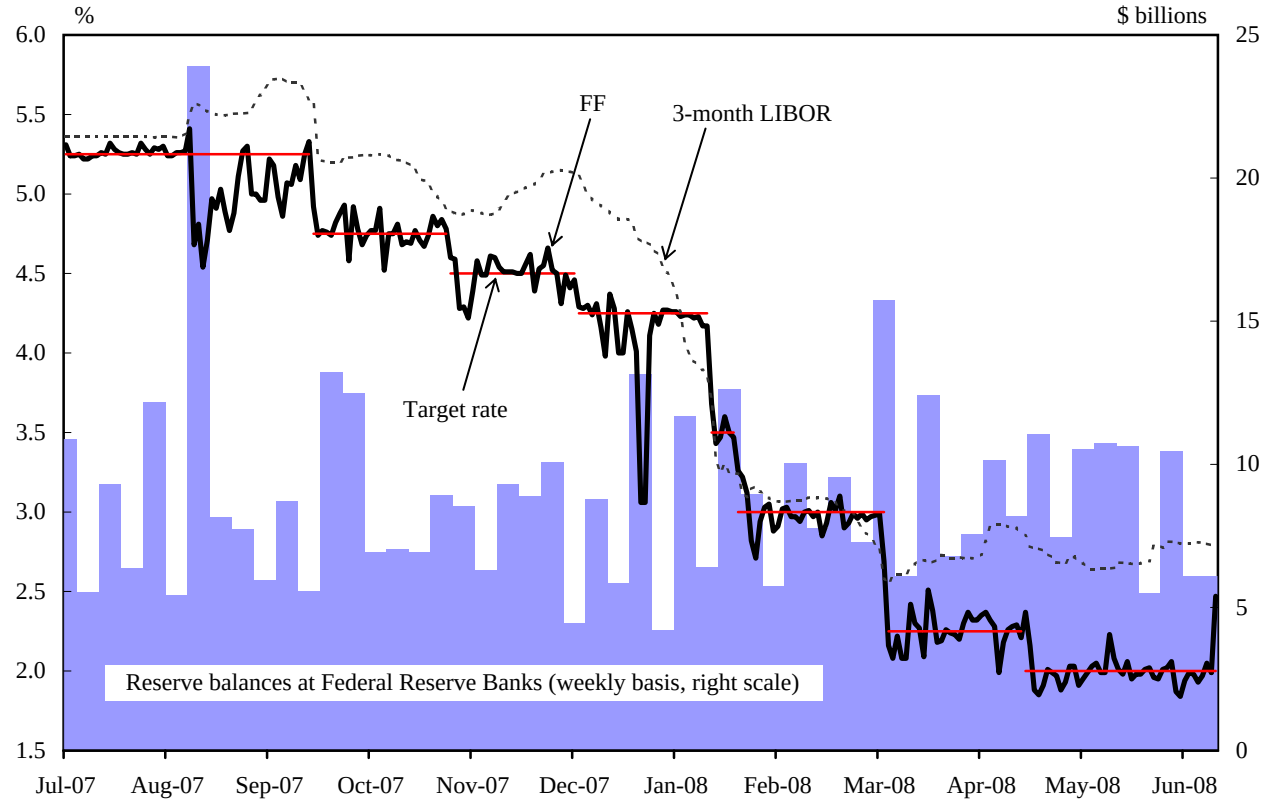
- **Fixed rate tender to allot 100% of bids (August 9, 2007)**: The ECB notes that there are tensions in the euro money market notwithstanding the normal supply of aggregate euro liquidity. The ECB is closely monitoring the situation and stands ready to act to assure orderly conditions in the euro money market.
- **Supplementary 3-month operation (August 22)**: This operation is a technical measure aimed at supporting the normalisation of the functioning of the euro money market.
- **New liquidity management policy (October 8)**: The ECB continues to closely monitor liquidity conditions and aims at further reducing the volatility of very short term rates around the MRO minimum bid rate. For this purpose, the ECB will reinforce its policy of allocating more liquidity than the benchmark amount in main refinancing operations to accommodate the demand of counterparties to fulfill reserve requirements early within the maintenance period. The difference between the allotted and the benchmark amount is envisaged to decline gradually in the course of the maintenance period, taking into account the prevailing market conditions.
- **Operation covering year-end (November 30)**: The Governing Council decided yesterday, by means of a teleconference, to lengthen the maturity of the main refinancing operation settling on 19 December 2007 to two weeks. [snip] In this operation, the ECB will aim to satisfy the banking sector's liquidity needs for the entire two-week period, covering both the Christmas holidays and the end of the year. [snip] The main refinancing operation settling on 28 December 2007 will allow potential further liquidity demands to be satisfied. The ECB continues to monitor liquidity conditions in order to keep very short term rates close to the minimum bid rate.
- **Foreign exchange swap agreement (December 12)**: The Governing Council of the ECB has decided to take joint action with the Federal Reserve by offering US dollar funding to Eurosystem counterparties.
- **Supplementary 6- and 3-month operations (March 28, 2008)**: These supplementary three-month and six-month LTROs are aimed at supporting the normalisation of the functioning of the euro money market.
- **Increase in the size of foreign exchange swap line (May 2)**: It is intended to continue the provision of USD liquidity for as long as the Governing Council considers it to be needed in view of the prevailing market conditions.

Bank of England

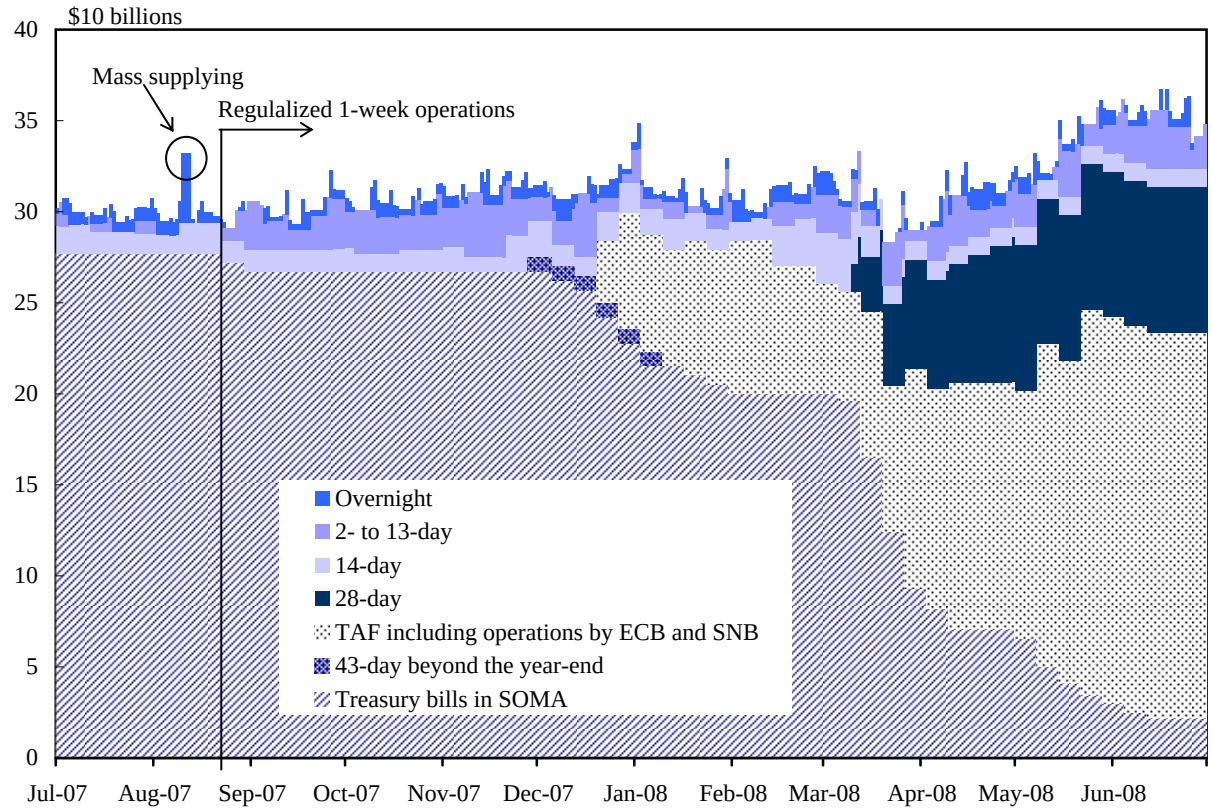
- **Increase in reserve balances (September 5, 2007)**: The Bank of England's objective is that, over the coming maintenance period, interest rates on secured overnight borrowing should be close to Bank Rate. [snip] The source of these problems does not, therefore, lie in a lack of central bank liquidity.
- **Exceptional 2-day operation (September 18)**: This action [snip] is being taken to help to offset the disturbance to conditions in the short-term money markets following the announcement of LOLR assistance to Northern Rock last Friday morning. Since then, secured overnight money market rates have again been unusually high relative to Bank Rate.
- **3-month term auction (September 19)**: This measure is being taken in order to alleviate the strains in longer-maturity money markets. [snip] This will help to ensure that the secured overnight rate is in line with the Bank Rate set by the Monetary Policy Committee.
- **Operation covering year-end (November 29)**: In order to alleviate concerns that money market conditions will be particularly tight over the year-end, and to provide greater assurance to banks in managing their liquidity positions over that period, the Bank intends to offer a significant proportion of its scheduled supply of reserves during the maintenance period beginning on 6 December in the form of a 5-week repo Open Market Operation.
- **Exceptional 3-day operation (March 17, 2008)**: This action is being taken in response to conditions in the short-term money markets this morning. The Bank will take actions to ensure that the overnight rate is close to Bank Rate.
- **Treasury Select Committee opening statement made by Bank of England Governor (March 26)**: Such lending can be only a temporary measure but it can be a useful bridge to a longer-term solution.
- **Special Liquidity Scheme (April 21)**: With markets for many securities currently closed, banks have on their balance sheets an 'overhang' of these assets, which they cannot sell or pledge as security to raise funds. Their financial position has been stretched by this overhang so banks have been reluctant to make new loans, even to each other. [snip] By tackling decisively the overhang of assets in this way, the Scheme aims to improve the liquidity position of the banking system and increase confidence in financial markets.
- **Increase in the reserves target (May 2)**: In view of the increase in the reserves targets set by reserves scheme members in recent months, and the potential for increase in future months, with effect from the maintenance period starting on 8 May, the Bank will set the reserves target ceiling for each reserves scheme member as the higher of £2.5 billion and 5% of its sterling eligible liabilities as calculated for Cash Ratio Deposit purposes (rounded up to the nearest £10 million).

Recent operations conducted by the Federal Reserve

(1) FF rate and reserve balances



(2) Amounts outstanding



Sources: Federal Reserve; Bloomberg.

Chart 10

Coordinated measures taken by three central banks

	Federal Reserve	European Central Bank	Swiss National Bank
Type	- Term Auction Facility	- Foreign exchange swap line with the Federal Reserve - U.S. dollar liquidity-providing	- Foreign exchange swap line with the Federal Reserve - U.S. dollar liquidity-providing
Maturity	- 1-month for liquidity-providing	- Swap lines term 1) 2) until Sep. 2008; and 3) until Jan. 2009 - 1-month for liquidity-providing	- Swap lines term 1) 2) until Sep. 2008; and 3) until Jan. 2009 - 1-month for liquidity-providing
Frequency	- Twice per month	- In conjunction with TAF, twice per month except for zero in Feb. and once in Mar.	- In conjunction with TAF, 1) 2) once per month except for zero in Feb; and 3) twice per month
Sizes	- Liquidity-providing: 1) $20bn in Dec. and $30bn in Jan.-Feb.; 2) $50bn; and 3) $75bn	- Swap lines: 1) $20bn; 2) $30bn; and 3) $50bn - Liquidity-providing: 1) $10bn; 2) $15bn; and 3) $25bn	- Swap lines: 1) $4bn; 2) $6bn; and 3) $12bn - Liquidity-providing: 1) $4bn; 2) $6bn; and 3) $6bn
Counterparties	- Primary credit users	- Marginal lending facility users	- Counterparties eligible for usual operations
Collateral	- Collateral eligible for primary credit	- Collateral eligible for usual operations - Margin of 17% for FX rate risk	- Collateral eligible for usual operations
Pricing	- Variable rate tender with Dutch style - Minimum bid rate at OIS rates	- Fixed rate tender at the stop-out rate of TAF	- Variable rate tender with conventional style

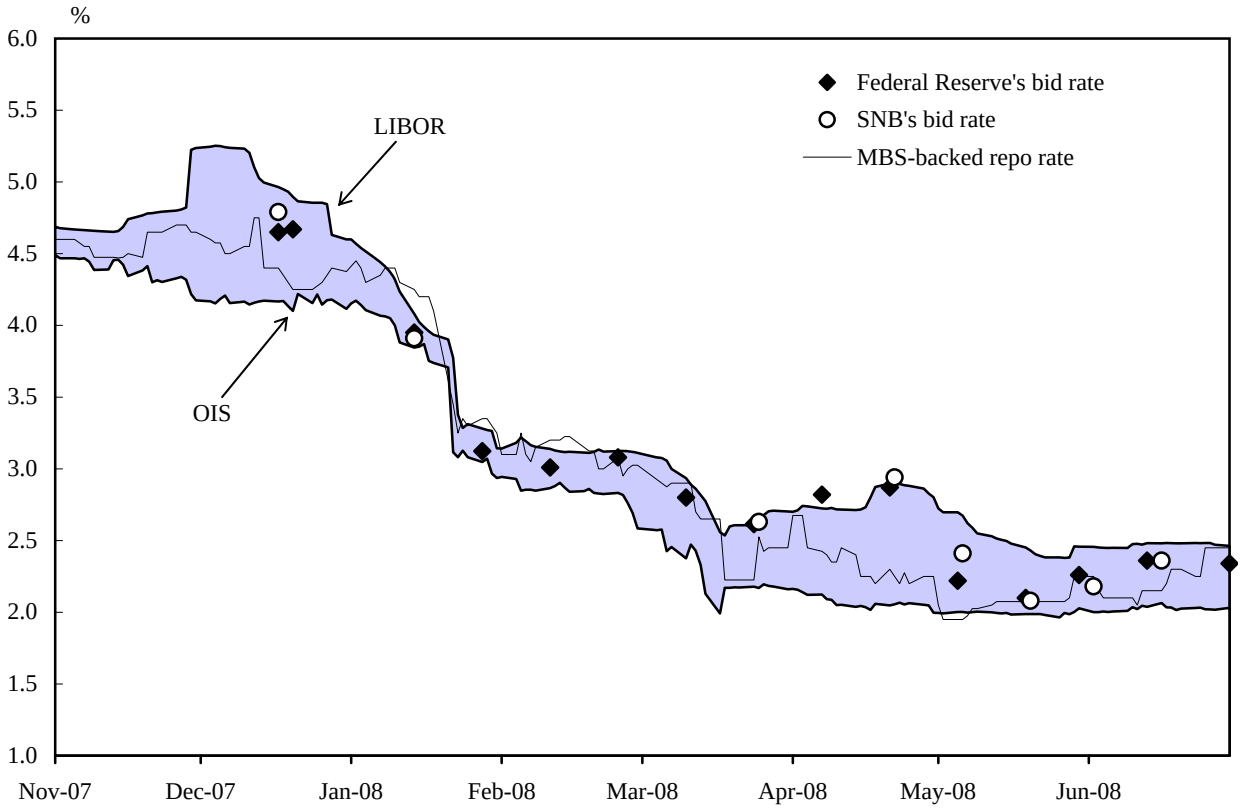
Note: 1), 2), and 3) in Table indicate decision-making on December 12, 2007 (or January 4, 2008), on March 7 (or March 11), and on May 2, respectively.

Chart 11

Federal Reserve's liquidity measures for primary dealers

	28-day repos	Term Securities Lending Facility（TSLF）	Primary Dealer Credit Facility（PDCF）
Outline	- 28-day repos with longer maturity than those of usual overnight and 2-week operations	- Federal Reserve offers Treasury securities to primary dealers in exchange for other securities including agency securities and MBSs	- PDCF lends to primary dealers while the existing primary credit lends to depository institutions
Maturity	- 28 days	- 28 days (the existing SLP is on an overnight basis)	- Overnight. New loans can be taken out each day
Frequency	- Once per week	- Once per week, alternating schedule 1 and 2 collaterals	- At any time - PDCF remains available for at least 6 months or longer
Securities		- Treasury securities held by Federal Reserve. TSLF offers Treasury GC while the existing SLP offers specific Treasury securities	
Collateral	- Treasury securities, agency securities, and agency MBSs	- Schedule 1: Treasury securities, agency securities, and agency MBSs - Schedule 2: In addition to Schedule 1 collateral, AAA/Aaa-rated private-label RMBSs; in Mar. 20, agency CMOs, and AAA/Aaa-rated CMBSs were added; and in May 2, AAA/Aaa-rated ABSs were added	- Treasury securities, agency securities, and agency MBSs all investment-grade corporate bonds, municipal bonds, MBSs, and ABSs - Collateral that is not priced by the clearing banks is not eligible
Lending rate			- Primary credit rate
Sizes	- $100bn in total - $15bn in 1st-5th auctions, and $20bn in 6th and afterward	- Federal Reserve lends up to $200bn ($75bn in 1st auction) - A dealer can borrow no more than 20% of the par value offered	- A dealer can borrow up to the margin-adjusted collateral they can deliver
Others		- All transfers are made through the dealer's designated clearing bank account	- All transfers are made through the dealer's clearing bank account

Term Auction Facility

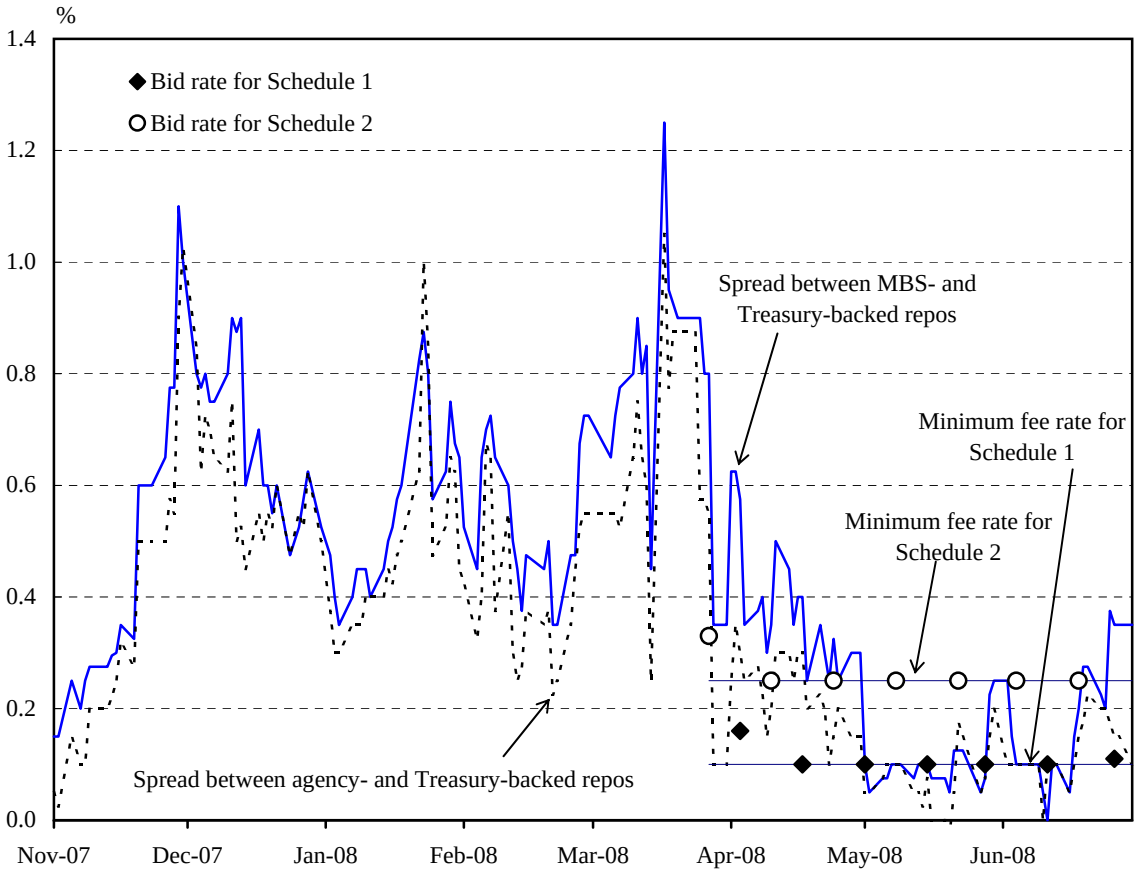


	Federal Reserve				ECB			SNB		
	Submission date	Size ($ bn)	Bid to cover	Bid rate (%)	Size ($ bn)	Bid to cover	Bid rate (%)	Size ($ bn)	Bid to cover	Bid rate (%)
1st	2007/12/17	20	3.08	4.650	10	2.21	4.650	4	4.25	4.790
2nd	2007/12/20	20	2.88	4.670	10	1.41	4.670	-	-	-
3rd	2008/1/14	30	1.85	3.950	10	1.48	3.950	4	2.72	3.910
4th	2008/1/28	30	1.25	3.123	10	1.24	3.123	-	-	-
5th	2008/2/11	30	1.95	3.010	-	-	-	-	-	-
6th	2008/2/25	30	2.27	3.080	-	-	-	-	-	-
7th	2008/3/10	50	1.85	2.800	-	-	-	-	-	-
8th	2008/3/24	50	1.78	2.615	15	2.08	2.615	6	2.47	2.630
9th	2008/4/7	50	1.83	2.820	15	2.05	2.820	-	-	-
10th	2008/4/21	50	1.77	2.870	15	2.01	2.870	6	2.56	2.940
11th	2008/5/5	75	1.29	2.220	25	1.58	2.220	6	1.62	2.410
12th	2008/5/19	75	1.13	2.100	25	2.36	2.100	6	1.28	2.080
13th	2008/6/2	75	1.28	2.260	25	2.59	2.260	6	1.89	2.180
14th	2008/6/16	75	1.19	2.360	25	3.14	2.360	6	3.04	2.360
15th	2008/6/30	75	1.21	2.340	25	3.39	2.340	6	2.75	2.250

Note: 1-month maturity.

Sources: Federal Reserve; European Central Bank; Swiss National Bank; Bloomberg.

Term Securities Lending Facility



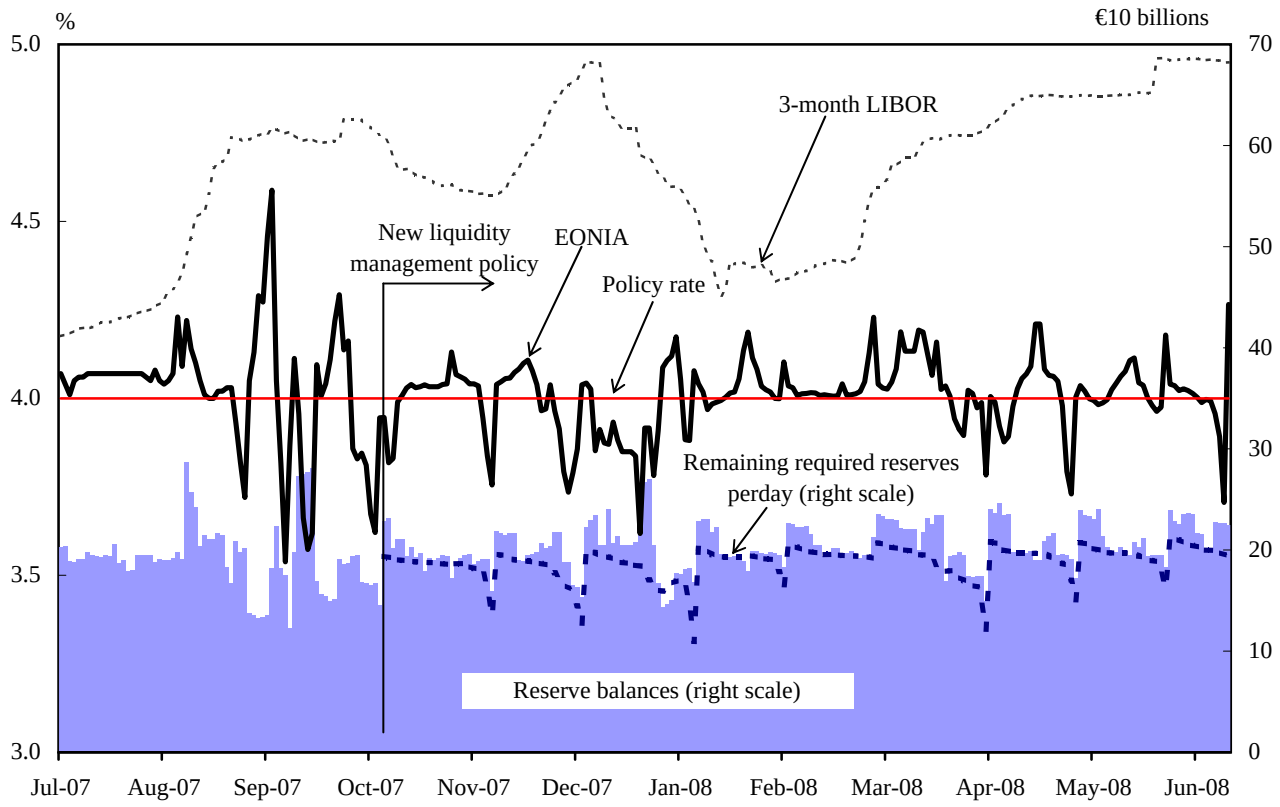
	Submission date	Schedule	Size ($ bn)	Bid to cover	Bid rate (%)	Amounts outstanding ($ bn)
1st	2008/3/27	2	75	1.15	0.33	75
2nd	2008/4/3	1	25	1.88	0.16	100
3rd	2008/4/10	2	50	0.68	0.25	134
4th	2008/4/17	1	25	1.40	0.10	159
5th	2008/4/24	2	75	0.79	0.25	143
6th	2008/5/1	1	25	0.96	0.10	143
7th	2008/5/8	2	50	0.58	0.25	137
8th	2008/5/15	1	25	0.29	0.10	120
9th	2008/5/22	2	75	0.62	0.25	106
10th	2008/5/29	1	25	0.66	0.10	99
11th	2008/6/5	2	50	0.54	0.25	97
12th	2008/6/12	1	25	1.09	0.10	114
13th	2008/6/19	2	75	0.49	0.25	105
14th	2008/6/26	1	25	0.62	0.11	104

Note: 1-month maturity.
Sources: Federal Reserve; Bloomberg.

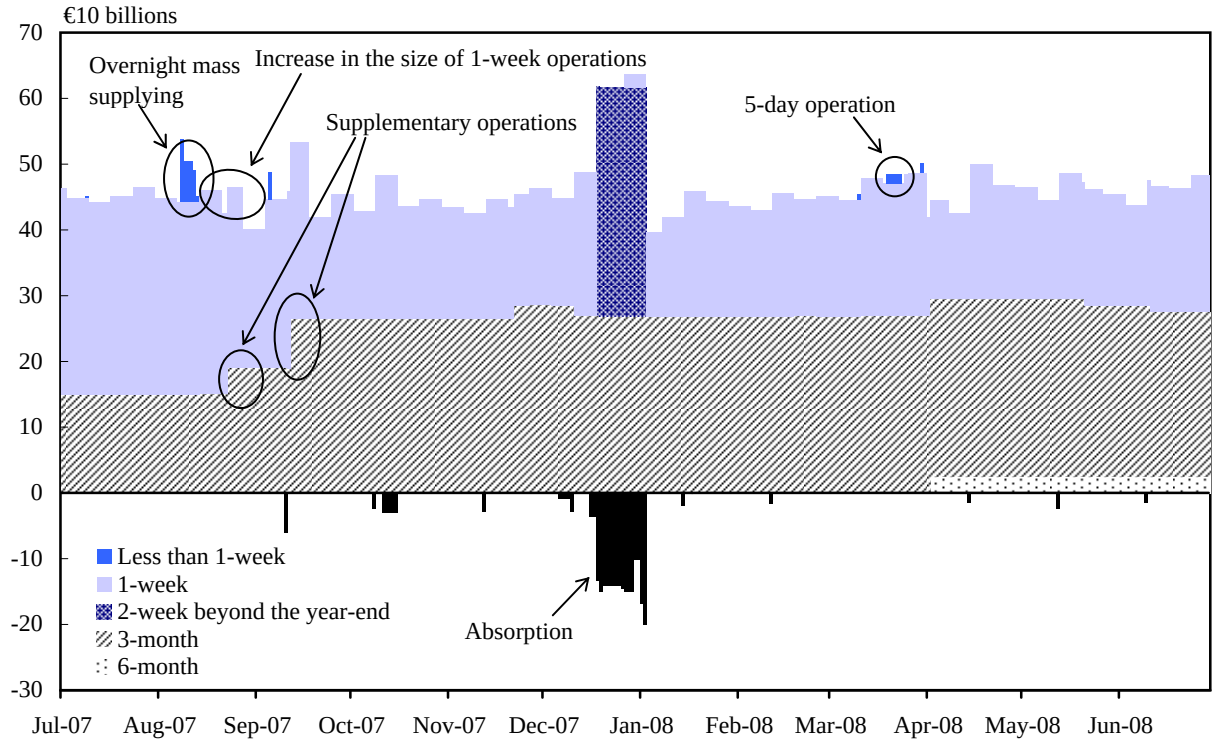
Chart 14

Recent operations conducted by the European Central Bank

(1) EONIA and reserve balances



(2) Amounts outstanding

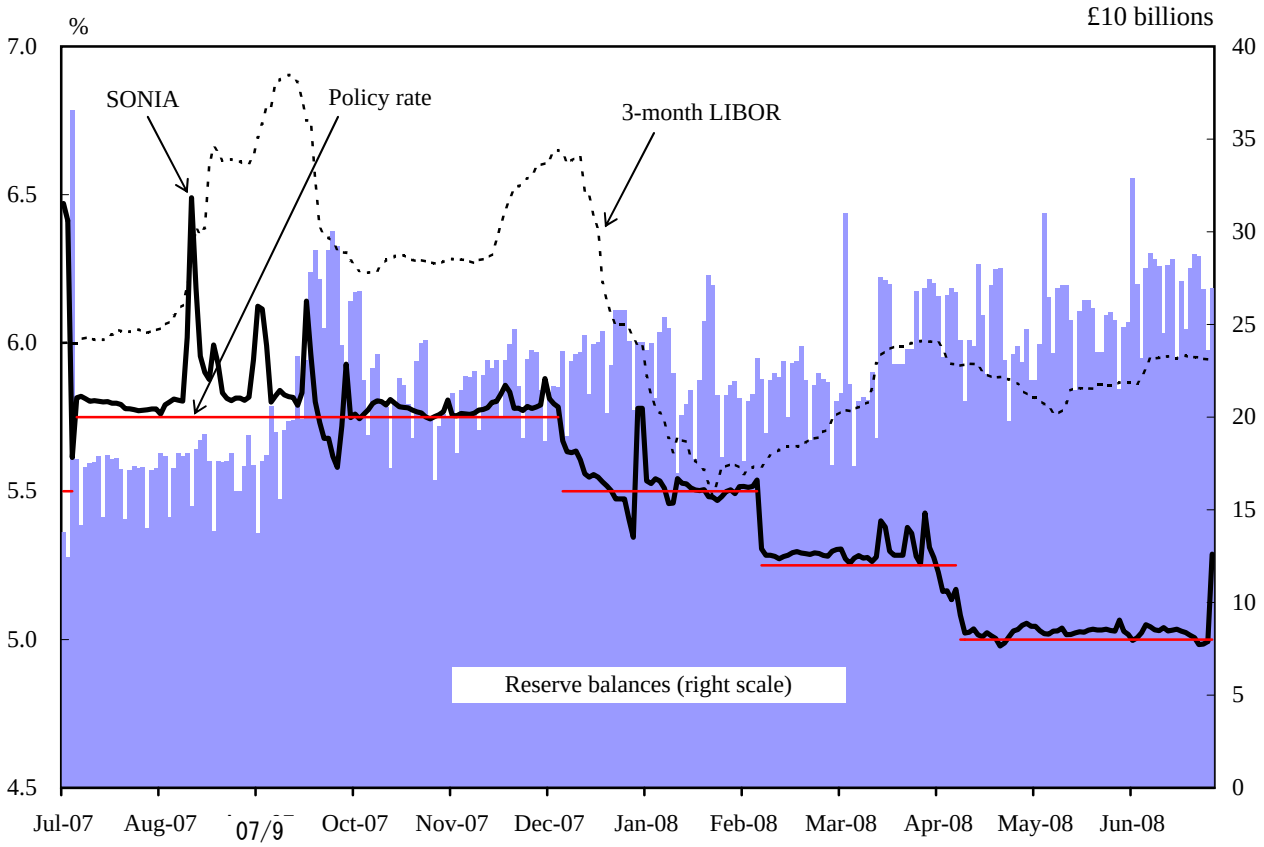


Sources: European Central Bank; Bloomberg.

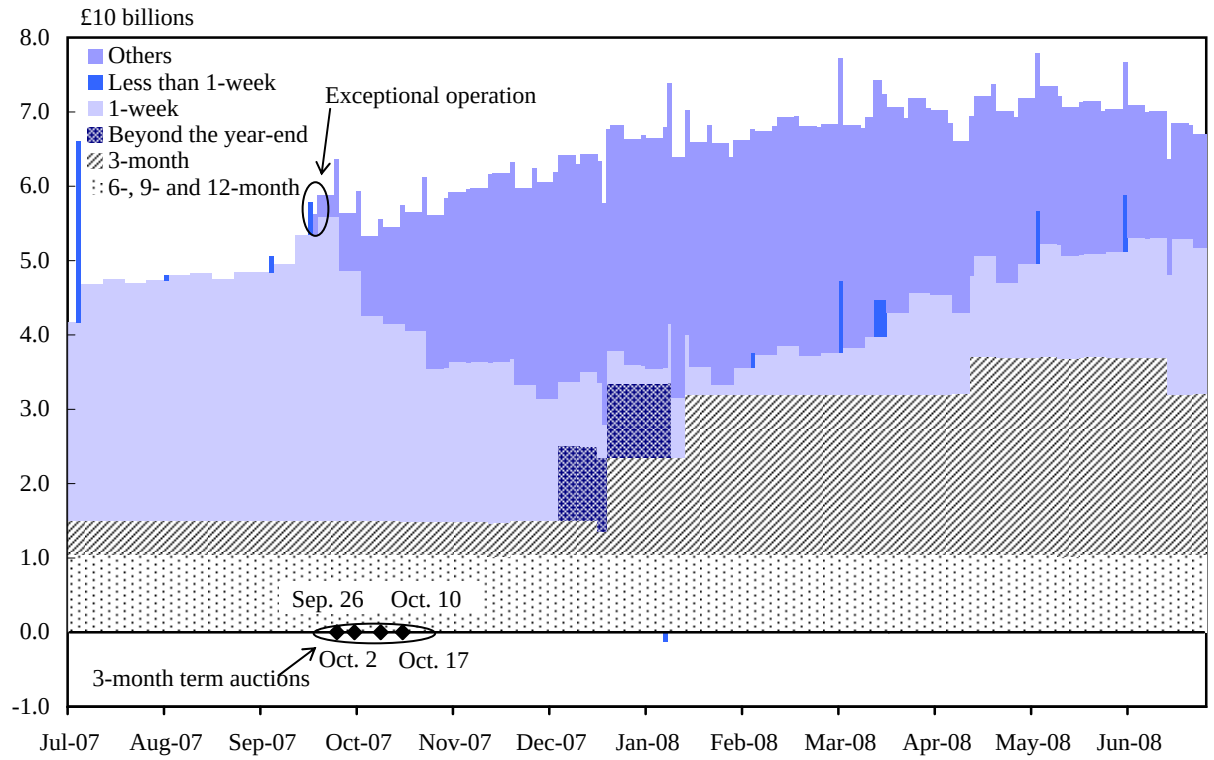
Chart 15

Recent operations conducted by the Bank of England

(1) SONIA and reserve balances



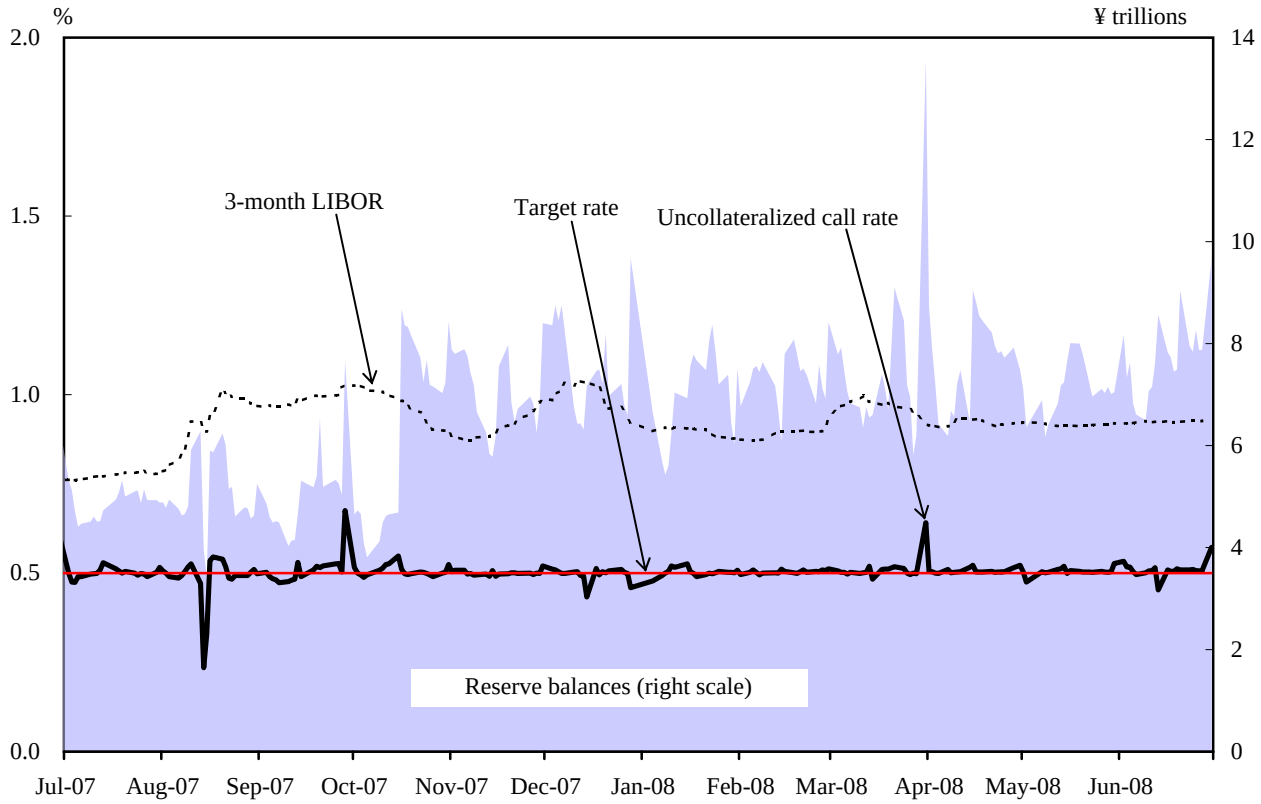
(2) Amounts outstanding



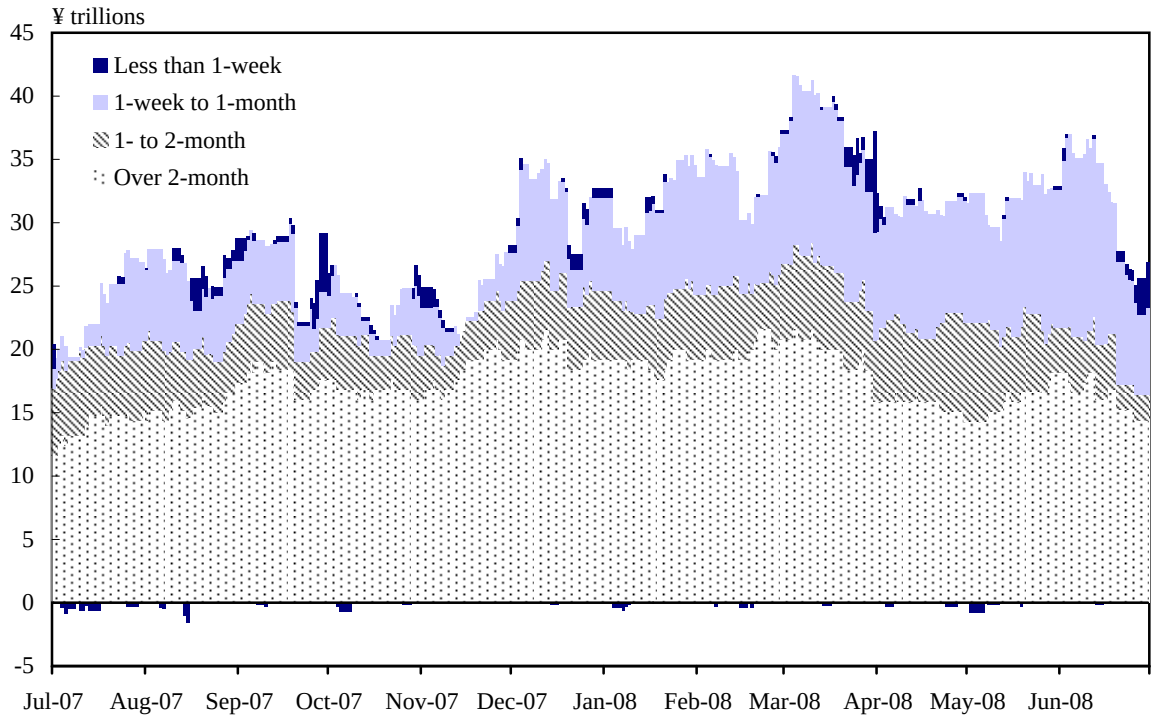
Note: "Others" indicates an increment of the other assets including the lending to Northern Rock.
Sources: Bank of England, Bloomberg.

Recent operations conducted by the Bank of Japan

(1) Uncollateralized call rate and reserve balances



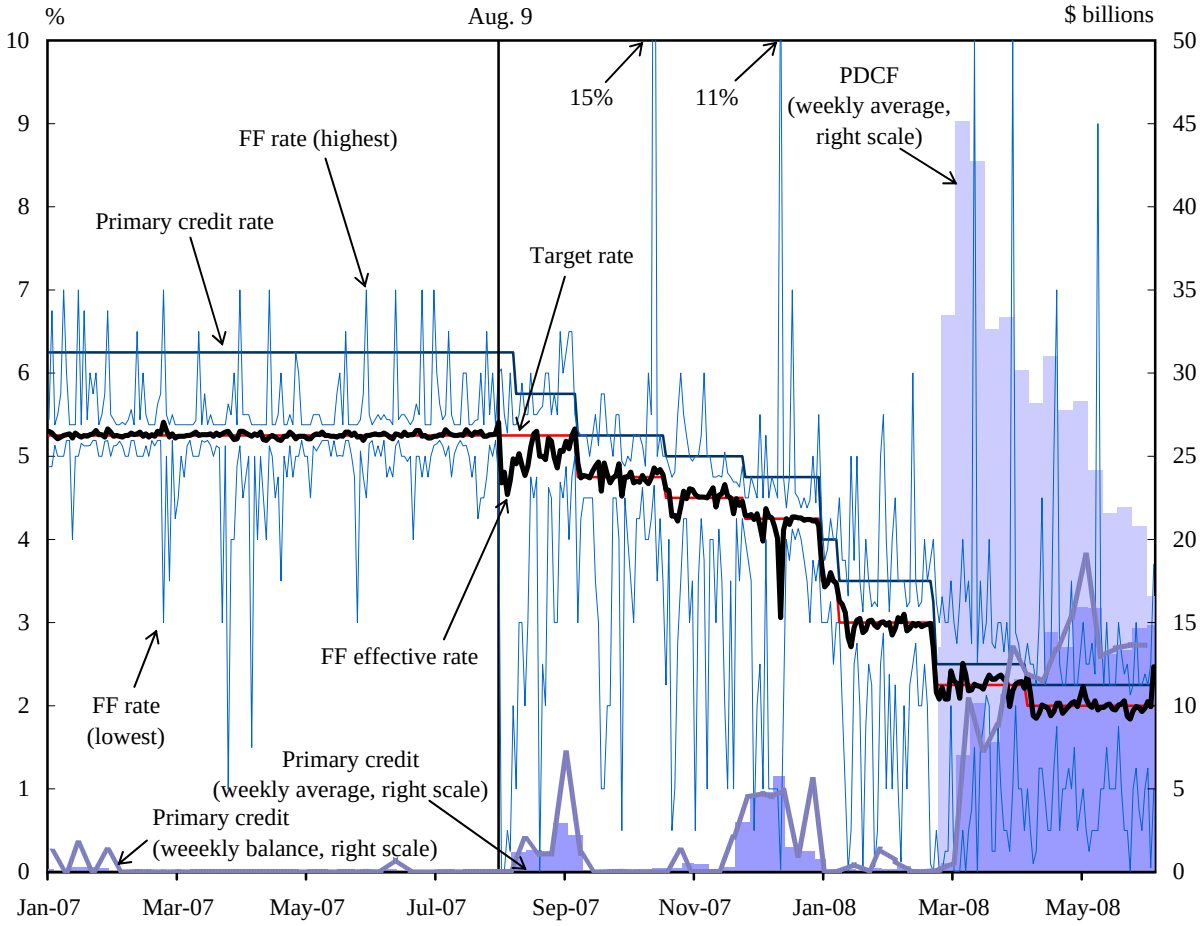
(2) Amounts outstanding



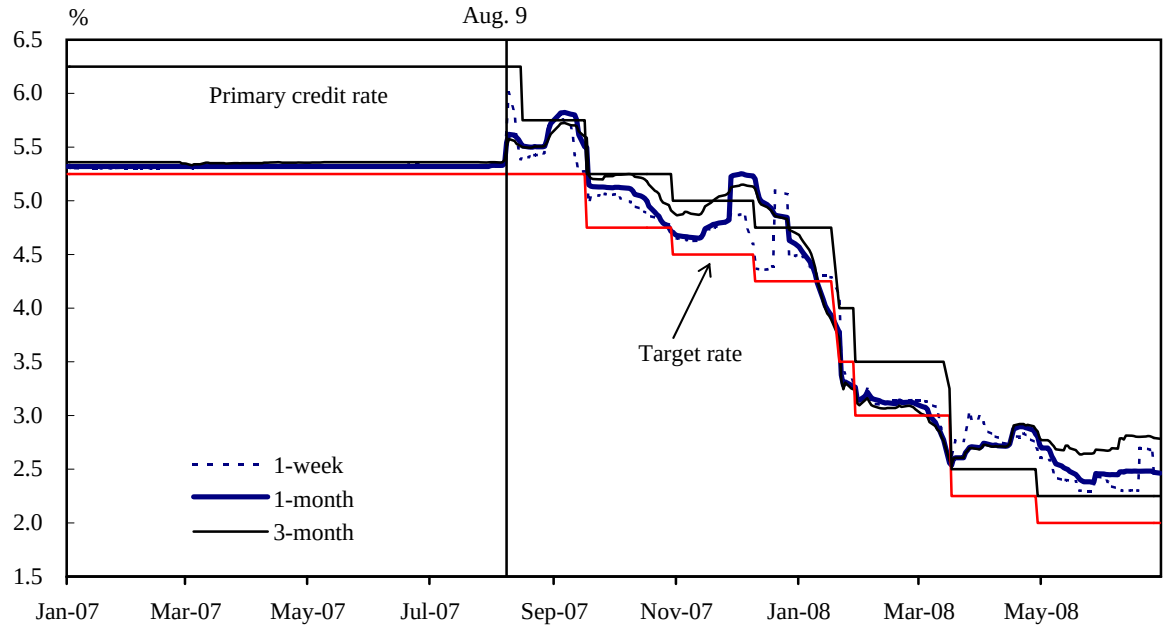
Sources: Bank of Japan; Bloomberg.

Federal Reserve's lending facility

(1) Usage amounts of Primary credit and Primary Dealer Credit facilities



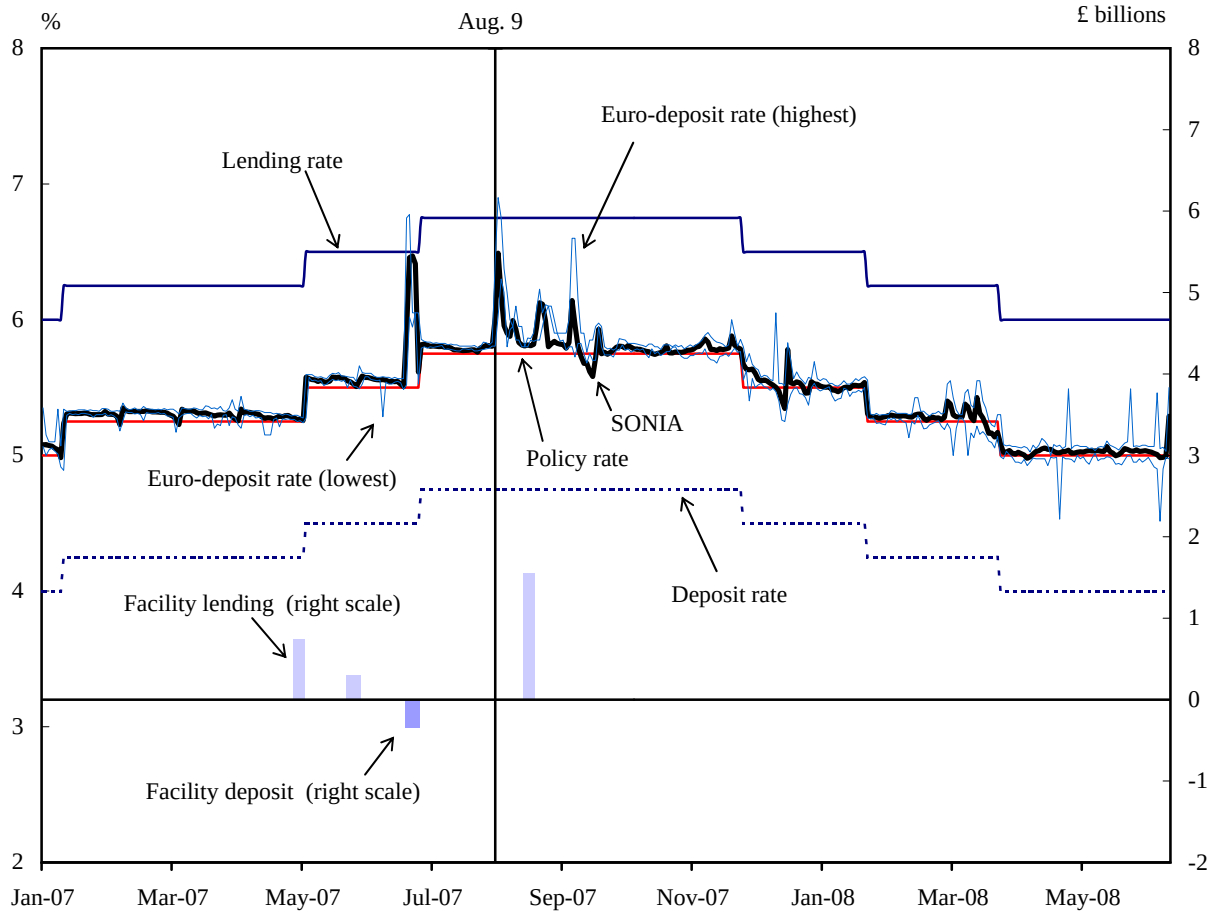
(2) U.S. dollar LIBORs



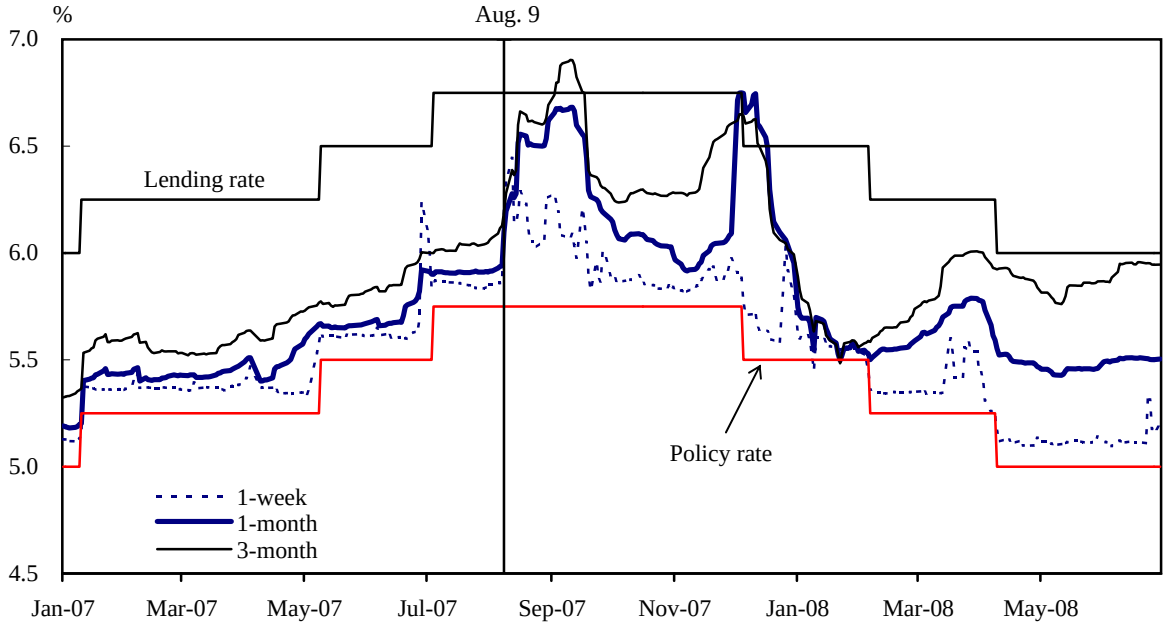
Sources: Federal Reserve; Bloomberg.

Bank of England's standing facilities

(1) Usage amounts of lending and deposit facilities



(2) Pound sterling LIBORs

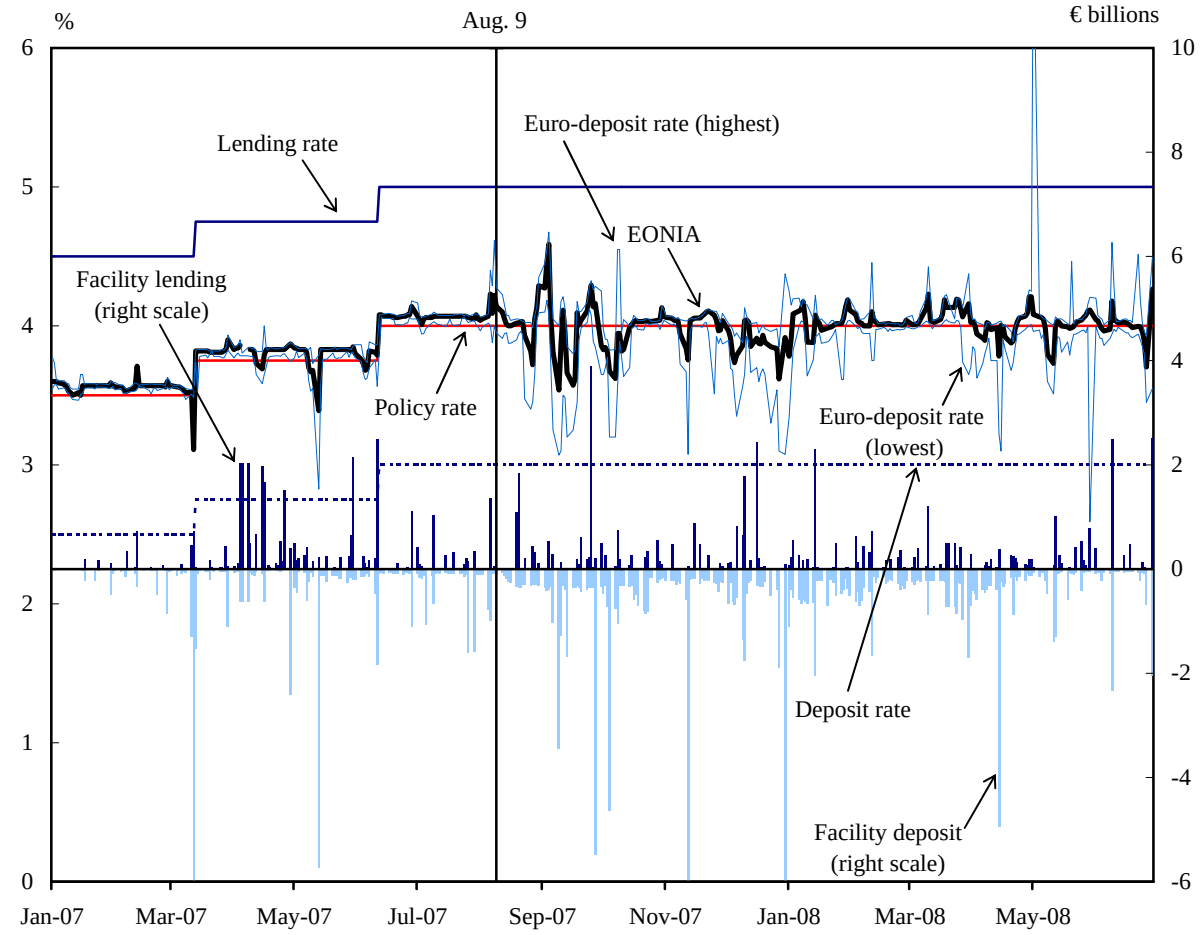


Sources: Bank of England; Bloomberg.

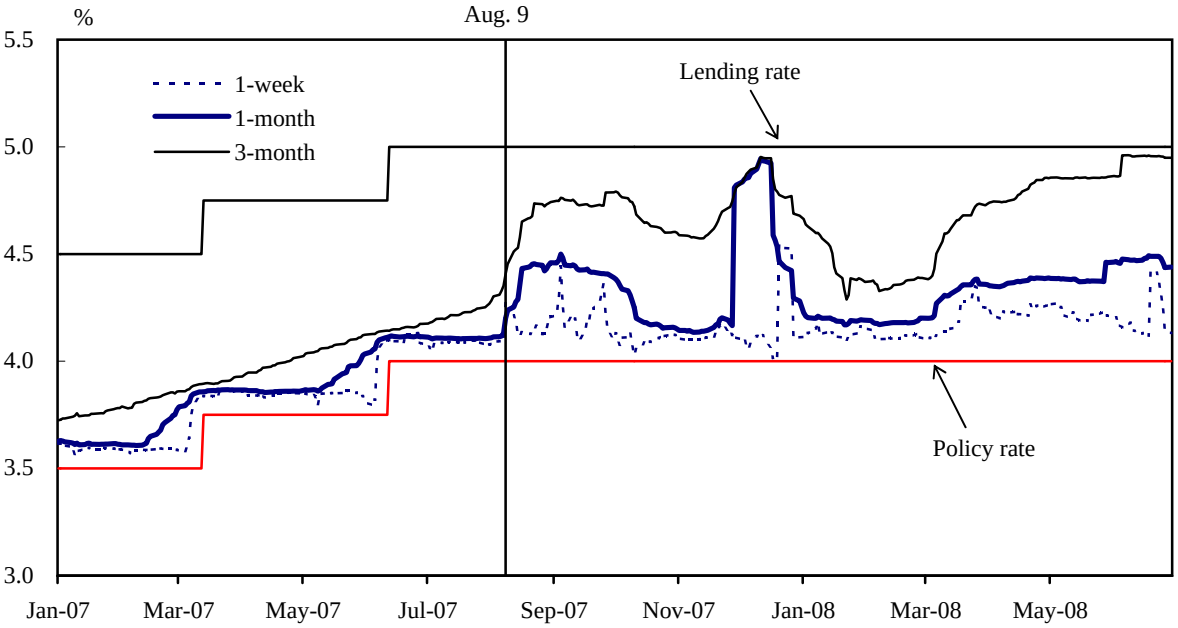
Chart 19

European Central Bank's standing facilities

(1) Usage amounts of lending and deposit facilities



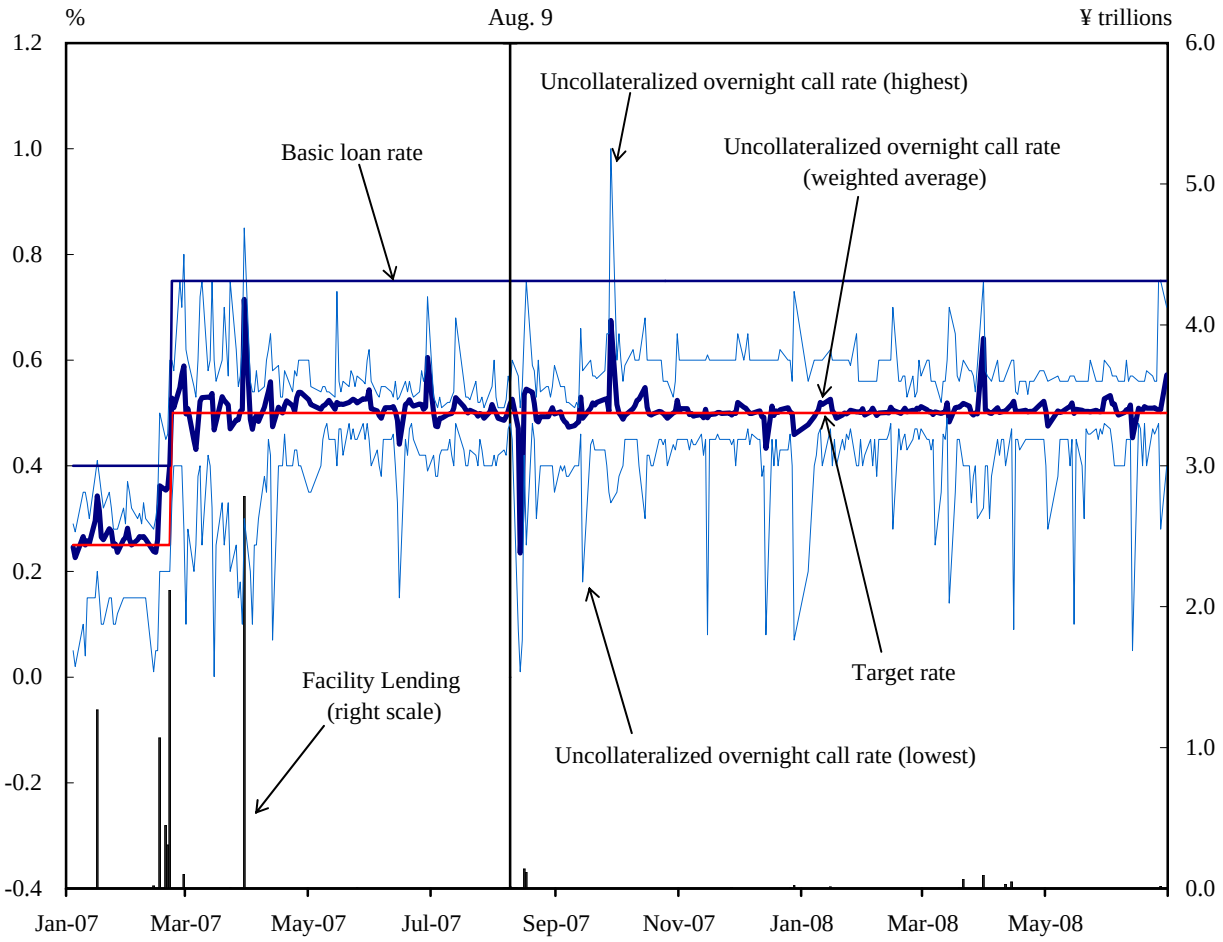
(2) Euro LIBORs



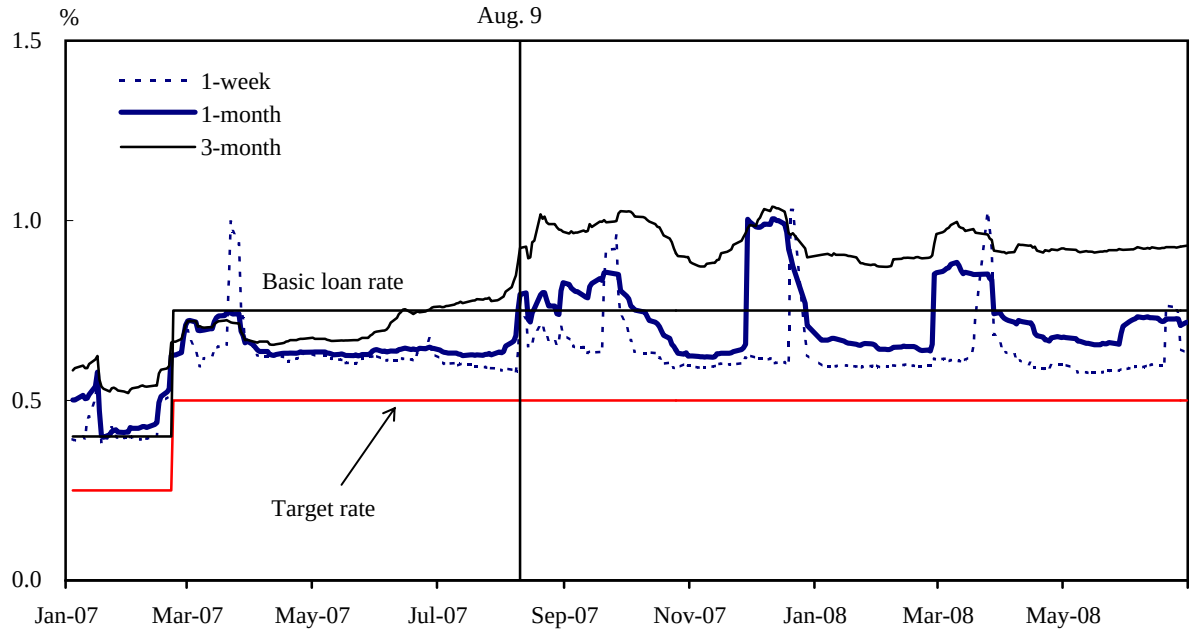
Sources: European Central Bank; Bloomberg.

Bank of Japan's lending facility

(1) Usage amounts of Complementary lending facility



(2) Japanese yen LIBORs



Sources: Bank of Japan; Bloomberg.

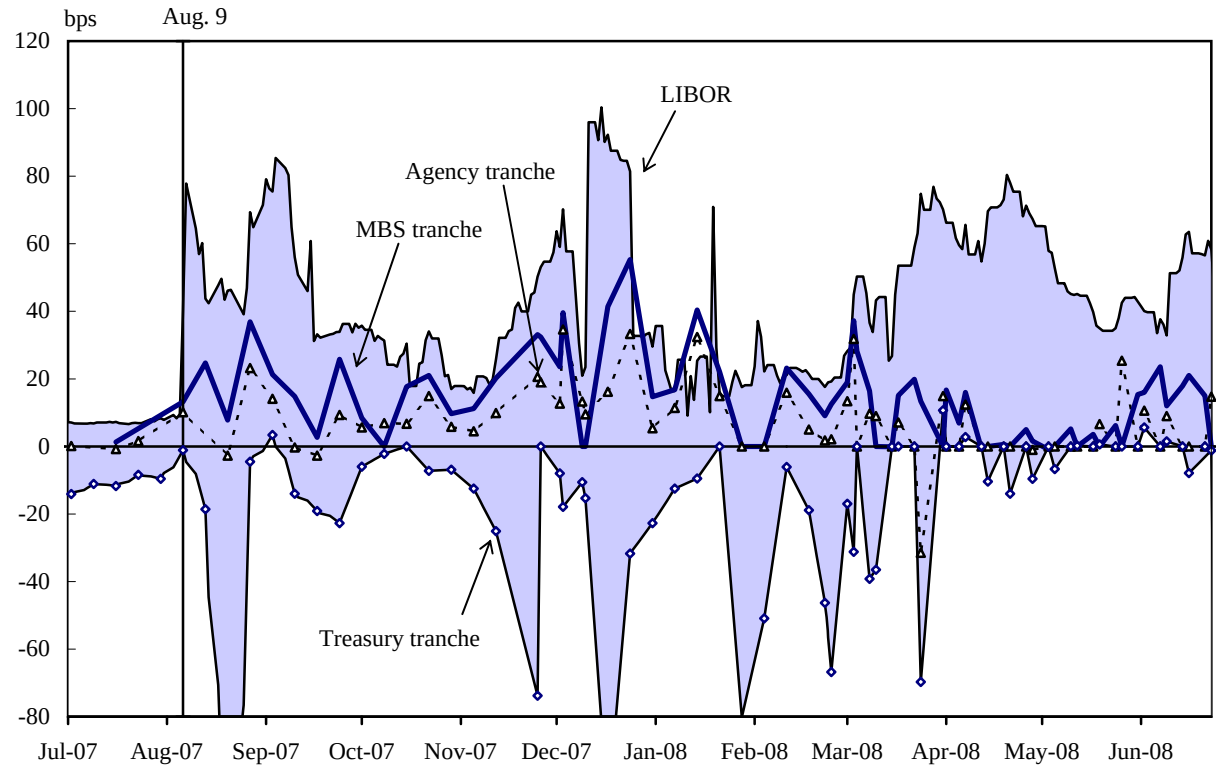
Eligible collateral framework

	Federal Reserve		ECB		BOE		BOJ	
	Operations	Lending	Operations	Lending	Operations	Lending	Operations	Lending
Government securities	Eligible	Eligible	Eligible		Eligible	Eligible	Eligible	
Agency securities	Eligible	Eligible	Eligible		---	---	Eligible	
Municipal bonds	---	Eligible	Eligible		---	---	Eligible	
Corporate bonds and CP	---	Eligible	Eligible		---	---	Eligible	
ABSs, MBSs, and ABCP	---	Eligible	Eligible		---	---	Eligible	
Loans	---	Eligible	Eligible		---	---	Eligible	
Foreign government securities	---	Eligible	---		Eligible	Eligible	---	
New measures from Aug. 2007	- Made clear the range of eligible collateral including structured products (on Aug. 23, 2007) - TAF accepted collateral eligible for primary credit (on Dec. 12) - TSLF accepted parts of structured products as eligible collateral (on Mar. 20 and May 2, 2008)		---		- Exceptional 3-month term auction accepted parts of structured products (on Sep. 19, 2007) - Regular 3-month operation accepted parts of structured products (on Dec. 12)		---	

Note: Items in Table are representative products only.

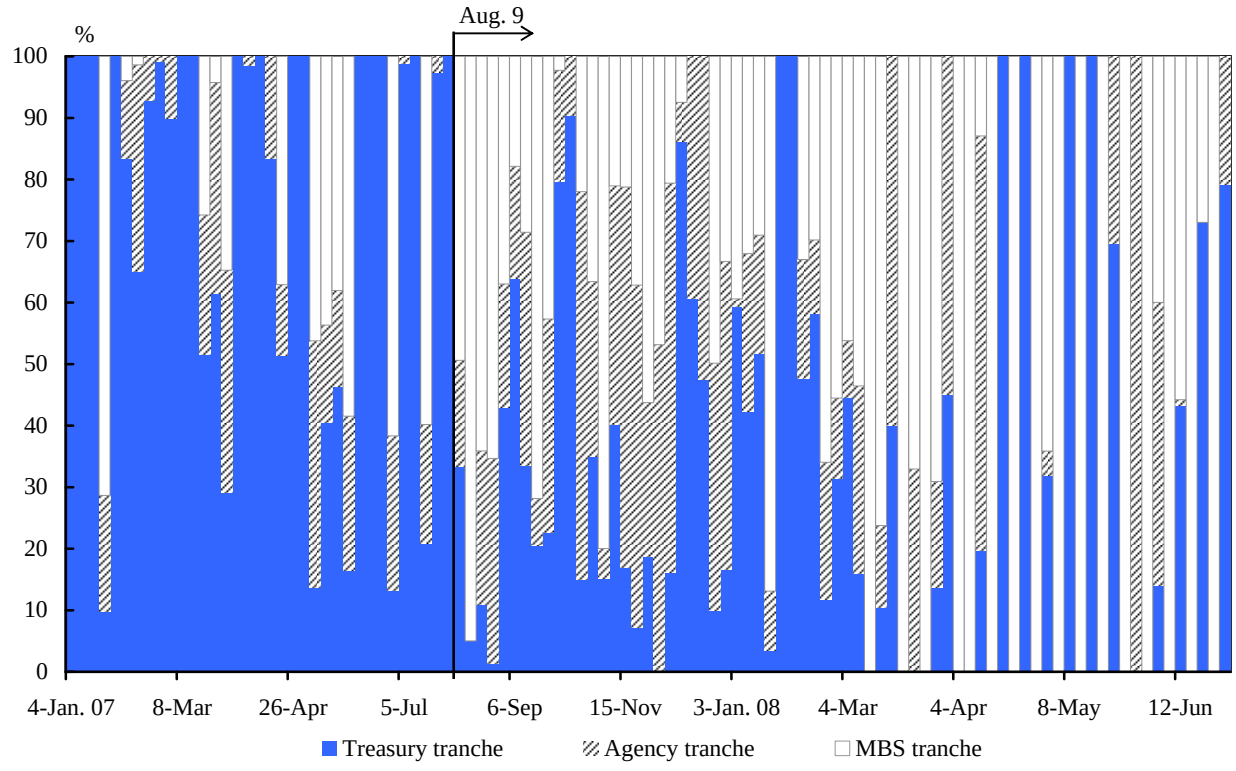
Bid rates and collateral composition under Federal Reserve's operations

(1) Successful bid rates by collateral type



Note: 2-week spreads over OIS rates.

(2) Percentage of collateral accepted



Note: Excludes less than 1-week operations and the operation that was conducted on November 28, 2007 to cover the year-end.

Sources: Federal Reserve; Bloomberg.

Comparison of money market operations

	Federal Reserve					ECB				
	Number offered		Value offered in $ bn			Number offered		Value offered in € bn		
		(Percentage)		(Average)	(Maximum)		(Percentage)		(Average)	(Maximum)
Short-term provision	297	100%	2,144			66	100%	16,340		
Overnight	194	65%	1,323	6.8	15.8	2	3%	12	6	10
Less than 1-week	46	15%	333	7.2	18.0					
1- to 2-week	6	2%	51	8.4	14.5	52	79%	15,788	304	338
2- to 3-week	51	17%	438	8.6	17.0					
3- to 4-week										
1- to 2-month										
2- to 3-month										
Over 3-month						12	18%	540	45	50
Short-term absorption	4	100%	19			7	100%	71		
Overnight	4	100%	19	4.8	6.5	7	100%	71	10	23
Less than 1-week										
Over 1-week										
Outright purchase	25	100%	31							
TBs/FBs	1	4%	2	1.6	1.6					
Government bonds	24	96%	29	1.2	1.9					

	BOE					BOJ				
	Number offered		Value offered in £ bn			Number offered		Value offered in ¥ bn		
		(Percentage)		(Average)	(Maximum)		(Percentage)		(Average)	(Maximum)
Short-term provision	69	100%	1,695			500	100%	346,053		
Overnight	5	7%	8	2	5	71	14%	48,331	681	1,501
Less than 1-week						21	4%	13,990	666	1,003
1- to 2-week	52	75%	1,652	32	37	93	19%	66,785	718	1,209
2- to 3-week						65	13%	44,825	690	806
3- to 4-week						67	13%	44,843	669	1,001
1- to 2-month						116	23%	78,247	675	803
2- to 3-month						67	13%	49,032	732	801
Over 3-month	12	17%	35	3	3					
Short-term absorption						73	100%	35,196		
Overnight						59	81%	28,911	490	1,800
Less than 1-week						10	14%	4,584	458	600
Over 1-week						4	5%	1,701	425	600
Outright purchase						94	100%	33,466		
TBs/FBs						46	49%	19,093	415	517
Government bonds						48	51%	14,373	299	312

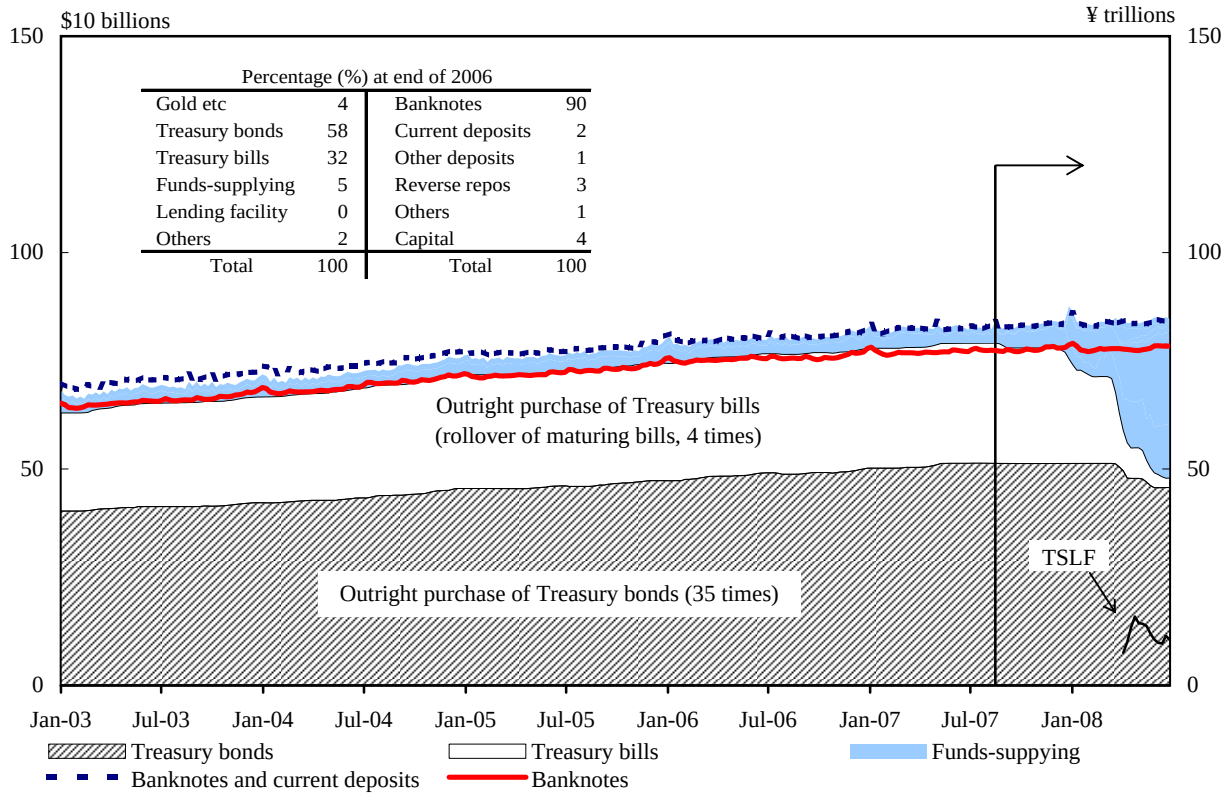
Notes: 1. Money market operations offered from July 2006 to June 2007.

2. The Federal Reserve's outright purchase excludes rollovers.

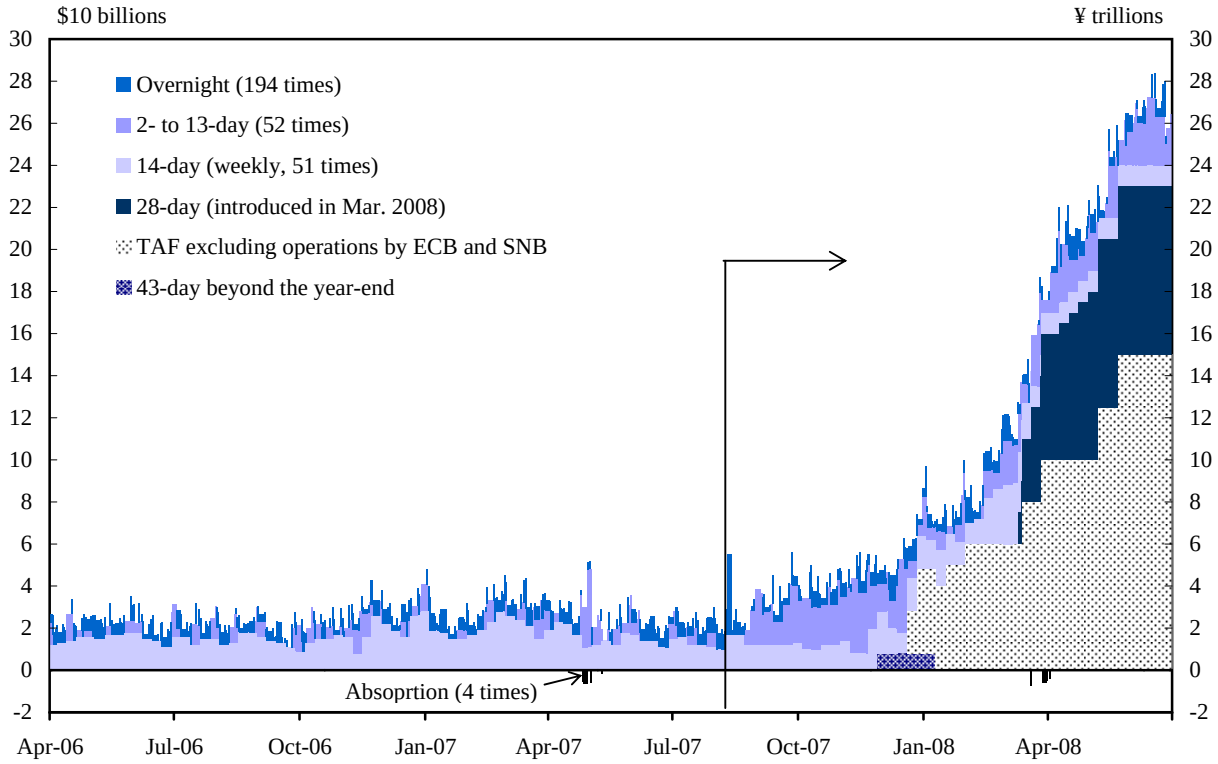
Sources: Federal Reserve; European Central Bank; Bank of England; Bank of Japan.

Money market operations conducted by the Federal Reserve

(1) Balance sheet



(2) Amounts outstanding by maturity



Types of operations:

- Outright purchase of Treasury securities
- Over 14-day (usually 14-day): weekly conducted to offset short-term shortage
- Less than 14-day (usually overnight): daily conducted for fine-tuning

Notes: 1. Figures in ( ) indicate the freguencies of operations conducted from July 2006 to June 2007.

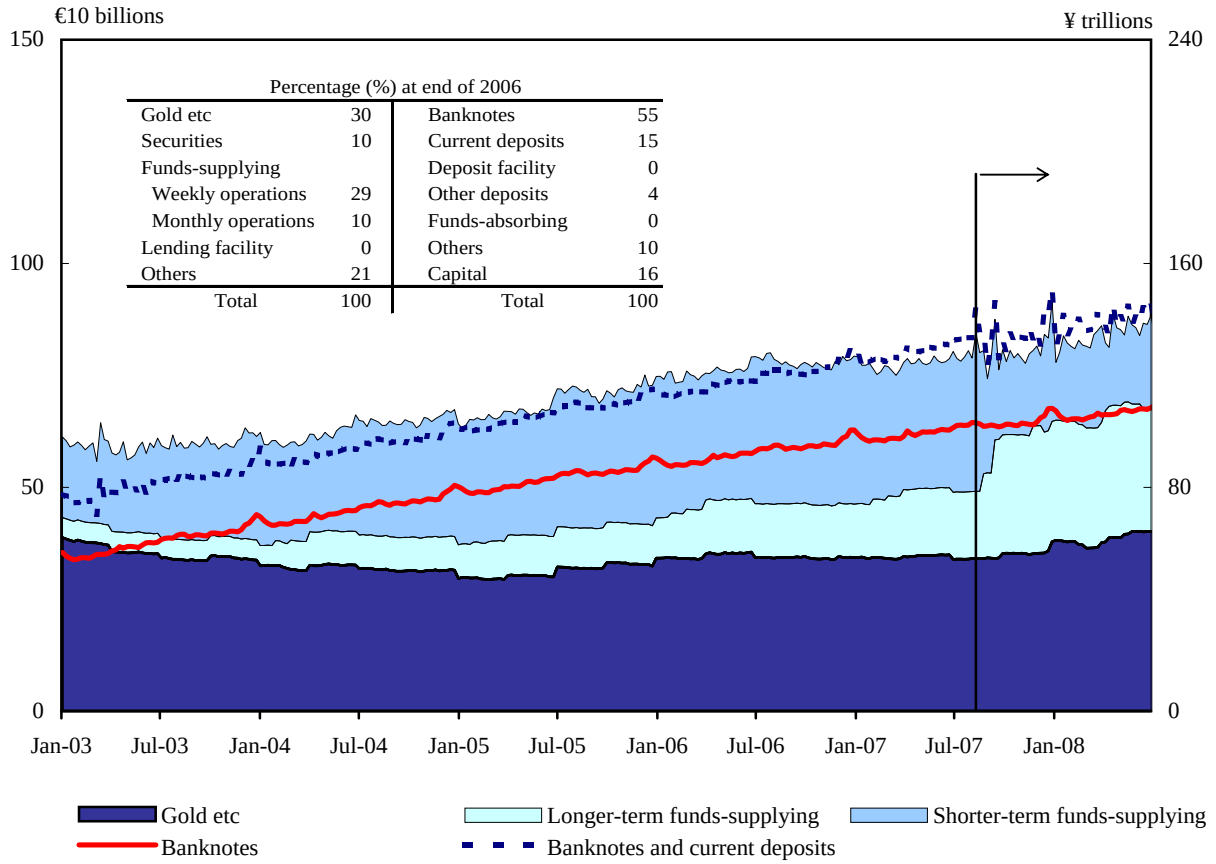
2. Right axis represents the value denominated in Japanese yen as $1 is equivalent to ¥100.

3. Data in the upper chart are on a weekly basis.

Source: Federal Reserve.

Money market operations conducted by the European Central Bank

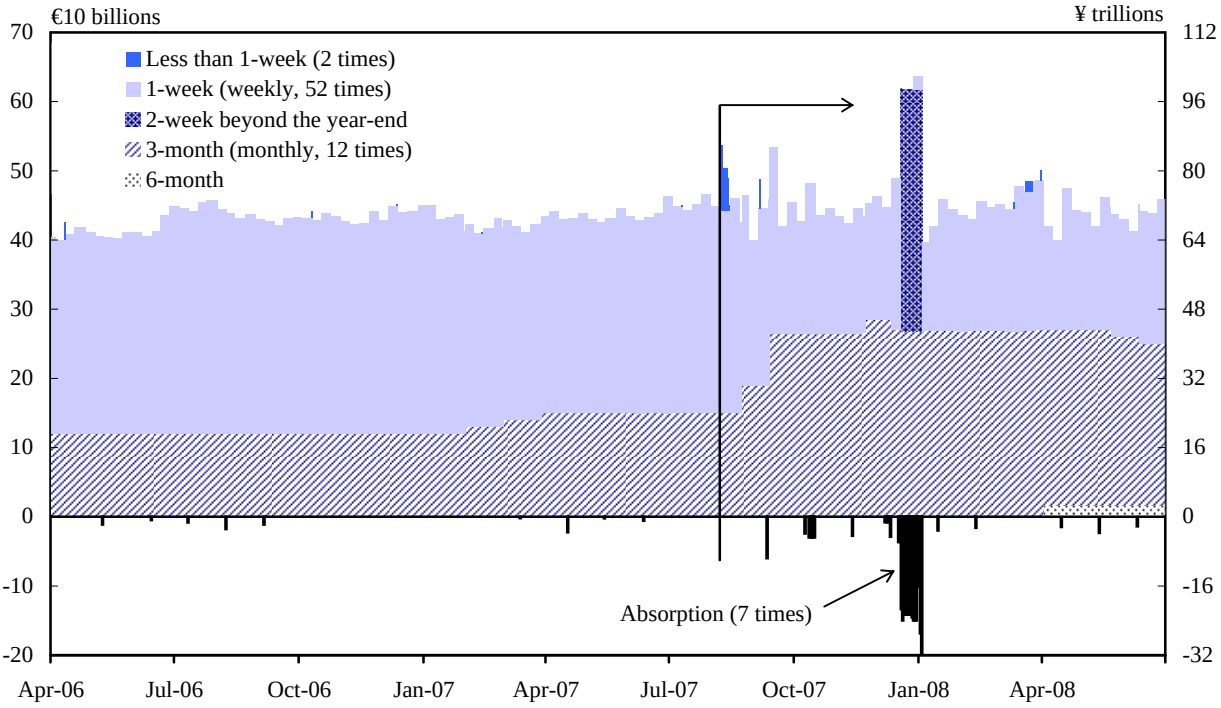
(1) Balance sheet of the Eurosystem



Percentage (%) at end of 2006

Gold etc	30	Banknotes	55
Securities	10	Current deposits	15
Funds-supplying		Deposit facility	0
Weekly operations	29	Other deposits	4
Monthly operations	10	Funds-absorbing	0
Lending facility	0	Others	10
Others	21	Capital	16
Total	100	Total	100

(2) Amounts outstanding by maturity



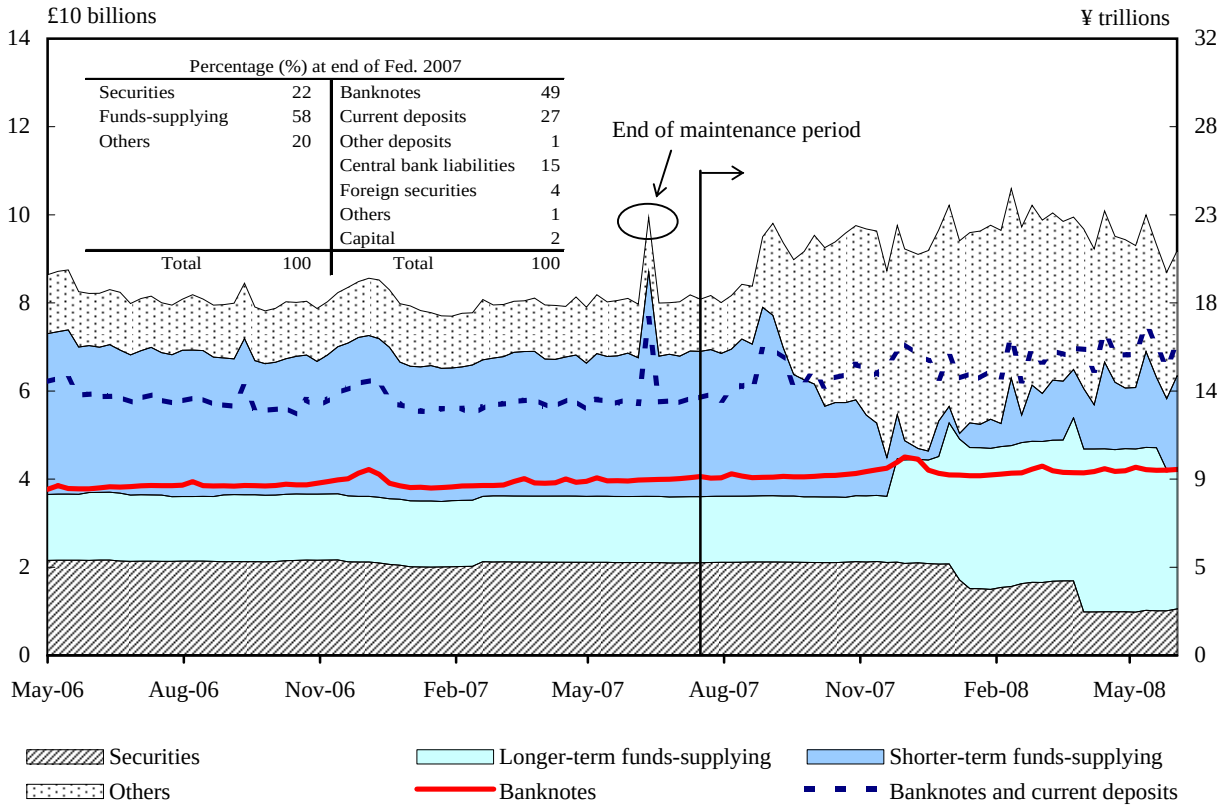
Types of operations:
- 3-month: monthly conducted as a supplementary tool
- 1-week: weekly conducted as a main supplying tool
- Less than 1-week (usually overnight): conducted as needed for fine-tuning

Notes: 1. Figures in ( ) indicate the frequencies of operations conducted from July 2006 to June 2007.
2. Right axis represents the value denominated in Japanese yen as €1 is equivalent to ¥100.
3. Data in the upper chart are on a weekly basis.

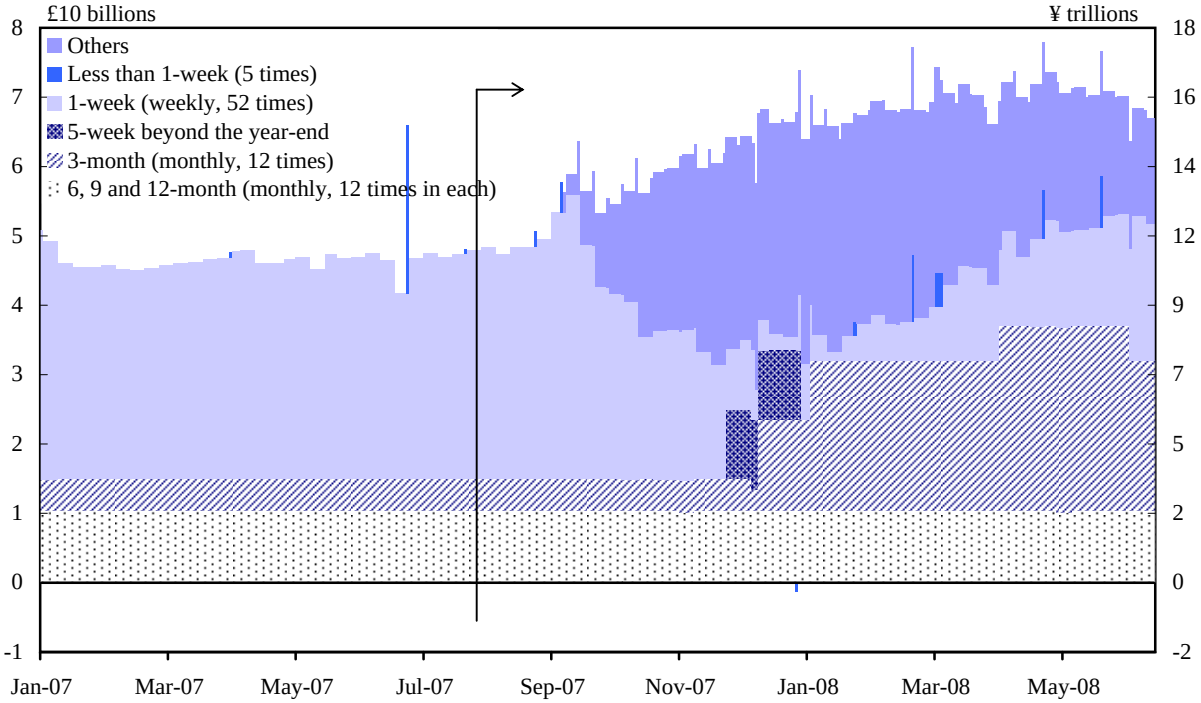
Source: European Central Bank.

Money market operations conducted by the Bank of England

(1) Balance sheet



(2) Amounts outstanding by maturity



Types of operations:

- 3-, 6-, 9- and 12-month: monthly conducted to support weekly operations
- 1-week: weekly conducted as a main supplying tool
- Less than 1-week (usually overnight): conducted for fine-tuning at the end of the maintenance period

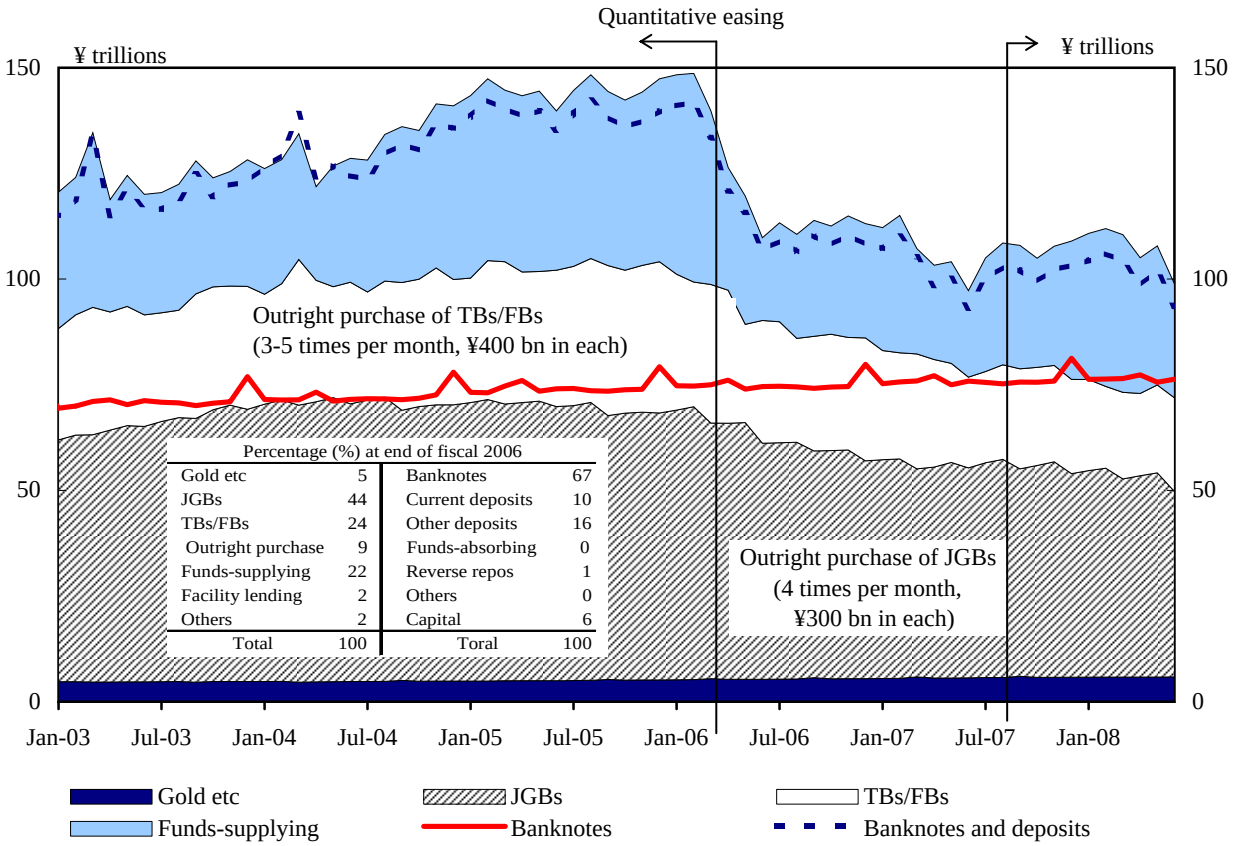
Notes: 1. "Others" indicates an increment of the other assets including the lending to Northern Rock.

2. Figures in ( ) indicate the frequencies of operations conducted from July 2006 to June 2007.
3. Right axis represents the value denominated in Japanese yen as £1 is equivalent to ¥230.
4. Data in the upper chart are on a weekly basis.

Source: Bank of England.

Money market operations conducted by the Bank of Japan

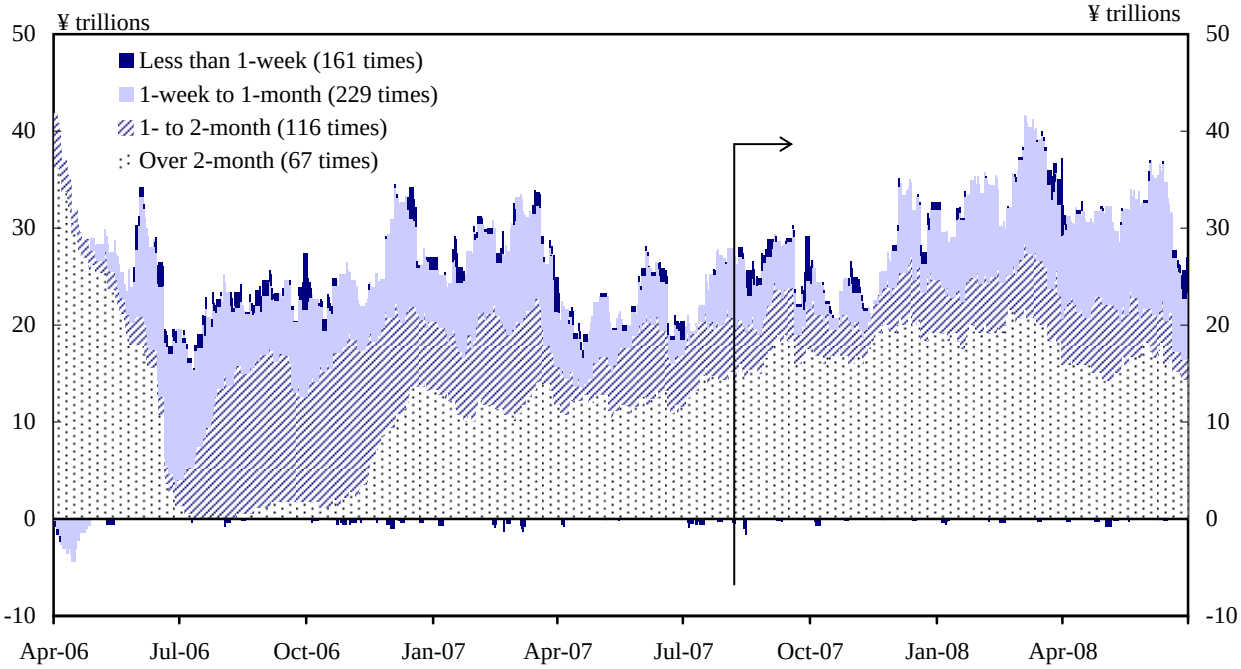
(1) Balance sheet



Percentage (%) at end of fiscal 2006

Gold etc	5	Banknotes	67
JGBs	44	Current deposits	10
TBs/FBs	24	Other deposits	16
Outright purchase	9	Funds-absorbing	0
Funds-supplying	22	Reverse repos	1
Facility lending	2	Others	0
Others	2	Capital	6
Total	100	Toral	100

(2) Amounts outstanding by maturity



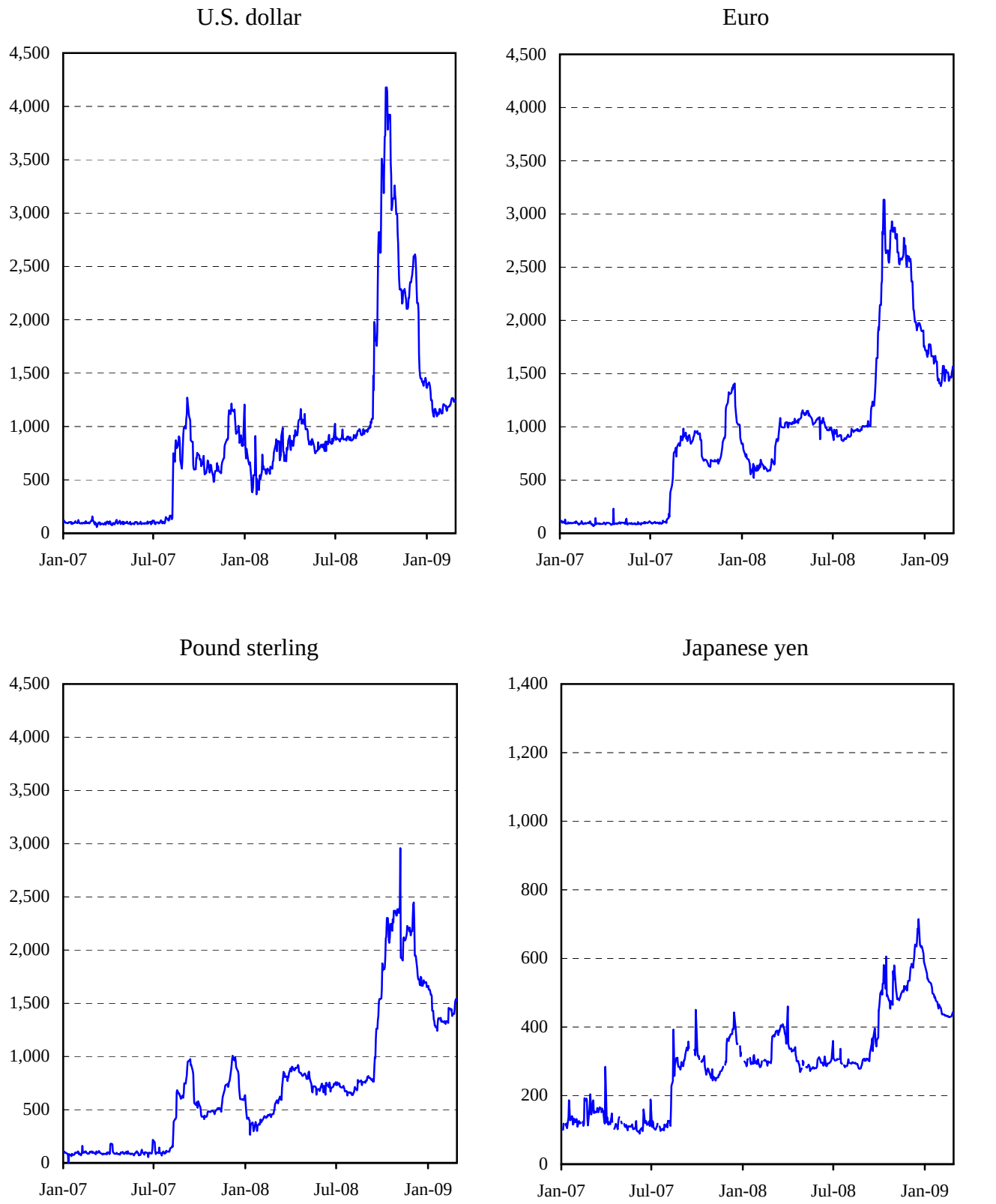
Types of operations:
- Outright purchase of JGBs, outright purchase/sales of TBs/FBs
- Funds-supplying against pooled collateral, purchase of JGBs/TBs/FBs/CPs with repurchase agreement, outright sales of bills, sales of JGBs/TBs/FBs with repurchase agreement

Notes: 1. Figures in ( ) indicate the frequencies of operations conducted from July 2006 to June 2007.
2. Data in the upper chart is on a monthly basis.

Source: Bank of Japan.

Box 2 Chart

Money market liquidity indicators



Note: The liquidity indicator is a simple average of the following standardized series: the absolute value of spread between the overnight interest rate and policy rate (target level or upper range); and 1- to 12-month spreads between LIBORs and the corresponding OIS rates.

Sources: Bloomberg; Federal Reserve; European Central Bank; Bank of England; Bank of Japan.