

# Research

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## US: Monetary Policy and Liquidity Effects

- From boardroom decisions to market transactions... Are you aware of how the Federal Reserve implements target rate decisions in the open market? We present a primer on the traditional US monetary policy instruments and explain their practical implementations.
- TAF, TOP, TSLF, PCF, PDCF – the labyrinth of acronyms is expanding and it's easy to get lost. We introduce an ABC-guide to the new Fed credit facilities and explain how they are aimed at easing strains in the financial markets in the light of the liquidity crisis. In addition, we discuss how well the Fed has succeeded in carrying out its intended objectives.
- Looking forward, we analyse how these new credit facilities may influence the ability of the Fed to conduct monetary policy. The added risky components have dramatically changed the Fed balance sheet and could potentially restrain the Fed's ability to influence the economy in the future.

### Traditional US Monetary Policy

#### *The Federal Reserve System*

The monetary policy of the US central bank is the anchor of interest rate markets and has a significant impact on both the US and global economies.

Being the central bank of the US, the principal purpose of the Federal Reserve System (the Fed) is to ensure the stability and soundness of the financial and economic systems.

The Fed is composed of the Board of Governors (appointed by the president), The Federal Open Market Committee, 12 regional Federal Reserve Banks, several private US member banks, and various advisory councils.

The Fed is responsible for implementing the overall monetary policy to ensure maximum employment, price stability, and moderate long-term interest rates using the three main monetary policy instruments:

- Reserve Requirements
- Open Market Operations
- Discount Window Loans

#### *Reserve Requirements*

Banks and other depository institutions keep a certain amount of funds in reserves to act as a buffer against unexpected outflows and to clear financial transactions. These reserves can be held as cash in the bank vaults or as deposits with the local Federal Reserve Bank. In fact, banks are required to hold a certain amount in reserves. The Fed does not pay any interest on deposits and therefore the financial institutions have an incentive to lend out any excess reserves above the minimum requirements.

As banks' need for liquidity changes on a daily basis, banks with a liquidity deficit can borrow funds from other banks with a liquidity surplus in the Fed funds market (the market for bank reserves). Therefore Fed funds transactions redistribute bank reserves and enable each bank to clear its liquidity

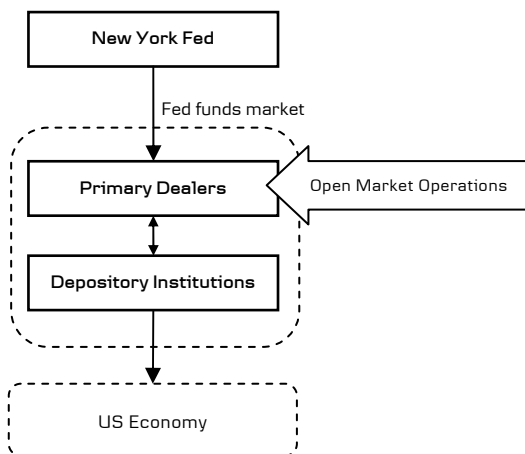
on a daily basis. The consequent interest rate is determined by the market participants and the average interest rate charged on overnight loans between banks is called the (effective) Fed funds rate. Hence the Fed funds rate is the rate at which the most creditworthy banks borrow and lend in the brokered Fed funds market.

The Fed rarely changes the required reserves, as these requirements impose a cost to the financial institutions (the interest rate opportunity cost) and can create liquidity problems for under-capitalised banks.

**Open Market Operations**

The primary tool for implementing monetary policy is open market operations (OMO). Because of its flexibility, open market operations are the most frequently used instrument to influence short-term interest rates via the Fed funds market.

**Figure 1 - Mechanics of open market operations**

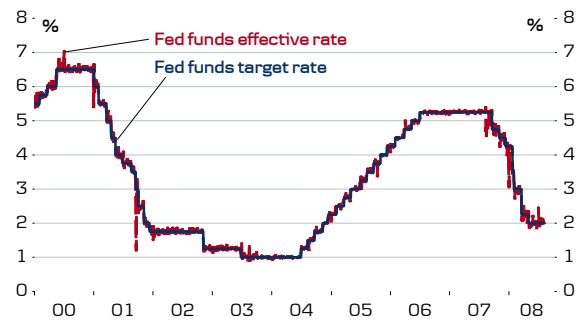


The Federal Open Market Committee (FOMC) typically meets eight times during a year and votes on the level of the Fed funds target rate. It is the job of the Domestic Trading Desk under the Federal Reserve Bank of New York to make the effective Fed funds rate in the market resemble the target rate set by the Fed by performing open market operations. The trading desk will perform these operations in the Fed funds market with a set of designated primary dealers as counterparts through buying and selling US Government securities.

The goal of the Domestic Trading Desk is to affect the Fed funds rate at which the banks borrow reserves from each other. Buying securities sends a cash flow that increases the banks' deposit reserves and lowers interest rates as a result, while selling securities drains bank reserves and raises interest rates. As observed in figure 2, the effective

Fed funds rate tracks the Fed funds target rate set by the FOMC with minor fluctuations.

**Figure 2 - Fed funds target rate vs. effective rate**



The Domestic Trading Desk transactions can either involve temporary repo/reverse repo agreements to affect short term imbalances due to daily fluctuations (see "repo and reverse repo definitions") or outright buying and selling of securities to permanently affect bank reserves and economic balances in the long run.

**Repo and reverse repo definitions**

A repurchase agreement (repo) is a short term collateralised loan where one party sells securities to another party and agrees to repurchase the securities at a future date for a slightly higher specified price. Thus the loan is practically without any credit risk and provides temporary liquidity.

A reverse repurchase agreement (reverse repo) is the opposite situation where securities are bought with a promise to sell them back later on.

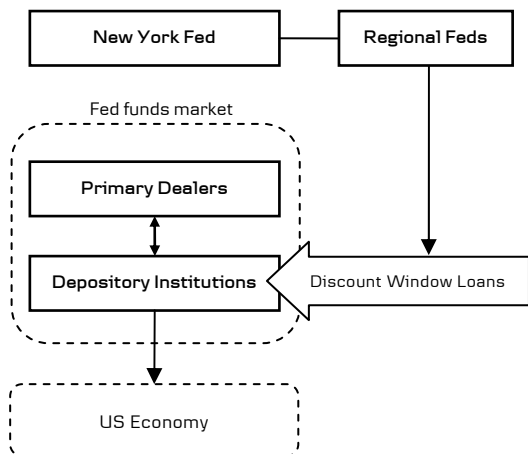
All transactions are carried out on an open market basis where the primary dealers bid on the auctioned securities. The primary dealers will distribute the increased reserves to banks in the Fed funds interbank market which will influence the operations of financial institutions as it affects the funding costs. As a result, loan and investment policies will be affected by the cost of lending and this impacts the entire US economy.

**Discount Window Lending**

The Fed can also affect market liquidity by letting the depository institutions borrow directly from the discount window of the regional Federal Reserve Banks if liquidity is not available in the Fed funds market. Hence, the discount window functions as a safety valve in times of systematic stress, circumventing the primary dealers and the Fed funds mar-

ket. However, the discount window is meant as a last resort of lending after attempting to raise funds in other conventional ways.

Figure 3 - Mechanics of discount window Loans

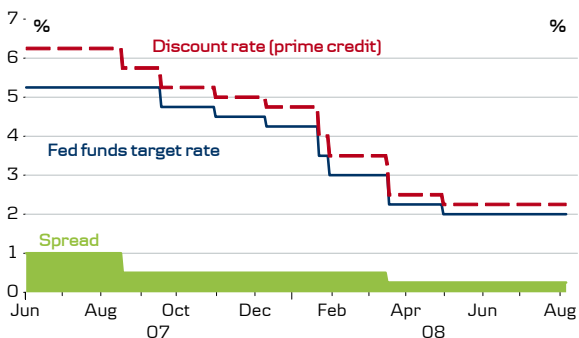


Three types of lending programs exist for depository institutions:

- Primary credit
- Secondary credit
- Seasonal credit

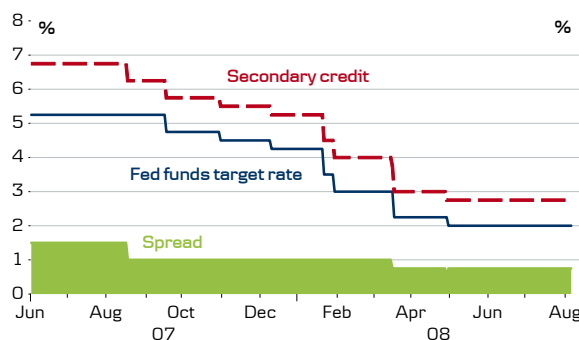
The discount rate is the rate that financially sound banks must pay for the “primary credit”. Since January 2003, the discount rate has typically been set 100 bps above the Fed funds target rate but this spread has recently been tightened due to the new credit facilities provided by the Fed.

Figure 4 - Primary credit vs. Fed funds target



“Secondary credit” is offered at a higher interest rate and on more restrictive terms to institutions that do not qualify for primary credit. Since January 2003, the rate on secondary credit has typically been 150 bps above the Fed funds target rate (50 bps above the discount rate) and this spread has also recently been tightened with the discount rate.

Figure 5 - Secondary credit vs. Fed funds target



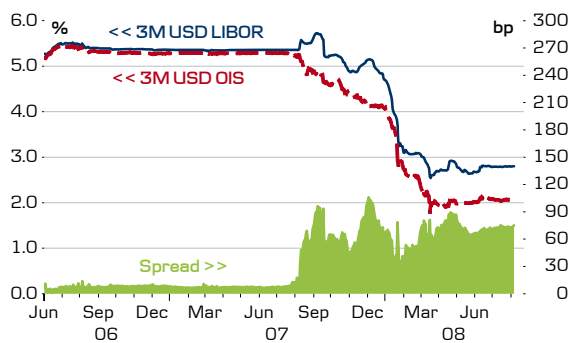
Furthermore, seasonal credit is available to small and medium sized banks able to demonstrate a clear pattern of recurring intra-year fluctuations in funding needs.

All of these discount window rates are set by the Board of Directors of the Federal Reserve Banks subject to approval by the Board of Governors. The rates are deliberately set higher than the Fed funds target rate to force banks only to use the discount window as a last resort when they have exhausted all other less expensive alternatives. At the same time, the discount rate acts as an effective ceiling for the fed funds rate.

### The Liquidity Crisis

After the credit crisis evolved in the summer of 2007 due to problems associated with the credit quality of subprime mortgages and structured products, the Fed has monitored the market reactions very carefully.

Since the main monetary policy instrument is the system of open market operations as described in the previous chapter, the Fed relies on a relatively small number of primary dealers to distribute the reserve changes to the depository institutions through the interbank market. However, after the crisis broke out into the open, banks have been increasingly reluctant to provide term funding (periods longer than overnight) to other financial institutions. This is conventionally indicated by the LIBOR/OIS spread (see “the Fed funds market, the LIBOR market and Overnight Index Swaps”).

**Figure 6 - 3 month US LIBOR/OIS spread**

The widening of this spread happened while the volume of interbank transactions contracted and depicts an unusual premium for unsecured term funding as banks are reluctant or unable to distribute excess reserves. The three main reasons why the interbank market broke down were:

- Higher liquidity demand
- Higher liquidity risk
- Higher credit risk

#### **Liquidity Demand**

As the market became aware of issues with mortgage backed securities (MBS) such as subprime loans in the late summer of 2007, banks faced a significant rise in their demand for funds. Most banks had created off-balance sheet investment vehicles with investments in MBS. These investment vehicles were funded with short-term loans, typically with maturities ranging from 1-6 months. The banks had additionally issued funding guarantees of these investment vehicles in case of a deterioration in the supply or cost of funds.

Because of the crumbling MBS markets, the flow of short-term funding to the investment vehicles declined and this led to calls on the banks' liquidity and credit guarantees. Since this was a systematic shock in the financial sector, the demand for term funding with maturities above 1 month rose dramatically. Hence the situation illustrated in figure 6 is similar for all maturities of 1-6 months.

#### **Liquidity Risk**

While the demand for liquidity in the market rose, the expected demand for future liquidity also went up as the banks expected more liquidity guarantees to be exercised in the future. Furthermore, because of the breakdown in the MBS market, these securities became highly illiquid and difficult to value, and therefore hard to sell in order to raise capital. This situation created concerns about the risk of not having adequate access to funds in the future and made many banks unwilling to lend excess reserves to other banks.

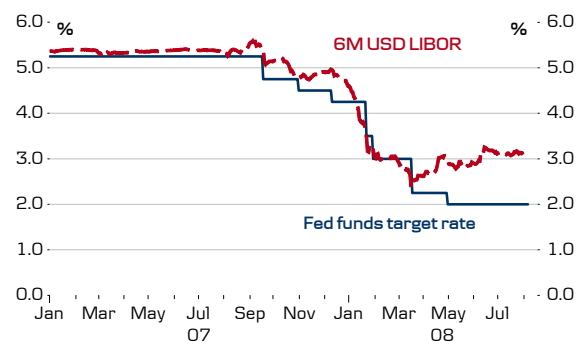
#### **Credit Risk**

While the banks' demand for funds rose significantly, the supply of funds in the money market declined for longer term loans. This was caused by increasing concerns associated with the creditworthiness of commercial banks and risk aversion due to the reduced market liquidity. This counterparty uncertainty caused term premiums on unsecured money market loans to escalate while volumes decreased.

#### **Further Market Impacts**

Because of the intensified demand for liquidity combined with a high perceived credit risk in the financial sector, funding terms were progressively shortened. Furthermore, because of the liquidity risk and hoarding of money, banks with excess funds did not ease the liquidity conditions by providing lower rates for term funds. As a result, many banks resorted to overnight interbank funding and this increased overnight borrowing dependence contributed to higher volatility in overnight interest rates, which in turn increased the uncertainty of funding costs. This inefficiency exposed the financial institutions to the risk of being unable to renew their maturing loans, i.e. roll-over risk.

The supply and demand imbalances also developed beyond the US as a large number of European banks fund dollar-denominated assets which increases their demand for dollar-funding. Since these European banks do not necessarily have access to credit facilities provided by the Fed and because of the hoarding of money reserves in the US, the interest rate premiums for term loans also soared in other parts of the world.

**Figure 7 - LIBOR vs. monetary policy target**

Because of this added risk-premium, the traditional use of LIBOR as a risk-free benchmark is under strain. This removes the previous close relation of term interbank rates being the preferred tradable proxy for monetary policy rates.

Instead, market participants are considering Overnight Index Swaps as substitutes because of the high liquidity in the overnight market and low credit risk. (See “The Fed funds market, the LIBOR market and Overnight Index Swaps” and figure 7).

## The Fed funds market, the LIBOR market and Overnight Index Swaps

The effective Fed funds rate is essentially the interbank interest rate for FDIC regulated banks with US deposits. This also includes foreign banks with branches in the US. The published interest rate is a volume weighted average of the actual overnight transactions in the market. The Fed is able to influence this market rate directly with open market operations.

The USD LIBOR rate is in broad terms the dollar interbank interest rate in the global market outside the Fed clearing system. These interbank loans are bilateral private transactions between banks and thus no public data on the volume and interest rates of the transactions is available. Instead, the British Bankers' Association survey a panel of major banks about the interest rates at which the banks are able to borrow dollar-denominated funds from other banks. Only 3 of the 16 BBA USD LIBOR panel banks are headquartered in the US and as a result, the Fed cannot directly influence LIBOR in the same way as with the Fed funds market. Besides overnight rates, LIBOR is also quoted for longer term periods.

Normally, the Fed funds and the LIBOR rates are very similar. However, with the recent liquidity constraints and uncertainties in the financial markets there has been a decoupling of the term rates with maturity above 1 month. Normally the Overnight Index Swap (OIS) rate is used to represent the Fed funds rate at such maturities since the OIS rate is calculated using the markets' expectations of the compounded funds rate of the term.

The LIBOR/OIS is conventionally used to measure the relative size of term rates as it corrects for any expected changes in overnight rates. The recent increase in the LIBOR/OIS spread can be observed in figure 6. Due to the significance of LIBOR, this has had widespread consequences.

LIBOR is one of the most important and widely used benchmarks for short term interest rates e.g. for adjustable rate mortgages (ARM), corporate loans, credit card interest rates, floating reference rate for interest rate swaps, and as a riskless rate proxy for money market fund managers. Hence an inflated LIBOR rate influences the credit of the entire economy; homeowners et. al. do not fully benefit from the Fed's rate cuts, and money market fund managers can only create a return equal to the LIBOR benchmark by adding somewhat risky investments.

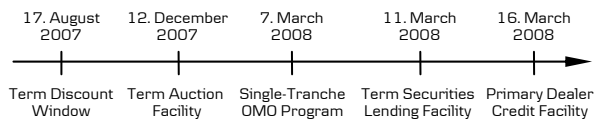
The Overnight Index Swap has virtually no credit risk as there is no exchange of notional and the floating rate is furthermore calculated using the actual market data of the effective Fed funds interest rate. Therefore there has been an increasing use of these indices to better reflect the riskless rate and the implied expectations in the markets of the future monetary policy implementations of the central bank.

For a detailed introduction and examples of OIS hedging and speculation on future central bank interest rate changes, see our forthcoming publication: “*Introducing Overnight Index Swaps*”.

## New Bank Credit Facilities

Because of the prolonged impact of the credit crisis with persistent irregularities as described in the previous chapter, the Fed has launched several other forms of liquidity-providing instruments on an ongoing basis as the crisis evolved. These new facilities were introduced in order to help overcome some of the shortcomings of the traditional monetary policy instruments and hence improve confidence in the markets and the economy.

**Figure 8** - Timeline of new credit facilities



The first action was to temporarily change the discount window “**primary credit facility**” (PCF). The discount rate was lowered by 50 bps, making it only 50 bps above the Fed funds target rate (see figure 4), and the term window was increased for as long as 30 days (and later 90 days). The discount rate was lowered to provide the depository banks with greater assurance about the cost and availability of funding, thus ensuring liquidity of individual institutions and preventing bank runs (known as a standby borrowing facility).

Traditionally, banks have been reluctant to borrow at the discount window because the weekly loan statistics of each Federal Reserve District is published in the Board of Governors reports. This data can be an indicator of whether some banks could be in trouble. However, at the end of 2007 the Fed launched the **Term Auction Facility (TAF)** where term funds are auctioned to depository institutions eligible to borrow under the primary credit program. This facility allows anonymously borrowing from the Fed with no regional statistics of each district. This 28-day term was supplemented with an 84-day TAF facility on July 30th 2008. The goal of this credit facility is to help banks with limited or constrained access to the interbank market and with securities available as collateral. Thus, the TAF is targeting term interbank funding issues as indicated by the LIBOR/OIS spread. Hence, the minimum bid rate for the auctioned funds is the OIS rate of corresponding maturity.

Later the Fed announced that a series of open market repo transactions were conducted to further inject liquidity into the primary dealers in the Fed funds market. The 28 day term of these transac-

tions is also longer than the normal overnight to 14 day term of open market operations. While conventional repo transactions are divided into three tranches depending on the type of collateral, the new program is a single-tranche program for all collateral securities. Because of the longer repo maturities, this **single-tranche OMO** facility also targets term funding problems as indicated by the LIBOR/OIS spread.

Soon after, the Fed decided to increase the securities lending auction facility to primary dealers from overnight terms to 28 days while accepting a wider range of collateral securities instead of only US Treasuries. Once again, the longer loan maturities of this **Term Securities Lending Facility (TSLF)** are meant to improve term funding in the market. As of July 30th, the Fed announced the upcoming **TSLF Options (TOP)** facility with exercise in periods characterised by elevated stress (i.e. quarter ends).

The latest act of the Fed is the **Primary Dealer Credit Facility (PDCF)** which provides overnight liquidity to primary dealers in exchange for investment-grade debt securities as collateral. The interest rate on these loans is the discount rate (the primary credit rate), which was at the same time lowered by 25 bps to be just 25 bps above the Fed funds target rate (see figure 4). This facility lets the primary dealers obtain access to the discount window which is normally reserved for depository institutions only and thus some investment banks were previously kept from obtaining loans at the discount window. Just as for commercial banks under the PCF, the goal of the PDCF is to provide backup liquidity for the individual investment banks (standby facility). The increased liquidity should ensure confidence in repo clearing banks which in return should improve the liquidity situation for participants in securitisation markets.

Table 1 below summarizes the new credit facilities and how the PDCF and TSLF for primary dealers are analogous to the PCF and TAF programs for depository institutions. The single-tranche OMO is an expansion of the regular open market operations and is not included in the table.

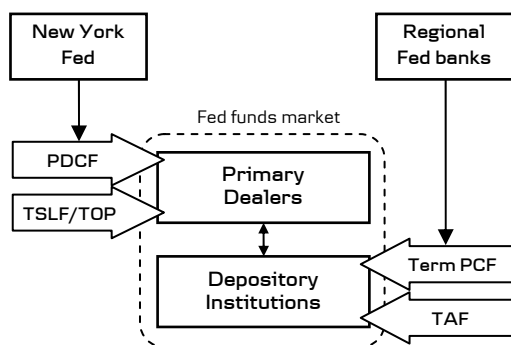
**Table 1** - Summary of new credit facility classes

Eligible borrowers	Standby facility	Auction facility
Depository institutions:	Term PCF	TAF
Primary dealers:	PDCF	TSLF/TOP

The auction facilities are all meant to address term funding issues and are the main sources of liquidity. The standby facilities are backstop loans mainly available for reassurance in the markets.

Figure 9 illustrates the flow from respectively the New York Fed and the regional Fed banks to the primary dealers and depository institutions in the Fed funds market for the new credit facilities.

**Figure 9 - Mechanics of new Fed credit facilities**

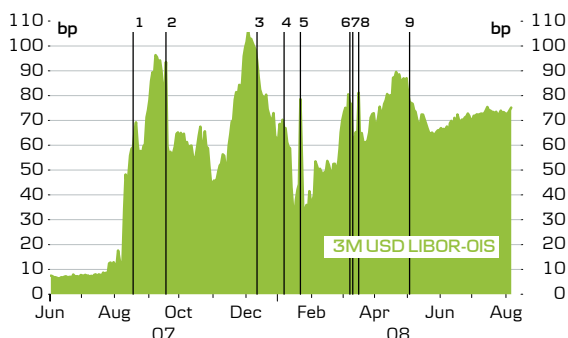


Furthermore, to offset the previously mentioned effect of the European banks having high demand for dollars when US banks at the same time tend to hoard money, the Fed facilitated reciprocal currency swaps with the European Central Bank and Swiss National Bank. These central banks could then provide dollar liquidity to European Banks.

**Credit Facilities' effect on the Market**

Although the new credit facilities supplied by the Fed have had a directly observable impact, the effects tend to have been neither persistent nor significant enough to eradicate the current issues and market imbalances.

**Figure 10 - Fed actions' effect on LIBOR/OIS spread**



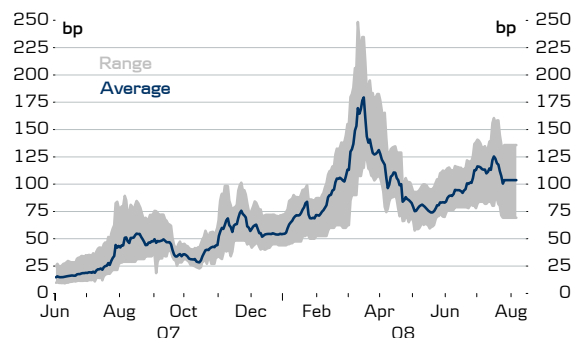
1. Discount rate cut (50 bps)
2. Fed funds target rate cut (50 bps)
3. TAF introduced & dollar-swap with ECB
4. TAF size increased
5. Inter-meeting Fed funds target rate cut (75 bps)
6. TAF size increased & single-tranche OMO
7. TSLF introduced

8. Discount rate cut (25 bps) & PDCF introduced
9. TAF size increased

In figure 10, the effects of the different events and credit facilities can be compared with respect to the 3 month LIBOR/OIS spread. The spread peaked in December 2007 when banks were building up their balance sheets for the year-end-statements and just after, the situation improved somewhat. With the new TOP facility, such a year-end effect may be prevented in December 2008. The biggest effects can be seen from traditional rate cuts in the Fed funds target rate and from early TAF auctions. However, a while after each Fed intervention the effects have had a tendency to die out as the spread drifts upward again and the current level of the spread remains at an exceptionally high level. This indicates a lasting uncertainty and a high level of perceived risk.

Furthermore, as seen in figure 11, credit default swap spreads for major US banks had an accelerating upward trend until March 2008. This suggests that the crisis went from being driven mainly by liquidity risk to a strong focus on credit risk when banks were raising haircuts on collateralised securities, which triggered forced selling at plunging prices and an increased level of volatility.

**Figure 11 - CDS spreads for various major US banks**



**Note:** Bloomberg/CBIL 5-year CDS for Citigroup, Bank of America, JP Morgan, Goldman Sachs, Charles Schwab and Credit Suisse.

However, the credit spread has been reasonably reduced from the March-peak as the Fed launched the PDCF and arranged a financing agreement for JP Morgan to take over Bear Stearns. Despite this, the LIBOR/OIS spread has remained high, which may indicate that it is not a counterparty risk problem but rather a sign of balance sheet pressure whereby the capital raised by banks may only have offset mark-to-market losses from issued structured investment vehicles. In general, there are still market imbalances and term funding pressure continues despite the new credit facilities with extended maturities and a broader collateral base.

Thus, the liquidity from the Fed does not seem to be fully reaching the broader money market and the real economy.

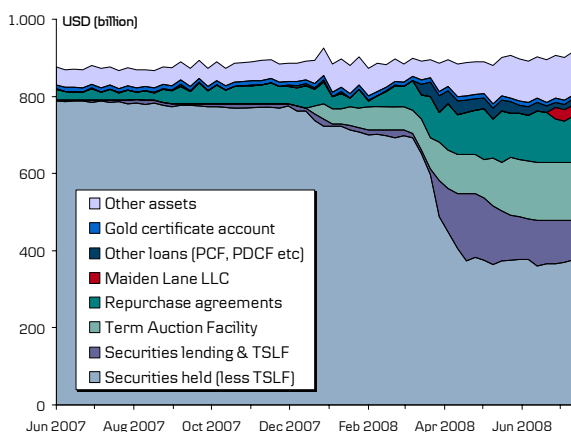
## The Federal Reserve Balance Sheet

The Federal Reserve is self-funded and has a traditional balance sheet of assets and liabilities. The liabilities mainly consist of deposits from depository institutions (required reserves and excess reserves) and currency outstanding (circulation in the public). These liabilities do not have any interest payable.

The asset side consists mainly of Treasury securities held outright (i.e. for open market operations) and discount loans issued to banks (i.e. discount window loans). Unlike the liabilities, these assets earn interest which secures the Fed a profit that is passed on to the US Treasury.

Due to the recent temporary loan facilities, the Fed balance sheet has undergone massive changes. With the increased offering of loans to banks, the Fed has taken loans backed by performing mortgage-backed securities (which includes various sub-prime mortgages that may be illiquid and/or hard to price) and other forms of collateral on its balance sheet. To fund these loans, the Fed has sold, collateralised or pledged an increasing part of its portfolio of Treasuries and has additionally let some of the Treasuries mature in order to keep the total balance sheet fairly constant. If the Fed allowed the balance sheet to grow (printing money and increasing excess reserves), it would increase the amount of credit in the economy and push interest rates below the Fed funds target and hike inflation.

**Figure 12 - Change in the Federal Reserve assets**



**Note:** Maiden Lane LLC is a limited liability company formed to acquire certain assets of Bear Stearns for J.P. Morgan Chase & Co.

Although the newly introduced credit facility commitments will at least be partly offset by reduced borrowings in other facilities, there has been recent speculation of what would happen if the Fed were to use up all of the Treasury securities on its balance sheet and thus exhaust its ability to provide further lending through the credit facilities, should the crisis persist.

A step considered by the Fed would be to let the US Treasury issue more securities than needed to fund government operations. The proceeds would be transferred to the Fed and used to buy an offsetting amount of Treasuries since legal constraints prohibit the Fed from buying the securities directly from the US Treasury. This would increase the balance sheet, but as the new funds are kept separate from the bank reserves, this would not impact interest rates.

Another possibility is to seek congressional approval to pay interest on banks' reserves instead of waiting until a 2006 law permits this from 2011. Such an interest rate would create a floor that would limit the banks' incentives to lend out excess reserves if the Fed funds rate were to drop to this level. This would offset the effect of the Fed funds rate often crashing at the end of the day when banks realise they have more reserves than they need. Thus liquidity can be increased directly without putting downward pressure on the overnight Fed funds rate, causing inflation to rise. The deferred 2011 date was set because such interest payments on reserves will impose a cost on the Fed liabilities and reduce profit, which currently helps to reduce the US budget deficit.

The Fed also recently allowed the two government sponsored enterprises Freddie Mac and Fannie Mae to tap into the discount window as a last liquidity resort. To keep the balance sheet constant, the normal procedure when facilitating loans at the discount window is to sterilize the borrowings by conducting offsetting open market operations, selling Treasuries. Consequently such a loan facility to the mortgage institutions could potentially erode the Fed's Treasury portfolio even further.

Looking ahead, the Fed will have to conduct an unusually large amount of Treasury-bill purchases to rebuild the balance sheet portfolio. Although this would happen gradually, there could be some downward pressure on T-bill yields.

## Conclusion

Since the summer of 2007 when the first sign of distress in the US financial markets appeared, it has become increasingly important to understand how the traditional monetary policy of the US Federal Reserve is implemented. In order to ease uncertainties in the strained interbank market, the Fed launched several new forms of extended monetary policy instruments, thus attempting to soften the blow on the economy.

These new credit facilities all provide liquidity to depository institutions and primary dealers in exchange for various forms of collateral to the Fed. This has significantly changed the asset side of the Fed balance sheet in a more risky direction while the portfolio of Treasury securities held by the Fed has declined. This decline could intensify further due to the recent expansion of the Fed credit facilities and with the credit lines to the two mortgage institutions, Freddie Mac and Fannie Mae.

While the new liquidity-providing credit facilities have had effects on the interbank money market, these have tended to be short-lived and slender, showing no permanent effect. If the crisis should require further supply of liquidity, the Fed may become restrained by the declining Treasury holdings (providing that lowering the Fed funds target rate to zero is not an option). Instead new types of liquidity-providing methods would have to be implemented, which could in turn affect the entire financial sector.

Furthermore, it has been indicated by the Fed that the dynamic properties of the Term Auction Facility makes it likely to become a permanent monetary policy instrument in the future. The Fed is able to control and adjust the auctioned amount of credit while the market participants set the price. It is also a useful tool for policymakers to assess market conditions and sentiment.

### References and further readings:

#### U.S. Monetary policy:

- [U.S. Monetary policy: An introduction](#)
- [U.S. Monetary policy details](#)
- [Overview: Forms of Fed lending](#)
- [Reserve Requirements](#)
- [Open Market Operations](#)
- [Discount Window I](#)
- [Discount Window II](#)
- [Term Auction Facility](#)

#### General information on the Fed:

- [Fedpoints \[topic reference list\]](#)
- [Federal Reserve Education](#)
- [Fed balance sheet: Factors affecting reserves](#)

#### Market impacts:

- [WSJ: What could the Fed do?](#)
- [FT: Libor dominance under threat](#)
- [Bloomberg: Money markets will show strains...](#)

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