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1. Introduction

The current economic and financial crisis is considered to be the worst recession since the “Great Depression” in the 1930s. Some argue that it is even worse than that. Not only that many economies around the globe experience negative GDP growth rates, but also large parts of the banking system came into severe difficulties thereby causing a threat for the stability of the overall financial system. Under these circumstances, central banks in most industrial countries have lowered their key short-term interest rate targets to nearly zero.

However, as it turned out, in these extraordinary times “traditional” monetary policy responses in terms of variations of interest rate targets might not be sufficient in order to successfully master the current challenges. As a consequence, many central banks introduced so called “unconventional” monetary policy measures, which are generally summarized under the term “Quantitative Easing (QE)”. The concrete actions attributable to QE can be subdivided into “active” and “passive” QE. Active QE, which is at the discretion of the central bank, refers to outright purchases of government securities or other assets. Passive QE, on the other hand, is at the discretion of the central bank’s counterparty and means that counterparties can approach the central bank to obtain funds, given their ability to provide eligible collateral. Both have in common that aim to achieve certain – often country specific – targets by increasing the overall liquidity in the banking system.

The Bank of England (BoE), for example, announced in March 2009 to purchase GBP 75 billion of assets via reverse auctions because it feared that the achievement of its final target – an inflation rate (CPI) of 2 percent – is in danger. In May, the UK’s central bank decided to provide additional GBP 50 billion for further asset purchases. The BoE’s QE approach focuses primarily on the purchase of government debt (“gilts”). In addition, also corporate bonds are included. The introduction of QE in the UK was accompanied by a policy shift that places a higher weight on the quantity of money supplied rather than the short-term interest rate (“bank rate”). And also the European Central Bank (ECB) is active on the fields of unconventional monetary policy. In fact, as the current ECB president Jean-Claude Trichet points out, the European central bank was “the first central bank to take non-standard measures” by providing “additional liquidity to banks with immediate liquidity needs” at the beginning of August 2007. Since the banking system is more important for corporate financing in Europe than in Anglo-Saxon countries like the US or the UK, its primary concerns are the strains in the banking system. To face these strains, the ECB started very early to follow a “fixed rate full allotment” approach under which, in contrast to the

previously applied variable rate tender procedure, commercial banks can obtain as much liquidity as they want at the prevailing interest rate target. In addition to this, the European central bank considerably increased the maturity (up to 12 months) and frequency of its liquidity-providing operations as well as the range of eligible collateral. The most recent (May 2009) measure announced by the ECB is a purchase program to buy covered bonds of about €60 billion, which can be considered as active QE. However, the primary focus of the ECB's use of unconventional monetary policy lies, as just mentioned, on the extension of its existing liquidity-providing facilities, by which it heavily and also at an early stage of the current crisis increased the liquidity within the banking system. The problem pressure the American central bank (Fed) is currently facing is, to a certain degree, comparable to the one its European counterpart has to deal with: In both areas, fighting the strains in the banking system became one of the main tasks of monetary policy. In order to do so, the Fed relies on a threefold approach: First, it provides liquidity to banks and depository institutions on a short-term basis. For example, it introduced a liquidity-providing standing facility for primary dealers ("Primary Dealer Credit Facility"), which are not allowed to obtain funding through "traditional" standing facilities. Secondly, due to the comparably high significance of capital markets for corporate financing in the US, the Fed engages directly with borrowers and investors in key credit markets. And thirdly, it introduced several purchase programs for long-term government securities (up to \$300 billion) as well as for government-sponsored enterprise debt and mortgage backed securities (up to \$200 billion and up to \$1.25 trillion, respectively).

Yet QE is not a phenomenon of the current crisis, it had been implemented for the first time more than eight years ago: The Bank of Japan (BoJ), having unsuccessfully tried to end deflation and recession, opted for a radical policy change and introduced the then unknown QE-policy in March 2001. When the Fed announced to engage in outright purchases of certain problematic assets as well as of government securities, many commentators made oversimplifying cross references to the Japanese QE-policy between 2001 and 2006. However, as Fed Chairman Ben Bernanke points out, the Japanese QE approach differs fundamentally from the QE approach the Fed currently pursues. In fact, when talking about the Fed's current monetary policy, he refers to "Credit Easing (CE)", which he opposes to QE as pursued by the BoJ.

It is therefore the aim of this diploma thesis to examine the differences between QE applied by the BoJ between 2001 and 2006 and the current QE policy pursued by the American central bank (although Bernanke calls the Fed's approach CE, for reasons of easier

comparison I will refer to QE most of the time). The questions I try to answer are what different macroeconomic and financial developments forced the two central banks under considerations to believe that their respective toolkits of conventional monetary policy instruments are not sufficient for addressing these developments, in which way their respective QE regimes differ from each other, how these differences affected certain variables like the size of the central bank balance sheet and finally to what extent today's US and Japanese monetary and also fiscal policy decision makers took into consideration the experiences Japan made in the last two decades when trying to address the current strains in the financial system and in the economy as a whole. For this purpose I proceed as follows: After reviewing the range of traditional monetary policy instruments at the disposal of the Fed and the BoJ, I focus on the economic conditions prior to the introduction of QE in the US and Japan, respectively. This is the basis for a close examination of commonalities and differences between the two QE regimes, which is done in the following part. I conclude with an evaluation of the implemented measures.

The main findings are as follows: First, the BoJ formally introduced QE on a certain date and also explicitly used the words "Quantitative Easing". The Fed, on the other hand, neither used the term "Quantitative Easing" in its official statements (also not "Credit Easing") nor was there a formal starting date. Secondly, although there are certainly parallels between the particular macroeconomic and financial environments that form the motivation behind the implementation of "unconventional" monetary policy measures by the two central banks under consideration, the differences in the economic performance are nevertheless the factors that shape the respective QE policies the most: Whereas the Japanese economy suffered from a prolonged deflation, the distinctive characteristics of the current US recession are severe problems within the banking system. Hence, the primary aim of QE in Japan was fighting deflation, whereas the American central bank addresses mostly strains in the banking system. Thirdly, the two QE approaches differ fundamentally with respect to their main policy targets. The BoJ switched from short-term interest rates to total reserves of commercial banks held at the central bank (i.e. the BoJ). The Fed, in contrast, keeps targeting short-term interest rates. This is clearly reflected in the respective monetary policy arrangements, which leads us to the fourth ground on which differences can be identified: QE by the BoJ consisted to a good deal of active QE in terms of outright purchases of Japanese government securities (JGBs), whereas the Fed currently follows a somewhat broader approach: Since interbank markets are not functioning as desired, it tries to engage with as many market participants as direct as possible. Therefore the Fed has introduced a much broader range of new instruments than its

Japanese counterpart did between 2001 and 2006. As a result, the Fed's balance sheet expansion was considerably larger than the one in Japan. (see Bernanke 2009a; Bank of England 2009; Trichet 2009; Pradhan 2009; Eichengreen/O'Rourke 2009).

2. “Conventional” Monetary Policy Instruments

Already 1969, Nobel Prize-winning Milton Friedman points out three main objectives that central banks should achieve when conducting monetary policy. The first one – “preventing money itself from being a major source of economic disturbance” – is, albeit appearing to be trivial, arguably the most important one. Having in mind the severe monetary policy mistakes by the Fed, that exacerbated the Great Depression in the 1930s, Friedman concludes that a central bank should “avoid drastic and erratic changes of direction”. His second proposition, “keeping the machine well oiled”, refers to the fact that a basic prerequisite for prospering economies are stable but also flexible prices and wages. At long last, monetary policy should in principle also focus on “offsetting major disturbances in the economic system arising from other sources”, although he stresses the limitations of monetary policy in dealing with disturbances in general (see Friedman 1968, p. 12-14).

Nowadays, a good deal of Friedman’s proposals is commonly agreed upon as being the main final targets a central bank should strive to achieve. The importance, however, that the big central banks attach each of these objectives, differs from institution to institution. Whereas Japan’s central bank primarily aims at “achieving price stability, thereby contributing to the sound development of the national economy” (see Bank of Japan 1997), the Fed’s mandate incorporates a broader range of objectives, namely “maximum employment, stable prices, and moderate long-term interest rates” (see The Federal Reserve Board 2008). So while the BoJ sees stabilizing the price level as its main responsibility, the Fed has three final targets of which price stability is merely one of them.

Achieving a certain final target, however, stands at the end of a rather long chain of monetary policy implementation, which consists of an operational target, an operational framework that enables the central bank to control the operational target and finally the use of monetary policy instruments in order to achieve the operational target. The connection between the operational target and the final target is made via an intermediate target, that can be controlled or at least influenced through the operational target and that has a stable relationship with the final target. In the particular case of the Fed and the BoJ, the operational target is in both cases the overnight market interest rate, which is called “federal funds rate” in the former and “uncollateralized overnight call rate” in the latter case. The operational framework determines the range of available instruments, the counterparts with whom a central bank should conduct business and the range of eligible collateral. All these aspects will be discussed in the following subchapters. The intermediate target is usually constituted by a monetary aggregate,

M1 for example, though the importance of monetary aggregates as intermediate targets declined in recent years to some extent (Bindseil 2004, p. 7-9).

What now follows is a description of the instruments – including their requirements and the involved counterparties – modern central banks in general and the two monetary institutions discussed in detail use to exert control over short-term interest rates.

2.1. Open Market Operations

The following part outlines the general procedure as well as the specific characteristics of open market operations in the US and Japan prior to the introduction of QE. These operations, which are essential for the implementation of monetary policy, can be divided into two main subgroups, namely outright transactions and (reverse) repurchase agreements.

Today, open market operations are regarded as the most important class of monetary policy instruments for influencing short-term interest rates. Though there are different types of such operations, they have some commonalities. In contrast to standing facilities, which will be discussed below, they are only conducted at the discretion of the central bank. Therefore, if one considers “ideal” open market operations, it is not possible for market participants to anticipate its implementation (see Bindseil 2004, p.145-147). In practice, however, many central banks (the ECB, for example) conduct (at least certain types of) open market operations on a regular basis (see ECB 2002, p. 7).

Concerning the procedure of liquidity-provision or liquidity-absorption, regardless of the type of open market operation, fixed-rate or variable-rate tender procedures have become the main tool for open market transactions between the central banks and eligible counterparties. If, for instance, a monetary institution decides to provide liquidity through a fixed-rate tender, it pre-announces the interest rate at which the counterparties can submit the amounts they wish to obtain. Unfortunately, this procedure has some important limitations, mostly because counterparties tend to bid for larger amounts than they actually want to obtain since they know that the actual amount allotted to them is just a fraction of their initial bid. This problem can be avoided by applying variable-rate tenders, where bidders are asked to submit rate/quantity pairs, which results in a downward-sloping demand curve. Now the central bank has to choose a marginal rate. All bids that lie above this particular interest rate and a predetermined minimum bid rate will be fully allotted, whereas rate/quantity pairs below the marginal rate will be refused. Bids that have been submitted exactly at the marginal rate will be allotted concerning to an allotment ratio that has to be specified by the central bank. The counterpart to fixed-rate as well as variable-rate tenders are bilateral operations, where the

central bank engages directly with one or more counterparties, which could also include sales on the stock exchange. However, this kind of transaction procedure is barely used (see Bindseil 2004, p.162-163).

2.1.1. Outright Transactions

Regarding the different types of open market operations, outright transactions, which include purchases or sales of securities, are primarily used for structural liquidity-provision or for liquidity-absorption from the banking system. In general, both the Fed and the BoJ try to avoid draining reserves by creating a so called “structural liquidity deficit”, whereby they inject less liquidity through outright purchases than is demanded so that there ideally remains a constant need to add reserves, which is typically done via reverse operations (see Bindseil 2004, p.154-155 and BIS 2001, p. 17-18).

2.1.1.1. USA

In the US, outright transactions and open market operations in general are carried out by the Federal Reserve Bank of New York on behalf of the Federal Reserve, which, in turn, has been authorized by its central decision-making body, the Federal Open Market Committee (FOMC). At the Federal Reserve Bank of New York, the division in charge of open market operations is called the “Open Market Trading Desk” or, in short, the “Desk”. Although the operational target is the uncollateralized lending rate between banks – the federal funds rate – the Desk actually conducts business mostly with so called “primary dealers”, which are banks and securities brokers. This procedure nonetheless affects reserves of the banking system held at the Fed since all primary dealers have clearing accounts at depository institutions. These accounts are used for the transactions between the Fed and the primary dealers. Thus, clearing account movements also lead to fluctuations of reserve holdings. In general, the Desk tries to achieve through its open market operations an equilibrium of supply of and demand for Federal Reserve balances at the prevailing federal funds target rate. If a deficit or surplus of reserves is perceived to be structural, the Desk conducts outright purchases or sales of assets through variable-rate tender procedures. Even though the domestic “System Open Market Account (SOMA)”, which administrates all domestic securities held outright, accounts for the bulk of total reserves supplied through open market operations (Chart1) (stock variable, average of 2006, so before financial turmoil started: \$762.478 billion), reverse operations (stock variable, average of 2006: \$24.863 billion, see The Federal Reserve Board 2009) are far more common.

When considering an outright transaction, the Desk has to pay attention to aspects like the maturity of the security or the liquidity of the relevant market. Therefore, the Desk generally focuses on US Treasury securities since the respective market is the broadest and most liquid one in the US. Concerning the maturity of the securities, the Federal Reserve imposed guidelines limiting the percentage share of certain maturities in its portfolio to avoid distortions of the yield curve, allowing for larger amounts of short-term securities. As a result, in 2006 about half of the securities in the SOMA portfolio had a maturity of one year or less (Chart2) (see Bindseil 2004, p. 155 and 163; Board of Governors of the Federal Reserve System 2005, p. 35-39; Federal Reserve Bank of New York 2007a, p. 14-24; Federal Reserve Bank of New York 2007b).

2.1.1.2. Japan

Japan's central bank does, like the Fed, focus on the overnight market interest rate – the uncollateralized overnight call rate – as the operational target. But whereas monetary policy implementation in the US relies heavily upon transactions between the Federal Reserve and a limited number of primary dealers – 19 as of September 2008 – the circle of eligible counterparties in Japan is larger: Prior to the introduction of QE, it ranged from about 30 to 50, depending on the type of transaction and has been expanded considerably after 2001. Counterparties can be banks, securities companies, securities finance companies and money market brokers. In contrast to US primary dealers, however, all of them have to maintain reserve accounts at the BoJ. In general, Japan's central bank conducts more open market operations, or rather repurchase transactions, than its American counterpart: While the first one has to engage in open market operations several times a day to offset undesired liquidity fluctuations, the latter one conducts such transactions typically just once a day. The reasons for this might be the higher volatility in autonomous factors, such as banknotes in circulation, as well as the illiquidity of some market segments in Japan. This could also serve as an explanation for the higher spectrum of instruments at the disposal of the BoJ. Before turning to the concrete design of outright transactions in Japan, it should be noted that many of the instruments in the toolbox of the BoJ have only recently been introduced. Some forms of outright transactions and reverse operations as late as the end of the 20th century. The reason for this was the BoJ's focus on its lending rates to banks as the primary monetary policy instrument. This was necessary due to the underdevelopment of the Japanese securities market, which made open market operations very difficult. In 1962, however, with bond and

bills markets becoming more and more liquid, the BoJ started focusing on open market operations in order to achieve its policy goals.

If the Policy Board, which is the BoJ's decision-making body, perceives that there is a structural shortfall of reserves, it conducts outright purchases of long-term Japanese government bonds (JGBs) with maturities ranging from 10 to 20 years via flexible-rate tender (Chart 3, note: the MPM on May 18, 2001 decided to extend the range of eligible JGBs, therefore also JGBs with a maturity of less than 10 years are included in the graph because earlier data was not available. Anyway, their total amount was still not significant at that time). The total amount bought should, on average, match the net increase in banknotes (Chart 4). Currently the BoJ purchases long-term JGBs on an outright basis about twice a month.

In contrast to the Fed, the BoJ also conducts outright purchases on a daily basis to address temporary liquidity-needs. Therefore, it purchases short-term government securities, namely Treasury bills (TBs) and financing bills (FBs). Yet two of the BoJ's short-term outright transactions differ somewhat from the usual definition of this monetary policy instrument: The first variation includes buying so called "master bills", which are bills issued by counterparties solely for the purpose of engaging in transactions with the BoJ. These bills, in turn, are backed by a pool of eligible collateral. The second variation of outright transactions implies purchasing bills collateralized by eligible corporate debt obligations, such as corporate bonds or asset-backed securities. All of these short-term outright transactions have in common that the maturity of the assets bought under such arrangements normally does not exceed 4 months. Finally, it should be mentioned that the BoJ conducts more repurchase than outright transactions, whereas the majority of funds is provided through the latter open market instrument (Chart 5). And in general, far more liquidity-providing than liquidity-absorbing operations are conducted. Obviously this pattern resembles the one described above when discussing the Fed. Concerning liquidity-absorbing outright transactions, the BoJ has the possibility to sell JGBs for addressing long-lasting liquidity-surpluses as well as TBs, FBs and bills issued by the BOJ with a maturity of up to 3 months for reducing liquidity on a short-term basis (see BIS 2001, p.12, p. 17-19, p. 28-33, p. 47; Bank of Japan 2004a, p. 124-125; Bank of Japan 2007b; Bank of Japan 2009b; Bank of Japan 2008a, p. 15-17).

2.1.2. (Reverse) Repurchase Agreements

In contrast to outright transactions, (reverse) repurchase agreements are used to (absorb) provide liquidity on a temporary basis. This implies that the central bank does not ultimately buy or sell assets but rather buys or sells assets while at the same time predetermining a fixed

date in the future for returning or re-obtaining the asset. For the duration of the transaction, the ownership rights of the assets are transferred to the buyer. Such transactions are mainly used for addressing short-lived liquidity fluctuations that might drive the short-term interest rate too far away from the target rate (see Bindseil 2004, p.156; ECB 2002 p. 82).

2.1.2.1. USA

In the US, it was not until the 1970s that (reverse) repurchase agreements became the dominant monetary policy tool for addressing temporary deviations from the reserve levels consistent with the federal funds rate. Nowadays, the Fed arranges such transactions on a very frequent basis, with short-term repos, especially those with overnight maturity, accounting for the vast majority of repurchase agreements: In 2006, 247 repos with a maturity of not more than 13 days had been arranged, compared to just a weekly long-term repo with a maturity of 14 days. As noted earlier, central banks try to create a “structural liquidity deficit” to avoid draining reserves. As a consequence, reversed repurchase agreements, which aim at absorbing liquidity from the banking system, have not been conducted at all in 2006. Concerning the range of eligible collateral, the Desk conducts three different operations simultaneously. In the first tranche, only Treasury securities are eligible. The second, in addition to Treasury securities, also allows for federal agency obligations. While these two types of collateral are also eligible in the third tranche, primary dealers, who are the Desk’s counterparts, may also try to obtain reserves in exchange for mortgage-backed agency debt. After all bids have been submitted, the Desk decides upon the allotment amount across the three tranches according to the attractiveness of each bid relative to the market price of the respective type of collateral. Yet in practice most of the allotted reserves have been collateralized by Treasury securities (2006: 78% of all outstanding repos, see Federal Reserve Bank of New York 2007a, p. 19). Critics argue, however, that, in case of severe market disturbances, in which not all types of collateral might be available at reasonable prices, the Fed’s range of collateral accepted at repurchase agreements could turn out to be too narrow (see Bindseil 2004, p. 158-159; Federal Reserve Bank of New York 2007a, p. 16-19; Board of Governors of the Federal Reserve System 2005, p. 39-40).

2.1.2.2. Japan

The BoJ relies, just like the Fed, heavily upon – due to the structural liquidity deficit mostly liquidity-providing – repurchase agreements to address short-dated liquidity fluctuations. The frequency of operations, however, is higher in Japan than in the US: While the Fed enters the

market typically on a daily basis, the BoJ conducts repurchase transactions several times a day. Another difference regards the range of eligible collateral: whereas the Fed accepts merely government securities, government agency debt obligations or obligations that are fully backed by those agencies, the BoJ follows a broader approach, which manifests itself in the set of repos the Japanese central bank can choose from. Apart from purchasing JGBs, TBs and FBs under such an arrangement, the BoJ has also the possibility to buy commercial papers (CPs) issued by non-financial companies, with TBs and FBs accounting for the bulk of collateral used in the BoJ's repos. The maturities of these transactions range from 3 to 12 months, which is considerably higher than in the US. A somewhat different kind of liquidity-provision under repurchase agreements are funds-supplying operations against pooled collateral, which is a loan with a maturity of up to 1 year. The pool of collateral is quite extensive, including a variety of government, government-backed and private obligations. If, on the other hand, the BoJ decides to absorb liquidity via reverse repurchase agreements, it can do so by selling JGBs, TBs, FBs. These operations are, however, like in the other country under consideration, relatively rare (see BIS 2001, p. 17-19, p. 28-33, p. 47; Bank of Japan 2007a; Bank of Japan 2009a; Bank of Japan 2008a, p. 15-17).

2.2. Standing Facilities

Analogous to the preceding subsection, the following two parts deal with standing facilities and reserve requirements – two other means of monetary policy that have a certain significance for achieving the operational target. Again, a theoretical assessment of these two instruments is followed by the practical implementation in the US and Japan.

Though nowadays open market operations are the most important means of monetary policy implementation, this has not always been the case. Until the 1920s, standing facilities have not only been the oldest but also the most important monetary policy instrument. Its most striking difference from open market operations is the fact that eligible counterparties can use standing facilities at their discretion at any desired moment during business hours. In principle, one can distinguish between borrowing and deposit facilities. Whereas the first type is usually set above the overnight market interest rate and is liquidity-providing, the latter one has only recently been introduced by some central banks and serves as a liquidity-absorbing instrument. Today, borrowing facilities are usually designed as so called “Lombard facilities”. Under such an arrangement, the central bank grants a credit with a certain maturity – usually overnight – to counterparties, which in turn have to deposit eligible collateral. Standing facilities, especially the more important liquidity-providing facilities, contribute substantially

to steering short-term interest rates. In the absence of such instruments, interest rates could exhibit extreme volatility. If, for example, a depository institution fails to obtain funds through open market operations or an expected payment from a counterparty has not been made, it can borrow funds at the borrowing facility. Furthermore, borrowing facilities contribute to the stability of the financial system, since banks can overcome temporary liquidity needs in case of either not smoothly functioning financial markets (for example a “credit crunch”) or individual financial difficulties that could lead to the collapse of the depository institution. Eligible collateral, however, is always essential for obtaining funds through borrowing facilities. Over the last years, though, widespread consensus has emerged among central banks that stabilizing functions of standing facilities should be separated from steering short-term interest rates, making sure that stabilization is at the discretion of the central bank (see Bindseil 2004, p.103-108).

2.2.1. USA

In the US, there is only a borrowing facility, which is called “discount window”. Prior to 2003, this term was used to summarize two lending programs called “adjustment credit” and the somewhat less important “extended credit”. Except for their importance, these facilities differed with respect to their credit period, with the first program addressing short-term and the latter longer-term liquidity needs. Yet both of them were set below the effective federal funds rate, which was problematic because it created arbitrage-opportunities that had to be prevented by the Fed. Therefore, there was a major revision of the discount window lending programs in 2003. As a result, the two programs had been replaced by “primary credit”, “secondary credit” and “seasonal credit” Lombard-type lending programs. Primary credit, representing the Fed’s main discount window program, is generally available to sound depository institutions on a short-term basis and is usually set about 1 percent above the federal funds target rate, although the spread might vary depending on the specific circumstances (Chart 6). There might also be situations in which primary credit is extended for periods of up to a few weeks. Secondary credit, on the contrary, is granted to depository institutions that are less financially sound and therefore not eligible to obtain primary credit. It is typically set 50 basis points above the primary credit rate. Finally, seasonal credit, which is based on market interest rates, is intended to provide funding for small depository institutions that face seasonal liquidity fluctuations. Regardless of the program, institutions that want to borrow through discount window programs have to be subject to reserve requirements. Eligible collateral, which is required for every discount window program, ranges from US

Treasury securities over asset-backed securities to consumer loans. Therefore, compared to the rather narrow list of collateral accepted by the Fed in its repurchase agreements, depository institutions have much more to choose from (see Board of Governors of the Federal Reserve System 2005, p. 45-50; The Federal Reserve Bank Discount Window & Payment System Risk Website).

2.2.2. Japan

Also the BoJ did not install a deposit facility and therefore relies exclusively on a (Lombard-type) borrowing facility, the so called “Complementary Lending Facility”, which is set above the overnight call rate. Yet in contrast to the US, the Japanese central bank does not offer several lending programs but only one. In principle, all counterparties that maintain accounts at the BoJ are eligible for obtaining funds through this borrowing facility. In practice, however, depository institutions are more likely to make use of it because securities companies and other eligible institutions must pay a higher tax on borrowed funds from this facility. Like the comparable facility in the US, the Complementary Lending Facility aims at providing merely short-term funding. More specifically, the maturity of the BoJ’s borrowing facility is usually overnight, with the rule that this facility can only be used on up to five business days in each maintenance period (1 month). The interest rate applicable to such loans is the “basic loan rate” (Chart 7). But other than primary or secondary credit, which are set at a fixed rate above the federal funds target rate, the spread between the Complementary Lending Facility and the overnight call rate might be altered at every Monetary Policy Meeting of the Policy Board. Then again, there are many similarities concerning the range of eligible collateral. Both, the Fed and the BoJ, accept not only government or government-guaranteed securities but also a broad variety of corporate bonds and private debt (see BIS 2001, p. 30 and 33; Olivei 2002, p. 40).

2.3. Reserve Requirements

The last monetary policy instrument to be discussed is the reserve requirement. Despite the incapacity to fulfill its initial purpose, namely ensuring banks’ individual liquidity against bank runs, and continually changing justifications for its existence during the 20th century, reserve requirements nevertheless remain an essential monetary policy instrument. Today, this instrument is considered to provide an important averaging facility, such that transitory liquidity-shocks do not cause fluctuations in short-term interest rates. Furthermore, reserve requirements might be viewed as a precondition for the effectiveness of open market

operations since they create a demand for central bank money, which comes as follows: When applying reserve requirements, commercial banks are obliged to hold a certain fraction of customer deposits at their accounts at the central bank. Since this liquidity is no longer in the banking system, there is a so called “structural liquidity shortage” that makes commercial banks willing to engage in open market operations with the central bank in order to counterbalance this “loss” of liquidity (see Bindseil 2004, p. 179-180 and Keijser 2006, p.54).

2.3.1. USA

Until the end of the Second World War, the Federal Reserve was the only major central bank that used reserve requirements as a monetary policy tool, although, as mentioned above, its legitimation was somewhat different than today.

Reserve requirement ratios are adjusted annually in order to keep up with the growth of the banking system (reserve requirement ratios mentioned below were in force in 2004). When applying reserve requirement ratios, the Fed takes into account the different sizes of institutions. Therefore, if a depository institution has less than \$6.6 million on its customers’ transaction accounts (transactions accounts include checking and other accounts, from which payments can be made), it does not face any reserve requirements. For amounts ranging between \$6.6 million and \$45.4 million, the institution has to deposit 3 percent of the amount. Larger banks with more than \$45.4 million on their customers’ transaction accounts face reserve requirements of \$ 1 164 000 plus 10 percent of the amount exceeding \$45.4 million. Unlike many other central banks, the Fed also accepts vault cash for the fulfillment. In recent years, however, there is an obvious downward trend of (absolute) required reserve balances held at the Fed (Chart 8). Except for two cuts in reserve requirement ratios in 1990 and 1992, this is primarily the result of the introduction of so called “retail sweep programs” that allow banks to transfer funds from reserveable transaction accounts to non-reserveable accounts, mostly money market deposit accounts (see Bindseil 2004, p.180; Board of Governors of the Federal Reserve System 2005, p. 41-42; The Federal Reserve Board 1997, p. 869-870).

2.3.2. Japan

In the 1940s, 1950s and 1960s, a good deal of the major central banks introduced reserve requirements as a monetary policy tool. Likewise, the BoJ discovered this instrument in 1959. As in the US, the Japanese central bank requires only depository institutions to hold reserve balances on their BoJ accounts, although also the other counterparties usually maintain current account deposits at the BoJ on a voluntary basis. In contrast to the Fed, however, the

BoJ imposes reserve requirements on a broad range of deposits, including time deposits and foreign currency deposits and does not accept vault cash for meeting these requirements. The specific reserve requirement depends on the amount, the type of deposit as well as the currency and ranges from 0.05 to 1.3 percent (as of 2000), which has to be fulfilled over the maintenance period (1 month). Another difference is the fact that the downward trend of (absolute) required reserve balances is not present in Japan, which might be the consequence of increasing required reserve rates (Chart 9) (see BIS 2001, p. 37; Bindseil 2004, p. 182; Bank of Japan 2004a, p. 53).

3. The Macroeconomic and Financial Conditions prior to the Introduction of Quantitative Easing

Both countries have in common that they experienced a period of substantial economic growth prior to the introduction of QE, which was followed by a severe recession. This, in turn, made it necessary to expand the traditional toolkit of monetary policy instruments to include also “unconventional” measures. In what follows, these macroeconomic, financial and also political developments that paved the way for QE are examined. Again, the starting point is the US, preceding the examination of the Japanese experience between 1980 and 2000.

3.1. USA

The recovery of the American economy that started in November 2001 following the economic slowdown after the dot-com bubble burst was to a large extent fueled by a rather steep increase in house prices all across the country (Chart 10): From 1997 (Q1) to 2007 (Q2), where the housing market reached its cyclical peak, the “House Price Index (HPI)”, which is estimated by the “Office of Federal Housing Enterprise Oversight (OFHEO)”, nearly doubled (+96.4%).

Accordingly, also new housing starts (2005: 2 068 000, see U.S. Census Bureau) and sales of existing homes (2005: 7 076 000, see National Association of Realtors 2008) reached record highs. Having in mind that historically, house prices increased on average with the same rate as the overall inflation and that US population growth amounted to about 10 percent in the last decade, the dramatic price-increases on the real estate market seem to be nothing but speculative. The Fed, which lowered the federal funds target rate to 1 percent in June 2003, set the basis for this asset price bubble since many homebuyers took advantage of adjustable

mortgage rates that have a low starting rate but can be adjusted after a lock-in period of usually three years. Of course the developments on the housing market had massive impacts on the overall economy: First, there was a direct effect through the employment of workers in construction as well as of employees in construction related industries (real estate, mortgage banking sector, etc.). Secondly, and perhaps more importantly, the increase in housing wealth was a major driving force for consumption expenditures since home owners took advantage of increasing real estate prices by borrowing against their homes, turning the savings rate negative. As a result, the consumption share of GDP rose from 68.7 percent in 2000 to 70.3 percent in 2006 (Q3). Investment, on the contrary, exhibited a somewhat lower growth rate, for the following reasons: First, the US-economy sustained a relatively high level of investment as a result of the dot-com bubble and secondly, the housing market pulled away resources from non-residential investment. GDP itself stopped its downward trend it had begun after the burst of the preceding bubble and reached a cyclical high in the 4th quarter of 2003 (+7.5%). Not surprisingly, the first years of the 21st century were also a period exhibiting a downward trend in the unemployment rate (Chart 11).

Many homebuyers that bought a house in recent years did so without adequate or even any funding. This balancing act did work out during the housing boom when house prices were rising and personal income was sufficient to cover the relatively low mortgage rates. But when the Fed started raising the federal funds target rate in June 2004, the burst of the bubble was merely a matter of time. It comes as no surprise that house prices nevertheless increased until 2007. The reason for this is the already mentioned lock-in period. Since a good deal of adjustable mortgages had been granted in 2003 and 2004, many home owners faced, depending on the type of mortgage, a considerable increase in their mortgage payment around 2006 and 2007. Home owners, who made no down payment and devoted a substantial fraction of their income to meet their mortgage payments already before the lock-in period had ended, faced severe difficulties. This led to a dramatic increase in foreclosure rates and a reversion of the prevailing upward trend in house prices (Chart 10). The implications are straightforward: Consumption based on increasing house prices was not possible any more, which led to a sharp decline of GDP growth and an equally sharp increase in unemployment (Chart 11) (see Baker 2006, p. 1-16 and Frankfurter Allgemeine Zeitung, 11/30/07).

Against the background of the collapse of two major investment banks (i.e. Bear Stearns and Lehman Brothers) and other financial institutions having severe liquidity problems as well as a serious recession that many observers, whether this is correct or not, lead to comparisons with the Great Depression of the 1930s, the Bush and the Obama administration, respectively,

introduced several massive financial and economic stimulus packages. A discussion of these programs is beyond the scope of this diploma thesis. Therefore, they are just briefly mentioned. The “Economic Stimulus Act of 2008”, passed in February 2008, basically provided tax rebates to low- and middle-income taxpayers that amounted to \$168 billion in total. The second and by far bigger stimulus package (“American Recovery and Reinvestment Act of 2009”) included \$787 billion in tax cuts and new spending programs. To help restoring the smooth functioning of bank lending, the “Emergency Economic Stabilization Act of 2008” allowed the US Treasury to buy distressed assets from financial institutions (which was abandoned later) and to provide them with additional funding if necessary. This program, commonly referred to as financial bailout, amounted to up to \$700 billion (see FoxNews.com 02/07/08; U.S. House of Representatives 2009; The Coloradoan 04/16/09; Reuters 11/12/08).

3.2. Japan

In the decades after the Second World War, the Japanese economy experienced a period of high GDP growth rates that culminated in the 1980, accompanied by an excessive boom in both the real estate and the stock market: Between 1985 and 1991, some segments of the real estate market rose by as much as 268 percent (Chart 12) and therefore much more than in the US. The Nikkei 225, Japan’s major stock market index, increased by 470 percent between 1980 and 1989.

Like in the US, monetary policy played a crucial role in fueling these asset price bubbles. Between 1985 and 1987, the Bank of Japan gradually lowered the official discount rate from 5 to 2.5 percent and left it there for two years, despite soaring asset prices. Equally important, however, was the liberalization of the financial sector in the second half of the 1980s, whereby large corporations gained access to national and international financial markets for acquiring funding. As a consequence, banks – until then the primary source for liquidity seeking corporations – lost a substantial part of their traditional client base. To compensate for these losses, financial institutions embraced smaller firms with limited access to capital markets and the property sector. This spurred demand for and prices of commercial as well as residential property, having the effect that property owning firms were able to increase borrowing against collateral, thereby causing additional demand for commercial real estate. Therefore, firms were the driving force behind the Japanese real estate bubble that was hence most excessive in commercial property. In the US, on the other hand, the recent housing bubble originated in the private housing market and was to a large extent fueled by non-commercial demand. When looking at the driving forces of GDP growth in the 1980s, one can

see that this somewhat reversed pattern also holds true for the development of consumption and investment: Although both expanded rapidly in this decade, the latter component of GDP grew at a considerably faster pace. The reason for this was, as already mentioned, easier access to capital markets or bank loans, respectively, and, on the other hand, a reluctance of private home owners to borrow against their house to finance consumption expenditures. Hence it comes as no surprise that also the overall GDP expanded at a remarkable pace during the late 1980s: Between 1985 and 1990, the Japanese economy grew on average by 4.8 percent per year. Correspondingly, unemployment was not much of a problem in the 1980s (average: 2.5 percent, Chart 13).

However, like every other asset price bubble, Japan's stock market and real estate bubble had to burst sooner or later, which happened at the end of 1989 with the Nikkei 225 stock market index reaching its all time high of nearly 40 000 points. Despite the burst of the stock market bubble, the BoJ started raising the discount rate to 6 percent in August 1990, apparently because real estate prices kept rising for about another year and concerns about inflationary pressure (1989 inflation: 2.3 percent) were present. Only after the real estate market begun to collapse, the BoJ started easing its monetary policy stance. Between June 1991 and September 1995, the official discount rate was lowered to 0.5 percent. But due to upcoming deflation, real interest rate changes were less pronounced than changes in nominal interest rates, thereby reducing the stimulative effect of nominal interest rate reductions. In 1999, after several years of recession and persistent deflation or very low inflation, the BoJ, by lowering its key policy rate (overnight call rate) to virtually zero, introduced a policy referred to as "zero interest rate policy (ZIRP)". This is a striking contrast to the Fed's policy in the current crisis, since it took the American central bank merely 16 months to reduce interest rates from their peak to near zero. It is worth mentioning that during the whole 1990s, the unemployment rate stayed below 5 percent and also GDP growth, though turning negative in some quarters, was merely stagnating at worst, which compares quite favorably to the current US macroeconomic performance. Thus, the different reactions of monetary policy in Japan and the US in terms of the key target rates are to some extent understandable. The comparably mild macroeconomic performance in Japan is partly the result of the 10 massive fiscal stimulus packages initiated in this particular decade, which, in total, exceeded 100 trillion yen (more than \$1 trillion, with USD/JPY exchange rate as of 04/27/09) and included tax cuts as well as large scale public work programs. It is argued, however, that the main guiding criteria for financing construction projects was to ensure the political support of the construction industry, rather than the effectiveness or usefulness of the specific projects. This is seen as one of the main reasons

why these huge stimulus packages were not able to shift the economy back on a solid growth path, except for a temporary recovery phase between 1994 and 1996, but resulted merely in a drastically increasing debt-to-GDP ratio: While this value amounted to only 46.8 in 1990, government debt reached as much as 106.2 percent of GDP only ten years later (2000). In addition to these stimulus packages, the Japanese government was also forced to pass several financial bailout packages to stabilize the banking system through recapitalizing undercapitalized but principally sound banks and the construction of a bridge bank facility to continue the operations of failed institutions. These measures became necessary as many banks suffered from “bad loans” since the collateral (i.e. real estate) upon which the loans had been granted, lost dramatically in value (see IMF 1998, p. 107-120; Powell 2002, p. 35-39; Makin 2008, p. 2-3 and OECD 2009).

4. Preparing the Path for Quantitative Easing: The Ineffectiveness of “Conventional” Monetary Policy

The economic and financial conditions that prevailed in Japan during the 1990s and in the US since 2007 affected the respective economies in quite different ways. It turned out, however, that in both countries “traditional” monetary policy reached its limits. Therefore, for addressing the particular problems, monetary policy had to break fresh ground. The specific developments, which made this shift necessary, are the main subject of the next two sections. The final section of this paragraph then examines on theoretical grounds possible “unconventional” measures at the disposal of the central bank that move beyond the traditional monetary policy toolkit. One of these is, in fact, Quantitative Easing.

4.1. USA

Rapidly falling house prices in the US had also indirect effects on the economy through the banking system, primarily because of a new trend that emerged in the financial sector: In the past, banks that granted mortgages kept them on their books. Yet in recent years, more and more banks switched to selling the mortgages they granted to other financial institutions. They did so by creating structured products, which consist of a portfolio of not only mortgages but also loans or credit card receivables. These products that are often called “collateralized debt obligations (CDOs)” or “collateralized loan obligations (CLOs)”, depending on the concrete composition of their portfolios, are then sliced into different

tranches with the first tranche (“super senior”) being the first one to be paid out by the issuer and thus enjoying the highest credit rating. An essential drawback that comes along with such a procedure is the fact that the transfer of the credit risk distances the borrower from the lender. Usually, banks that granted a loan also had to bear the default risk. Therefore they had an incentive to carefully examine the prospective borrower and to deny credit if necessary. With creating structured products, however, the initial credit grantor transfers the credit risk to other financial institutions. Thus, its incentive to grant loans or mortgages only to borrowers that are trustworthy, declines dramatically. When house prices started falling and more and more home owners failed to meet their mortgage payments, structured products lost dramatically in value and their respective markets became more or less illiquid. As a consequence, so called “precautionary hoarding” took place: Banks hoarded large amounts of liquidity and refrained from lending in the interbank market because first, their own exposure to losses due to structured products and therefore their own liquidity needs were far from certain and secondly, as banks were aware of the fact that their competitors had the same problems, they knew that obtaining funds in the interbank market at reasonable prices when needed was hardly possible and thirdly, due to counterparty credit risk concerns, they feared that loans granted to other banks might default because of serious liquidity problems. Hence it should come as no surprise that the spread between the 3 months LIBOR, which is a reference rate based on the interest rates at which banks borrow unsecured funds for three months from each other, and the effective federal funds rate, widened considerably as banks were hardly willing to grant uncollateralized credit for a longer period than overnight (Chart 14). Furthermore, the Fed faced severe difficulties in keeping the demand for and the supply of reserves in equilibrium, which manifested itself in above-average deviations of the effective federal funds rate from its target (Chart 15).

These developments had, of course, also implications for private persons and companies, regardless of the particular creditworthiness: Even those banks, that received a good deal of the government aid granted in the course of the financial turmoil, made or refinanced 23 percent fewer new loans in February 2009 than in October 2008, which further exacerbated the economic downturn (see Brunnermeier 2008, p. 2-27 and The Wall Street Journal 04/2009).

Against this background, the American central bank started lowering its target rate pretty soon after it became obvious that the severe problems within the financial sector started affecting the real economy: On December 16, 2008, the Fed set the target rate as a corridor ranging from 0 to 0.25 percent, thereby ending a series of more or less drastic reductions of its

operational target. With inflation averaging at 3.8 percent in 2008, this policy step was not primarily set to keep the price level from declining. Instead, the main motivation behind this decision was restoring the smooth functioning of interbank markets and of bank lending to businesses as well as to consumers, or, simply put, to end the “credit crunch”.

It should be noted, however, that money market frictions accounted only for a part of the credit crunch. Rather, apart from simple deterioration of debtors’ financial positions, banks’ poor lending activities stemmed from the decline in their capital-to-asset ratios: With declining asset prices, the banks also had to reduce the asset side (i.e. loans) to keep the ratio more or less at the level they are required to maintain for regulatory reasons. They did so by raising rates, tightening credit standards or by simply refusing to roll over expiring loans. How severe the effects on the lending activity were can be shown by the following example: In order to keep the capital-to-asset ratio at, say, 10 percent, a bank has to reduce its assets by \$10 for every \$1 decline in capital, which is called “deleveraging”. Therefore it should come as no surprise that in July 2008, according to the “Federal Reserve Board Senior Loan Officer Opinion Survey on Bank Lending Practices”, 65 percent of the banks tightened their lending standards for small firms, which is a record high. This can also be seen when looking at various spreads: The spread between the bank’s own cost of funding and the rate charged to small firms had been raised by about 80 percent of US banks (July 2008). And external financing was not much of an option either because also the spread between investment grade corporate bond yields and the effective federal funds rate widened considerably (Chart 16). Since consumption accounts for a relatively large share of GDP in the US, it is worth noting that the same pattern holds true for the spread between the 30-year mortgage rate and the effective federal funds rate, as seen in Chart 17 (see Rosengren 2008, p. 1-12 and Bernanke/Lown 1991, p. 221-224).

So with an US economy facing a credit crunch that is brought about by malfunctions of interbank markets as well as banks’ reluctance in granting or extending new loans (either because of weak positions of potential borrowers or because of banks’ declining capital cover), reductions of the target rate were apparently not enough to restore confidence in interbank markets and to encourage banks to increase their lending activities to both businesses and consumers.

4.2. Japan

Although the economic and financial developments in the USA and Japan after the burst of the two bubbles share some commonalities like severe difficulties of major financial

institutions and the financial system as a whole or worrisome output tendencies, there remain some important differences: Whereas the most striking problem in Japan during the 1990s was deflation, the most severe problems of the USA in the current crisis are wide credit spreads and dysfunctional interbank markets. Therefore one of the main goals of monetary policy in Japan was fighting deflationary tendencies. This was also the main motivation behind the introduction of the ZIRP (in fact, the lowest level of the uncollateralized overnight call rate that has been reached was 0.02 percent) in February 1999, which was intended to “counter the possibility of mounting deflationary pressure and prevent further deterioration in economic conditions” (Bank of Japan 2000) by providing “more ample funds and encourage the uncollateralized call rate to move as low as possible” (Bank of Japan 1999). However, after some early and ex post misleading signs of economic recovery and although deflation was still present, the ZIRP was abolished in August 2000 by raising the uncollateralized overnight call rate to 0.25 percent. Two months later, the Japanese economy was falling into recession and deflation got much worse (see Ito 2005, p. 107-115).

4.3. The Way Out: Quantitative Easing and Other “Unconventional” Measures

So both central banks were in the uncomfortable situation of having lowered their key target rates (nearly) as low as possible without seeing any signs of achieving the effects that were the initial motivation behind this step. It seems as if monetary policy has exhausted all potential options at its disposal and became more or less ineffective because both economies were seemingly stuck in a so called “liquidity trap”. This is a situation in which the nominal short-term interest rate is zero or near zero and, as a consequence, further monetary expansion has not the desired effects since the usual transmission mechanisms do not work properly: When the nominal short-term interest rate is (near) zero, financial institutions are indifferent between holding zero interest rate assets (currency) and holding near-zero interest rate assets (short-term bonds) on their balance sheet. Hence banks have no incentive to increase their lending activities. This view, however, is somewhat incomplete, since it does not take into account that first, in a deflationary environment, real short-term interest rates are still positive and that secondly, the yields of assets differ with respect to their maturity, i.e. the yield curve is not flat but upward sloping (Chart 18). Therefore, the central bank could either focus on lowering real short-term interest rates by affecting private sector inflation expectations, thereby facing credibility problems, or it could focus on lowering long-term interest rates. Having in mind that long-term interest rates are by far more important for investment and

consumption decisions, central banks still have a promising chance of stimulating output and ending deflation (in the case of Japan) (see Orphanides 2003, p. 16-19; Spiegel 2001).

4.3.1. Shaping Expectations

The central banks can flatten the yield curve by applying “unconventional” monetary policy measures. The one that requires the smallest, if any, amount of open market operations works via affecting expectations: Since the return on long-term financial assets depends crucially on the level of short-term interest rates that are expected to prevail in the future, the central bank can lower long-term interest rates by credibly assuring that it will keep short-term interest rates near zero even *after* certain macroeconomic variables like inflation have reached a level that would, under normal circumstances, imply a short-term interest rate target that lies above zero. Therefore, if the central bank is successful in convincing market participants that it will keep short-term interest rates longer at the zero bound than it would normally do, they will adjust their expectations concerning future short-term interest rates, which exerts downward pressure on long-term interest rates. This mechanism is referred to as the “policy duration effect” (see Bernanke/Reinhart 2004, p. 85; Ugai 2006, p. 8-9).

4.3.2. Changing the Composition of the Balance Sheet

Equation 1

$$i_t^L = (1/N) \sum_{j=0}^{N-1} E_t(i_{t+j}) + \theta_t^L$$

i_t^L is the long-term bond rate at time t.

i_t is the short-term rate at time t.

θ_t^L is the risk premium on long-term bonds.

(see Clouse et al. 2003)

Another possibility to lower interest rates at the long end of the maturity range would involve changes in the composition of the central bank’s balance sheet, but without affecting its overall size. Two theories help explaining the link between this measure and long-term interest rates: Under the assumption that long-term and short-term bonds are imperfect substitutes because risk-averse investors prefer short-term assets, which are generally less risky, a distinct decline in the relative supply of long-term assets can influence, that is to say

lower, the risk premium component of the long-term bond rate (equation 1). This mechanism is called the “portfolio balance channel”. Consequently, since central banks are important participants in the securities markets and hence have the ability to significantly influence relative demand, a shift in their securities holdings from short-term to long-term government debt is quite likely to flatten the yield curve. But by altering the composition of its balance sheet, the central bank could exert pressure on long-term interest rates also through the “signaling channel”. In contrast to the just described portfolio balance channel, however, this theory assumes investors to be risk neutral, which implies perfect substitutability of short-term and long-term assets, i.e. a risk premium of zero. Under this assumption, long-term bond yields equal the expected short-term yields that are expected to prevail in the future (first part of equation 1), thereby making investors willing to hold both asset classes. Now if the central bank announces that it is buying more long-term relative to short-term bonds, the monetary authority is “signaling” that it has a vital interest in rather low short-term interest rates in the future, since otherwise it would incur capital losses on its stock of long-term bonds. Therefore, market participants expect the future short-term interest rates to be lower than originally perceived, which, according to equation 1 (under the assumption that the risk premium is zero), leads to lower long-term interest rates. This effect might be present even if the central bank announced that it will maintain short-term interest rates of (near) zero because now it has something at stake (see Bernanke/Reinhart 2004, p. 86-87; Clouse et al. 2003, p. 25-26).

4.3.3. Increasing the Size of the Balance Sheet: Quantitative Easing

While a main characteristic of the just discussed policy option is a stable balance sheet in terms of the total amount, the most striking characteristic of the last policy option to be discussed here is, in fact, an increase in the overall size of the balance sheet. The central bank can achieve this by buying long-term securities, thereby affecting long-term interest rates directly. This is basically the portfolio balance channel. Nevertheless, even the purchase of short-term assets does not leave the long end of the yield curve unaffected since money is an imperfect substitute for (long-term) financial assets, making investors unwilling to hold cash instead of interest bearing (long-term) assets, which is known as the “portfolio rebalancing effect”. Apart from that, the term structure of interest rates might again be flattened through the expectations channel as well because a substantial expansion of the central bank’s balance sheet could increase the credibility of the commitment of keeping short-term interest rates near zero for quite a while (signaling channel).

This last policy option, which is at the discretion of the central bank, is commonly referred to as active “quantitative easing (QE)”. But although this specific form of QE might be the most important one, passive QE that aims at providing liquidity to eligible financial institutions at their request in order to increase the overall liquidity in the financial system, also fulfills an important function in overcoming the difficulties discussed above.

When the BoJ introduced QE in March 2001, it was the first central bank worldwide to do so, owed to the fact that Japan was also the only industrialized economy that experienced a long-lasting deflation. As the Fed engaged in (active) QE for the first time in March 2009 (purchases of long-term government debt to influence long-term interest rates), many observers made the somewhat misleading suggestion that both BoJ-type and Fed-type QE are roughly the same. However, as the Fed Chairman Bernanke clarified in a speech in January 2009, this is not the case. Until March 2001, the BoJ, like all other major central banks, considered short-term interest rates as its main policy target. Yet following the introduction of QE, the Japanese central bank abandoned the interest rate target and focused exclusively on targeting reserves held by financial institutions on their accounts at the BoJ. The specific form of transactions conducted under QE, was secondary at best. This is a striking contrast to the Fed’s current QE-policy. For the American central bank, the federal funds rate is still the main target. Instead, the Fed “focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses” (see Bernanke 2009a). Furthermore, the Fed relies on a threefold approach, containing active and passive QE as well as liquidity provision directly to borrowers and investors in stressed credit markets, whereas the BoJ used principally only active QE. That is why Bernanke described the Fed’s implementation of QE as “Credit Easing (CE)”, thereby making a clear distinction from Japan’s “pure” QE regime. In what follows now, these two concepts of QE will be discussed and compared in detail (see Ito 2005, p. 107-116; Bernanke 2009a; Bernanke/Reinhart 2004, p. 85-88).

5. Quantitative Easing in Practice: Commonalities and Differences of Two “Unconventional” Monetary Policy Approaches

In this paragraph, which represents the main part of this diploma thesis, the respective QE policies in Japan between 2001 and 2006 and in the US since 2007 are examined. After stating the general outlines and purposes of QE in the two countries under consideration,

which directly follows from the macroeconomic and financial problems identified above, the concrete measures attributable to active and passive QE as well as to “direct lending to borrowers and investors” (only for the USA) are analyzed. However, a comprehensive assessment of QE is not complete without an evaluation of the effects on macroeconomic and financial variables. Therefore the last subsection aims to identify the impact of QE.

5.1. Introduction of QE

5.1.1. Japan

At the end of 2000, after the termination of the ZIRP, with inflation still being clearly negative and economic growth, after showing some promising signs in spring, deteriorating even more, the overall picture of the Japanese economy did not look very favorable. As a consequence, on February 28, 2001, the policy board of the BoJ lowered the uncollateralized overnight call rate and the discount rate to 0.10 and 0.25 percent, respectively. The economy, however, did not respond to these interest rate cuts as it had been desired. Against this background, the BoJ opted for a radical policy change: In the monetary policy meeting (MPM) of March 19, 2001, the Japanese central bank decided to switch to QE, a policy strategy unknown at that time. In the view of the policy board, “the economic conditions warrant monetary easing as drastic as is unlikely to be taken under ordinary circumstances” (see minutes of the MPM on 03/19/2001).

The new strategy basically consisted of three pillars: The most distinctive feature of QE was the shift from the short-term interest rate to current account balances (CABs) at the BoJ – the sum of required and excess reserves – as the main operating target. Secondly, the policy board stated that QE should “continue to be in place until the consumer price index (excluding perishables, on a nationwide statistic) registers stably at zero percent or an increase year on year” (see minutes of the MPM on 03/19/2001), which is an explicit exit condition based on inflation. Thirdly, the BoJ announced that it will increase its purchases of long-term JGBs from at that time 400 billion yen per month, if the central bank deems it necessary.

Concerning the first pillar of QE, the BoJ decided to set the target for CABs at 5 trillion yen, which exceeded required reserves by about 1 trillion yen. In subsequent years, the target had been raised several times, beginning in August 2001 (6 trillion yen). In January 2004, the target (corridor) had been set between 30 and 35 trillion yen, thereby ending the cycle of consecutive CAB target increases (Chart 19). By switching to CABs as the main policy target, the BoJ implicitly determined the uncollateralized overnight call rate as well, which comes as

follows: For all assets, there exists a more or less stable relationship between the price and the quantity demanded. This is also true for excess reserves held at the BoJ. If the price of holding excess reserves, i.e. the short-term interest rate as a measure of opportunity costs, increases, counterparties are less willing to pile up reserves at their BoJ-accounts. On the contrary, if the BoJ injects liquidity into the banking system in the form of increased CABs, the price of CABs (i.e. the interest rate) has to decrease. And since the uncollateralized overnight call rate was at 0.10 percent even before the introduction of QE, it should come as no surprise that the short-term interest rate declined to virtually zero shortly after the MPM of March 19, 2001. This is also a prerequisite for achieving the CAB target since CABs do not bear interest. Hence, under normal circumstances with short-term interest rates significantly different from zero, banks would face opportunity costs when holding funds at the BoJ in excess of their reserve requirements which makes them reluctant to do so. It should be noted, however that at the beginning of the QE policy and also previously during the ZIRP, non-bank financial institutions, which are not required to hold reserves at the BoJ, absorbed the increases in CABs, whereas commercial banks were not willing to hold significant amounts of reserves in excess of their reserve requirements. Yet with the BoJ consecutively raising the CAB target, also commercial banks became more willing to accumulate excess reserves (see Bank of Japan 2002, p. 2; Shirakawa 2001, p. 3; Ito 2005, p. 115-116; Maeda et al. 2005, p. 4 and 9).

The second feature of QE in Japan – an easily quantifiable exit strategy based on inflation – is a clear improvement compared to the ZIRP. In 1999, the policy board aimed at maintaining “the current decisive easy stance of monetary policy (note: ZIRP), firmly underpinning economic activity until deflationary concerns were dispelled” (see minutes of the MPM on 04/19/1999). As already noted, the BoJ decided to keep QE in force until “the consumer price index (excluding perishables, on a nationwide statistic) registers stably at zero percent or an increase year on year” (see minutes of the MPM on 03/19/2001). This statement was specified in the MPM of October 10, 2003: “It requires not only that the most recently published core CPI should register a zero percent or above, but also that such tendency should be confirmed over a few months” and “the Bank needs to be convinced that the prospective core CPI will not be expected to register below a zero percent”. Hence, in order to abandon QE, past inflation had to be positive not only for a month or a quarter but for a somewhat longer period of time, together with a positive inflation forecast for the months ahead. But even in the presence of sustained and stable inflation, the BoJ left the backdoor open for continuing QE by stating that “the Bank will judge it appropriate to continue with quantitative easing even if

these two conditions are fulfilled“ (see minutes of the MPM on 04/19/1999, 03/19/2001 and 10/10/2003).

5.1.2. USA

In August 2007, when the subprime crisis started to accelerate and the exposure of financial institutions to the same became more and more apparent, also the above mentioned uncertainties regarding own funding needs as well as counterparty credit risk concerns intensified. As a result, banks were reluctant to engage in the interbank market as a credit grantor for maturities longer than overnight. Financial institutions in demand of funding, on the other hand, were forced to bid aggressively in the federal funds market. These two markets, in turn, experienced volatility rates that have not been seen for many years: While the spread between the 3 month LIBOR and the effective federal funds rate widened considerably (Chart 14 above), the Desk faced severe difficulties in maintaining the effective federal funds rate at its target (Chart 15 above). Yet in the following months, at least the federal funds market, except for the turn of the year, stabilized for the most part. In September of the following year, however, after the failure of Lehman Brothers – a major US-based investment bank – both markets exhibited extreme volatility and soaring spreads (in the case of LIBOR-effective federal funds rate).

While the Fed was struggling to stabilize financial markets, it was also concerned about inflationary pressures stemming from soaring energy and commodity prices. That is a striking contrast to the problems the BoJ faced in early 2001, prior to the introduction of QE: Its main objective was, in fact, fighting deflation, whereas, at least compared to the current US experience, strains in interbank markets were not much of a problem. Thus it appears that both QE approaches have entirely different aims in order to reflect these just mentioned “differences in financial and economic conditions between the two episodes” (Bernanke 2009a), which is also reflected in their respective arrangements: While the BoJ primarily relied upon outright purchases of government securities, the Fed, as noted above, follows a threefold approach consisting of active QE, passive QE and liquidity provision directly to borrowers and investors in stressed credit markets, whereat it attaches great importance to the latter two pillars: So far it has introduced as much as 8 new instruments and modified 2 of its existing facilities to provide the market with much needed liquidity by means of different types of credit or with Treasury securities, which, in turn, can be used to obtain funds in the market. These two pillars have in common that they extend both the range of eligible counterparties and of eligible collateral, thereby offering a much larger set of market

participants an affordable way to obtain liquidity. Thus, by dealing directly with market participants and not only with a limited number of primary dealers that act as intermediaries, the Fed undertook to some extent the task of interbank markets. It should be noted, though, that a well-defined attribution of the newly introduced measures to one of the three categories of the American QE approach is not always possible. That is, some instruments contain elements that could justify declaring them as “passive” or “active”, while at the same time embodying characteristics of direct liquidity provision to borrowers in credit markets.

What is more, the Fed never changed its operational target from the overnight interest rate to reserves of depository institutions, as did the Japanese central bank. As Bernanke puts it, “the stance of the Fed policy in the current regime – in contrast to a QE regime – is not easily summarized by a single number, such as the quantity of excess reserves [...]” (Bernanke 2009a).

Another striking contrast to the Japanese QE approach is the fact that there was no explicit starting date. Instead, the Fed started with some gradual changes into the direction of QE, before introducing completely new facilities: In August 2007, the FOMC decided to lower the spread between the federal funds rate target and the primary credit rate to 50 basis points by reducing the latter, which can be seen as a measure to promote passive QE. A further step into this direction was made in December 2007, when the American central bank implemented the “Term Auction Facility (TAF)”. Active QE, on the other hand, had been introduced as late as November 2008: On the 25th, the Fed announced plans to purchase up to \$100 billion in government-sponsored enterprise (GSE) debt as well as up to \$500 billion in mortgage-backed securities (MBS). The purchase of US Treasury securities had not been introduced before March 2009 (Federal Reserve Bank of New York 2008, p. 1-2 and 27; Federal Reserve Bank of New York 2009a, p. 1-3; Board of Governors of the Federal Reserve System 2009a and Bernanke 2009a).

And also with respect to the exit strategy, the Fed follows a somewhat different approach than its Japanese counterpart: Whereas the BoJ’s exit from QE is, as noted above, primarily based on past and expected future inflation, the Fed, on the contrary, did not explicitly name macroeconomic or financial variables whose performance is decisive for the exit of QE or rather for the abolishment of the particular instruments subsumed under the term QE. In most cases, while introducing the new instruments, the Fed at the same time stated an explicit date until which the particular facilities should remain in force or at least emphasized the temporal nature of the concerned measures. The Fed might, however, postpone the exit if conditions in financial markets warrant it, which it did several times so far. Currently the AMLF, MMIFF,

PDCF, CPFF and TSLF are intended to operate until February 1, 2010, whereas the TALF shall stay in place until December 31, 2009. It is possible to determine an explicit exit date since most of these instruments are designed as loans with a limited term or include purchases of short-term securities (for example in the case of the CPFF) that simply run off if no new transactions are conducted. It is not that easy when turning to the purchase programs of long-term US Treasury securities and agency debt or agency MBS, respectively. In these cases, the Fed announced upper limits for the total amounts to be obtained. Notwithstanding that, most of these instruments are designed to become unattractive when market conditions improve and funding via the market becomes an option again so that in such an environment, eligible counterparties increasingly lose interest in obtaining liquidity through these facilities (Board of Governors of the Federal Reserve System 2009c; Bernanke 2009a).

5.2. Active QE

5.2.1. Japan

In order to achieve the aims constituting the first and the second pillar of the Japanese QE approach – the CAB target and a sustainable (positive) rate of inflation – the BoJ heavily increased the amount of monthly outright purchases of long-term JGBs from 400 billion yen at the introduction of QE to 1200 billion yen in October 2002 (Chart 19) (see Ito 2005, p. 116).

When looking at these figures, one is tempted to presume that in Japan, active QE and QE in general to a large extent consisted of increased purchases of the above-mentioned long-term government bonds (JGBs), whereas other forms of active QE that provide liquidity on a short-term basis (such as outright purchases of TBs/FBs), open market operations like repurchase agreements and also passive QE might have played just a minor role in achieving the CAB targets. And indeed, when examining the percentage change in the BoJ's outright holdings of short- and long-term assets between January 2001 – shortly before the introduction of QE – and the QE period, this impression receives some confirmation: While the increase in the outstanding amount of short-term fund supplying operations (which, besides short-term outright purchases, also include various kinds of repurchase agreements) on the bank's balance sheet peaked in March 2002 with a value that exceeded the one at the beginning of 2001 by about 50 percent, the BoJ's stock of JGB holdings temporarily (February 2005) reached 160 percent of its initial value (Chart 20). This pattern is, although a little bit less obvious, also present when looking at Chart 21, which graphs the development of the absolute

amount outstanding of short- and long-term operations (see BoJ Time-Series Data Search 2009c).

By going a little bit more into detail, that is decomposing short-term open market operations into its components, the reliance of the BoJ on JGB purchases for achieving the CAB target becomes even more obvious (Chart 22). JGB holdings are by far the largest single component of outright holdings on the BoJ's balance sheet, followed, with some distance, by outright holdings of TBs/FBs and bills.

Yet the dominant position of JGB purchases is not the only thing that one can see when looking at this chart. During the course of 2002, the BoJ stopped conducting JGB repos as well as purchases of TBs/FBs under repurchase agreements, which serves as an explanation for the sharp decline of these two components during this particular year. As a substitute for these two operations, the Japanese central bank switched to purchases of JGSs (JGBs, TBs/FBs) under repurchase agreements. This is a consequence of the abolishment of a tax on securities trading in 1999 that made it more favorable for JGB traders to engage in repurchase agreements rather than in "borrowing of JGBs". The absolute amount of this newly introduced repurchase agreement did, however, not measure up to its predecessors. The most important component for short-term liquidity provision was, as already noted, the outright purchase of bills. This is not without good reason, as counterparties were able to use a broad range of pooled collateral for bill operations with the BoJ (see 2.1.1.2.). What is more, in October 2002 the maximum maturity of this instrument had been extended from six month to one year, thereby enabling counterparties to secure longer-term funding needs.

What can also be seen from the chart is that despite the dominant position of JGB purchases in the BoJ's QE strategy, the central bank maintained the already mentioned broad diversity of instruments at its disposal. First, this was, as stated above, necessary to smooth short-term fluctuations of autonomous factors. But especially in an environment of zero short-term interest rates, some market segments might turn illiquid, as a result of too high transaction costs. Therefore, the BoJ can maintain a certain degree of liquidity by focusing on a relatively large number of instruments, i.e. a broad range of markets (see BoJ Time-Series Data Search 2009c and Bank of Japan 2003, p. 4-5).

The manifold variety of instruments was also maintained under the QE policy in order to avoid becoming over-dependent on JGB purchases. The BoJ wanted to avoid this because first, a large amount of JGBs on the bank's balance sheet might limit the ability to conduct short-term operations unless it sells part of its JGB holdings. And secondly, the BoJ worried that market participants could conceive this as an attempt to finance government expenditures.

Hence the BoJ continued to keep the total outstanding amount of JGBs, on average, at or below the volume of banknotes in circulation (Chart 4 above) (see Maeda et al. 2005, p.10). Concerning the maturity of open market operations under the QE policy, both short-term and long-term (i.e. JGBs) market operations converged somewhat: In the MPM of May 18, 2001, the policy board decided to expand the maturity-spectrum eligible for outright purchases of JGBs to include not only 10- and 20-year but also 2-, 4- and 6-year government securities (Chart 23 and for comparison Chart 3 above). On the other hand, the BoJ increased the maturity for many of its short-term funds supplying operations in order to make bidding more attractive since a longer time horizon of short-term operations enables counterparties to better secure their future liquidity needs. For instance, the maturity of outright purchases of bills was extended from six month to one year (see Bank of Japan 2002, p. 4 and Bank of Japan 2009d). Apart from modifications of the maturity spectrum, there were also changes regarding the number of counterparties as well as the range of eligible collateral. Concerning the first, the number of banks and other financial institutions that are allowed to engage in transactions with the BoJ had been raised from 30-50 to nearly 150 (as of 2004), also including foreign banks. The main motivation behind this was warranting smooth functioning of open market operations. With respect to the latter, the BoJ decided at its MPMs of December 17, 2002 and April 30, 2003 to accept loans on deeds with original maturities from five to ten years, asset backed commercial papers (ABCP) and loans on deeds to the “Industrial Revitalization Corporation of Japan (IRCJ)”, which is a government-backed agency created to rehabilitate heavily indebted but viable companies, as eligible collateral. Since eligibility criteria for collateral are stated in the “Guidelines on Eligible Collateral” that also formulate the range of eligible collateral that can be used by financial institutions to obtain funds through the discount window, these amendments to the “Guidelines on Eligible Collateral” made discount window borrowing less difficult as well. The inclusion of these products was intended to make it easier for counterparties to refinance them and, in the case of ABCP, to foster the development of the markets for securitized products (see minutes of the MPM on 12/17/2002 and 04/30/2002, Maeda et al. 2005, p. 6, Bank of Japan 2004a, p. 305 and Bank of Japan 2009e).

But permitting ABCP as eligible collateral has not been the only action the BoJ undertook in order to promote securitized products. One of the main problems of the Japanese economy was the fact that the financial intermediary function of Japanese banks was still weak. Therefore, the policy board adopted at its MPM on June 25, 2003 the “Principal Terms and Conditions for the Outright Purchase of Asset-Backed Securities” to “secure smooth corporate

financing and stimulate the flow of funds in the economy” (MPM on 06/10/2003). This measure, which was limited in time, was one of the few new instruments that have been introduced during the QE regime. In practice, the BoJ bought Asset Backed Securities (ABS) and ABCP, whose respective markets have dried up (Chart 24). Eligible for purchase were ABS and ABCP consisting of at least 50 percent of assets related to small and medium-sized companies. Furthermore, if the underlying assets were pools of bank loans, the initial borrower had to be classified as “normal”. The range of possible ABS or ABCP was further limited by the fact that they had to be rated BB or higher by all rating agencies. The purchasing procedure depended upon whether ABS or ABCP should be bought. In the first case, the BoJ conducted public offerings to determine both the amount and the purchase price. This was necessary because under the prevailing circumstances, no reliable market price could be obtained. In the latter case, the BoJ decided to use competitive auctions as the volume in the secondary market was relatively high. When looking at Chart 22, one can already see that the overall volume of outright purchases of ABS and ABCP was not very large (ABS/ABCP purchases were regarded as short-term operations). In fact, compared to the other outright holdings of the BoJ, it is not even noticeable. Right from the beginning, these operations were intended to play only a minor role in the bank’s outright operations. Hence the maximum amount outstanding has been set at 1 trillion yen with the further condition that for ABS, the amount purchased shall not exceed 50 percent of the overall amount of an issue to avoid price distortions. As mentioned above, the BoJ regarded the ABS/ABCP purchase program solely as a temporary measure, already stating the termination date in its outline (March 2006). In January 2004, the regulatory framework specifying the conduct of ABS/ABCP transactions with the BoJ was relaxed in order to further promote smooth corporate financing (see minutes of the MPM on 06/10/2003 and 06/25/2003).

5.2.2. USA

The way and the premises under which the American central bank conducted open market operations were fundamentally different from the Japanese approach. As most western central banks, the Fed relied on the already mentioned structural deficit, which essentially means occasional outright purchases of long-term securities accompanied with rather frequent repurchase agreements to deal with short-dated liquidity needs. During the course of 2007, however, the modifications made to the primary credit rate as well as the introduction of new instruments such as the TAF prompted the Fed to abandon this policy because rising levels of reserves at the Fed caused by these novelties would have threatened the effective federal

funds rate to trade below the target, which was still relatively high in 2007 (August 2007: 5.25 percent). Therefore the Fed decided to rely more on repurchase agreements and less on outright purchases of securities than in the past. As a consequence, redemptions of securities – until then very uncommon – were made in order to keep total reserves on a level consistent with the prevailing federal funds target rate. It is obvious that this is a striking contrast to the Japanese monetary policy stance during the QE regime, which continuously increased the target levels for total reserves as well as for long-term government securities purchases (JGBs).

In 2008, with the introduction of further facilities to provide liquidity to different kinds of market participants (primary dealers and depository institutions, for example), also the need for offsetting the effects on total reserves caused by these instruments increased substantially. Hence the Fed not only redeemed maturing securities but also sold a substantial amount outright. But the conduct of repurchase agreements had undergone substantial changes as well: Under normal circumstances, the Fed accepts three different classes of collateral in its repurchase agreement auctions (“tranches”), taking into account differences in the quality of the assets included in each tranche. After the financial turmoil had started, however, market participants primarily supplied Agency MBS as collateral, which is contained in the last tranche. Therefore, on March 7, the Fed decided to introduce a single-tranche repurchase agreement with a maturity of 28 days, in which US Treasury securities, Agency debentures or Agency MBS are all equally eligible as collateral. Effectively, primary dealers will only supply Agency MBS since this is the cheapest type of collateral. By providing the counterparties with a financing source for Agency MBS, the Fed aimed at, among others, stabilizing the whole market for these products. The maximum amount outstanding of this instrument was expected not to exceed \$100 billion. Except from this action, there were, in contrast to the Japanese monetary policy between 2001 and 2006, no major changes with respect to the range of collateral eligible in open market operations. When looking at Chart 25, one can see that there is a notable increase in repurchase agreements setting in in March 2008 (note: TAF has not been included because it is a new instrument, which makes the calculation of relative values rather meaningless because the low starting basis would result in skyrocketing growth rates). This hike is caused by the introduction of the just mentioned single-tranche repurchase agreements. Yet the American central bank still faced the problem that the newly introduced facilities threatened to cause a level of total reserves inconsistent with the prevailing federal funds target. To deal with it, the Fed abolished in September its traditional overnight, 7- and 14-day repurchase agreements, thereby causing a sharp decline in

the outstanding amount of repurchase agreements around October 2008, as can be seen in Chart 25. Finally, in February 2009, the Fed decided to abandon also the single-tranche repurchase agreement, since the imposed limit had almost been reached. In addition to this, the Fed used reverse repurchase agreements to counterbalance the nearly exponential increases in total reserves, which it did especially in the last quarter of 2008: Between end of May 2008 and end of December 2008, the average amount outstanding of reverse repurchase agreements increased by about 125 percent. However, compared to total reserves, which had increased by as much as 1777 percent over the same period of time, it is obvious that the impact of this measure was rather limited.

As a consequence, the Fed opted for a major policy change: Prior to mid-September, the Desk was quite successful in keeping the effective federal funds rate at or close to its target (Chart 15 above). But the financial turmoil and the increasing need to offset the effects of the new instruments on total reserves made this task more and more difficult, if not to say impossible. On October 6, in order to find a way out of this dilemma, the Fed announced to pay interest on both required and excess reserves, which could be viewed as a kind of lending facility. In its statement, the Fed expressed the hope that this step “will give the Federal Reserve greater scope to use its lending programs to address conditions in credit markets while also maintaining the federal funds rate close to the target [...]” (see Board of Governors of the Federal Reserve System 2008b). Interest rates on required and excess reserves were set below the prevailing federal funds target rate. In theory, this measure should enable the Fed to keep the short-term interest rate at its target while at the same time allowing for a level of excess reserves that would, under normal circumstances, not be consistent with the target rate. However, due to the fact that GSE were not eligible for obtaining interest payments on their reserves, they continued selling their liquidity in the market at any possible rate, thereby depressing the effective federal funds rate below its target. Furthermore, banks were not willing to arbitrage by obtaining funds at relatively low rates in the market and putting them on their accounts at the Fed to earn interest. Finally on December 17, shortly after the FOMC decided to set the federal funds target rate as a corridor ranging from 0 to 0.25 percent, it set the interest rate applicable on required and excess reserves to 0.25 percent as well.

In any case, by allowing for higher total (i.e. excess) reserves and therefore also for an expansion of the balance sheet, the Fed was not forced anymore to sterilize the effects of the newly introduced instruments and therefore established the basis for QE in the true sense of the word, as it is sketched in section 4.3.3. . That involves also purchases of additional securities that are not primarily aimed at keeping the effective federal funds rate at a certain

level but at influencing conditions in specific markets. Until then, the Fed was basically changing the *composition* of its balance sheet, while keeping the overall size more or less constant, thereby complying with 4.3.2. This, however, marks a sharp contrast not only to the Japanese implementation of QE, but also to the public opinion, which believed that the use of new or the extension of existing instruments rather automatically comes along with an increase in the size of the balance sheet (see Federal Reserve Bank of New 2008, p. 16-17; Federal Reserve Bank of New York 2009a, p.4-12; Board of Governors of the Federal Reserve System 2008a; Board of Governors of the Federal Reserve System 2008b, Jobst 2009, p. 70).

Due to the Fed's efforts to sterilize the effects of the newly introduced instruments, it had to, as stated above, redeem or even sell a considerable amount of its US Treasury securities holdings. Thus, the value of the securities held in the SOMA decreased by nearly 40 percent between the end of 2006 and the end of 2008, thereby constituting the first decline since 1989. Then again, the consequent reductions of the federal funds target rate to finally 0 - 0.25 percent, which allows for a higher degree of volatility, as well as the decision to pay interest on required and excess reserves, mitigated the need to offset the impact of the new instruments. And with strains in financial markets reaching a new dimension caused by the bankruptcy of Lehman Brothers in September 2008 and a further deteriorating housing market, the Fed decided to purchase different kinds of securities to influence conditions in the respective markets directly. More precisely, the Federal Reserve announced on November 25 to purchase GSE debt and MBS backed by Fannie Mae, Freddie Mac and Ginnie Mae since over the past few months, spreads to US Treasury debt had widened and liquidity had dried up considerably in these markets. This was an important step because of their importance for housing markets and financial markets in general. In practice, the purchases of these two asset classes are implemented as follows: When it comes to GSE debt, the Fed instructs the Desk to conduct multiple-price competitive auctions for obtaining these securities from primary dealers. Concerning MBS, the Federal Reserve pursues a somewhat different approach. Since the characteristics of MBS are more complicated than those of the other assets in the SOMA portfolio, the Fed decided to entrust external investment managers with this task. These are BlackRock Inc., Goldman Sachs Asset Management, PIMO and Wellington Management Company, LLP. Similar to the GSE debt purchase procedure, these investment managers are only allowed to obtain MBS from primary dealers. Initially, the Fed planned to purchase up to \$100 billion in GSE debt and up to \$500 billion in MBS, beginning in January 2009. Yet on March 18, these limits had been raised to \$200 billion and \$1.25 trillion, respectively.

By proceeding to not only buying government securities, the Fed follows a similar approach than the BoJ did several years ago. However, the Japanese central bank purchased only ABCP and ABS backed primarily by loans or securities related to small and medium-sized companies. But not only the types of securitized products that are/were included in the respective purchase programs differ from each other. Also the total amounts bought in Japan and in the US, respectively, are/were very different. Since the comparison of absolute numbers is not very meaningful, the respective importance of such purchases is stated relative to the other securities held in the portfolios of the two central banks under consideration. In Japan, outright holdings of ABS amounted to not more than 0.34 percent (08/2004) of total securities held in the portfolio of the BoJ. In contrast, the SOMA consisted of as much as 46 percent of GSE debt and MBS in May 2009. This can also be seen in Chart 26, which graphs the total securities holdings of the Fed.

But what is also obvious is that the amount of US Treasury securities held outright not only stopped its downward trend, but actually increased in April 2009. This is owed to the fact that on March 18, the Fed unveiled plans to purchase long-term US Treasury securities worth up to \$300 billion with maturities ranging from 2- to 10-years. As usual, these transactions are conducted between the Desk and the primary dealers. With this step, whose announcement caught market participants by surprise, the Fed aims at helping to “improve conditions in private credit markets” (see Board of Governors of the Federal Reserve System 2009b) through the reduction of “intermediate- and long-term interest rates by bringing down the term premium on these securities” (see Kohn 2009).

Concerning the overall maturity of US Treasury securities held in the SOMA portfolio, there was a distinct shift away from rather short-term (less than 1 year) to medium- and long-term securities (Chart 27), which is the result of redemptions and sales of Treasury bills during 2007 and 2008 as well as the just mentioned purchases of long-term US Treasury securities (see Federal Reserve Bank of New York 2009a, p. 15-16; Board of Governors of the Federal Reserve System 2008c; Board of Governors of the Federal Reserve System 2008d; Board of Governors of the Federal Reserve System 2009b; Federal Reserve Bank of New York 2009b; Federal Reserve Bank of New York 2009c; Federal Reserve Bank of New York 2009d; FT.com 2009).

Finally, the last instrument to be discussed in this subsection is the “Term Auction Facility (TAF)”, which had been introduced on December 12, 2007, thereby being the first newly introduced *instrument* under the Fed’s QE policy. In principle, the TAF is comparable to open market operations with the distinction that depository institutions (in sound financial

conditions) and not primary dealers are allowed to participate. Funds obtained through this facility have to be collateralized by discount window collateral, which is, as stated in 2.2.1., much broader than the collateral eligible in normal open market operations. Thus, by introducing an additional way to canalize liquidity into the banking system accompanied by an extension of the range of eligible collateral, the Fed directly addresses strains in the interbank market and acts, to a certain degree, as a deputy for it. At the moment, the Fed conducts auctions of 28-day and 84-day credit, alternating on a biweekly basis with \$150 billion offered in each auction. As can be seen in Chart 26, the outstanding amount increased steadily since its introduction, especially in recent months (see Bernanke 2008; Board of Governors of the Federal Reserve System 2007a; Board of Governors of the Federal Reserve System 2008e; Board of Governors of the Federal Reserve System 2008f).

5.3. Passive QE

5.3.1. Japan

As already noted, to achieve the CAB target, the BoJ primarily relied upon increasing its monthly purchases of JGBs, that is, active QE. Passive QE, on the other hand, had not been very elaborate. It basically consisted of reductions and modifications of the basic loan rate and the introduction of the so called “securities lending facility”.

Before and during the QE regime, the policy board decided several times to lower the basic loan rate: In February 2001, it has been lowered from 0.5 to 0.35 percent, followed by another cut in March 2001, which brought the basic loan rate down to 0.25 percent. By setting it at 0.1 percent in September 2001, the BoJ ended the cycle of cuts of the rate applicable to the Complementary Lending Facility and kept it there for nearly 5 years. At the same time, the difference between the discount rate and the uncollateralized overnight call rate target decreased from 0.25 to 0.1 percent (Chart 28).

Except from lowering the basic loan rate, which is nothing remarkable since it is also done under normal circumstances, the Japanese central bank suspended the rule that counterparties are not allowed to use this facility more than five business days during each maintenance period unless they pay a premium of 2 percent on the basic loan rate. For the reserve maintenance period beginning on September 16, 2001 and ending on October 15, 2001, the maximum of days had been raised to 10 business days. Between March 1, 2002 and April 15, 2002, eligible counterparties were allowed to borrow at the borrowing facility on every business day without facing the additional charge of 2 percent. Finally, the policy board

decided at its MPM on March 25, 2003 to suspend the rule limiting the use of the Complementary Lending Facility for an indefinite period of time. Again, the inclusion of several new types of collateral, loans on deeds, for example, into the “Guidelines on Eligible Collateral” (see 5.2.1.) also applied to the Complementary Lending Facility. Hence, counterparties could choose from a wider range of collateral when obtaining funds through this standing facility. What these modifications of the Complementary Lending Facility had in common was the fact that all of them were intended to stabilize the financial system and make short-term financing easier for financial institutions (see minutes of the MPM on 09/18/2001, 02/28/2002, 03/25/2003).

The securities lending facility, on the other hand, is in fact a completely new measure and not just a modification of an existing one, like in the previous case. However, it is not a “pure” passive QE measure, although it presumably fits the best into this category. The BoJ intended it to provide “Japanese government securities held by the Bank to the markets” for “enhancing liquidity and maintaining the smooth functioning of government securities markets”. This was necessary because “in government securities markets, liquidity may decline and pricing may be hampered occasionally when market participants experience difficulties in securing specific issues or face uncertainties over their availability” (see minutes of the MPM on 04/09/2004). Therefore, on April 09, 2004, the policy board approved the “Principal Terms and Conditions for the Sale of Japanese Government Securities with Repurchase Agreements to Provide the Markets with a Secondary Source of Japanese Government Securities”, which acted as the framework for providing JGSs to counterparties. In practice, the BoJ conducted sales of JGSs under repurchase agreements. The JGSs sold had to be repurchased on the following business day. Principally, the BoJ initiates a competitive auction of JGSs if at least two counterparties request it. Yet the central bank kept itself the option to conduct auctions at its discretion if it believes that conditions on financial markets necessitate it (see Bank of Japan 2004b, p. 28-29; minutes of the MPM on 04/09/2004; Bank of Japan 2004c).

5.3.2. USA

In theory, with its discount window, the Fed already has a powerful tool attributable to passive QE at its disposal that can be used to address strains in interbank markets since depository institutions, which are (under normal circumstances) not allowed to act as counterparties in the Fed’s open market operations, can use this standing facility to obtain theoretically unlimited amounts of liquidity at their discretion. In practice, however, banks are

very reluctant to make use of this instrument: Because other financial institutions might associate the use of this standing facility by a particular bank as a sign of weakness or of serious liquidity problems, the discount window is associated with a “stigma”. This effect is even exacerbated in times of financial instability, when liquidity problems of financial institutions might indeed be a reasonable concern. Thus, while at least in theory the discount window is a proper measure to increase the liquidity in the banking system, it turns out to be not sufficient for addressing the current strains in the financial system. As a consequence, except from modifying its discount window program, the Fed introduced several new facilities attributable to passive QE.

The first step towards passive QE, however, was, as already noted, in fact a modification of the primary credit discount window facility. On August 17, 2007, the Fed decided to reduce the spread between the primary credit rate and the federal funds target rate from 100 to 50 basis points, followed by a further reduction to 25 basis points on March 16, 2008. Furthermore, depository institutions got the opportunity to obtain primary credit loans for terms of at first 30 days (decided on 08/17/2007), which had been extended to 90 days at the just mentioned Board meeting in March 2008.

A reduction of the spread between the interest rate applicable to the borrowing facility and the targeted short-term interest rate was also a policy measure pursued by the BoJ. Hence this instrument (or rather this modification of an existing instrument) is one of the very few instruments attributable to passive QE that both central banks implemented under their respective QE regimes. Differences exist, however, with respect to the term of loans granted through this standing facility as well as the range of eligible collateral: Whereas the Fed currently limits the use of this instrument to 90 day, its Japanese counterpart later on suspended all rules limiting the usage with respect to the time period. Furthermore, the modifications made to the “Guidelines on Eligible Collateral” in Japan also applied to the Complementary Lending Facility. The Fed, on the other hand, made no modifications to the types of collateral eligible for obtaining funds through the discount window, apparently because the range of discount window collateral had already been very extensive even before the financial turmoil set in.

In the US, the modifications made to the discount window, which were not only intended to increase the liquidity in the banking system but also to smooth movements of the effective federal funds rate, had some success though: As can be seen in Chart 29, depository institutions did make use of this facility: While the monthly average of outstanding primary credit loans amounted only to \$52.25 millions in July 2007, this value peaked in November

2008 with as much as \$97.64 billions outstanding. Since then, this number declined considerably, partly reflecting diminishing strains in financial markets. Thus, as some banks also started using this facility when the effective federal funds rate did not exhibit upward pressure because they more and more considered it as a source of ordinary liquidity supply, the discount window lost some of its stigma. Nonetheless, circumstances warranted that more had to be done (see Bernanke 2008; Federal Reserve Bank of New York 2009a, p. 17; Board of Governors of the Federal Reserve System 2007b; Board of Governors of the Federal Reserve System 2008g).

Therefore, on March 16, 2008, the Fed decided to introduce the “Primary Dealer Credit Facility (PDCF)”. This instrument is very similar to the previously discussed discount window, with the interest rate applicable to this instrument being the primary credit rate and the most striking difference being the fact that it is directed not at depository institutions but at primary dealers (which participate via their clearing banks), thereby enabling also these institutions to obtain loans from the Fed. Furthermore, loans are granted only on an overnight basis and have to be collateralized by assets that can be deposited in tri-party repo systems (i.e. a repo construction where a clearing organization acts as an intermediary between the borrower and the lender). This measure, which is aimed at improving “the ability of primary dealers to provide financing to participants in securitization markets” (see Board of Governors of the Federal Reserve System 2008g), is also comparable to the discount window when it comes to the amount outstanding (Chart 29) (see Board of Governors of the Federal Reserve System 2008g; Board of Governors of the Federal Reserve System 2008h; Federal Reserve Bank of New York, 2009e).

As in Japan, the Fed also introduced new or modified existing securities lending facilities. And again, these measures are not pure passive QE since they provide eligible counterparties not with funds directly but with US Treasury securities which are, in turn, exchanged for liquidity on financial markets. What is more, an essential characteristic of passive QE, namely the fact that participation is at the counterparties’ discretion, is missing since the Fed conducts these operations at fixed dates. Nevertheless, the securities lending facilities still share most commonalities with passive QE, wherefore they are included in this subsection. Since these instruments have all the same purpose and are akin for the most part, it should be sufficient to focus on the general procedure of securities lending facilities in the US and to restrict to detailed descriptions only if the peculiarities deem it necessary.

Prior to the outbreak of the financial turmoil, financial institutions used different kinds of securities to obtain funds in the respective markets. Yet after the problems related to subprime

loans became pressing, obtaining loans collateralized by MBS or ABS consisting of various kinds of consumer loans became virtually impossible. As a consequence, the markets for these assets dried up. One of the very few asset classes still accepted in such transactions were US Treasury securities. This, however, led to the scarcity of these securities, thereby threatening also the liquidity of this particular market, and to financial institutions facing refinancing problems as they already exhausted their most liquid securities and were not able to obtain funding through their securitized assets (i.e. MBS and ABS). Under these circumstances, the Fed introduced new or modified existing instruments in order to provide primary dealers with US Treasury securities, which, in turn, can be used to obtain liquidity in financial markets. Since in these operations government debt is exchanged for other securities and not for liquidity directly, they are reserve neutral. That is, the overall size of the balance sheet is not affected. The range of eligible collateral – depending on the specific program – consists of various securities, also including many assets whose respective markets have dried up and therefore can not be used any more to obtain liquidity on the market. The oldest and at the same time the most restrictive of these instruments is the so called “SOMA Securities Lending” that belonged to the Fed’s toolkit already before the financial turmoil had started. Under this facility, primary dealers, which are addressed by this facility, can obtain nearly all maturities of US Treasury securities held in the SOMA portfolio through competitive multiple-price auctions. The term of this operation is overnight and has to be collateralized again with different kinds of US Treasury. The “Term Securities Lending Facility (TSLF)”, in contrast, is a recently introduced (03/11/2008) instrument that differs with respect to the range of eligible collateral, the auction method, the term as well as the frequency of operations. It is generally not as strict as the previously discussed facility. Hence primary dealers can pledge as collateral in the weekly single-price auctions not only US Treasury securities but also GSE debt, GSE MBS and, every other week, investment grade debt securities in addition to the previously mentioned assets. The term of this instrument is currently 28 days – considerably longer than the one applicable to the SOMA Securities Lending. Finally, on July 30, 2008, the Fed introduced the “Term Securities Lending Facility Options Program (TOP)”, which differs somewhat from the other two securities lending facilities: Based on the TSLF, the Fed offers options at undetermined dates that, if exercised, entail the right to obtain US Treasury securities against all kinds of TSLF collateral with terms of usually two weeks or less. Primary dealers can not sell or exercise the options prior to a predetermined date since they are constructed as European options. With this arrangement, the Fed aims at providing primary dealers with a means to secure their need for US Treasury securities in advance of

periods that are generally characterized by increased strains in financial markets, such as quarter-ends (see New York times 05/03/2008; Federal Reserve Bank of New York 2009f-k; Board of Governors of the Federal Reserve System 2008i; Board of Governors of the Federal Reserve System 2008j).

In summary, when it comes to passive QE (together with the related measures in the next subsection), one cannot overemphasize the fact that the Fed appears to be far more active than its Japanese counterpart during 2001 and 2006, which can be attributed to the different kinds of problem pressures the two central banks under consideration are/have been exposed to: While the BoJ primarily focused on fighting deflation, the Fed focuses on relieving strains in financial markets: With malfunctioning interbank markets that provide insufficient amounts of liquidity even when market participants can supply highly rated collateral, the Fed tries to engage with all kinds of sound market participants as directly as possible to provide them with sufficient funding, thereby undertaking to some extent the function of interbank markets.

5.4. Direct Lending to Borrowers and Investors

The previously discussed instruments and programs of the first and second pillar of the Fed's QE approach, though partly very different, have something in common: All of them refer to transactions between the Fed on the one hand, and either primary dealers or depository institutions on the other hand. The third pillar of QE in the US, in contrast, could be described as "the most unconventional of the unconventional" measures for addressing the current financial problems. In the US, the commercial paper market is one of the most important sources of unsecured short-term funding for banks and large companies enjoying an excellent credit rating. Funds obtained on this market are usually used to meet short dated debt obligations, such as payrolls. The securitization market, by contrast, plays a key role in the provision of consumer credits like car and student loans. In the wake of the financial crisis, however, these markets dried up substantially. As a result, yields on these assets increased considerably and, with respect to commercial papers, issuers faced difficulties to roll over their existing liabilities. While the measures discussed so far address these problems – as already mentioned – only indirectly, the Fed also implemented some instruments to deal with borrowers and investors in these markets in a direct way: On October 7, 2008, the American central bank decided to install the so called "Commercial Paper Funding Facility (CPFF)". Although the Fed again engages in transactions with primary dealers, they merely act as intermediaries through which issuers of commercial papers (including asset backed commercial papers) can sell these assets to the Fed, or more specifically, to a special purpose

vehicle (SPV) founded and capitalized by the Fed. This facility is addressed only to (US) issuers of newly issued (dollar-denominated) commercial papers (maturity: less than 3 months). Thus, purchases from investors on the secondary market are not planned. Furthermore, commercial papers have to have an excellent credit rating by at least one major rating organization. Issuers, on the other hand, have to prove that they not just recently entered the market for commercial papers in anticipation of the Fed's stabilization measures by demonstrating their activity in the first eight months of 2008. In any case, this facility was designed rather as a last resource for issuers of commercial papers, which manifests itself in the fact that issuers not only have to pay a fee (as discounts on the proceeds) when selling their commercial papers to the SPV but also when they register for the general right to participate in this program. Once the SPV obtained commercial papers from an issuer, it holds them until maturity (see Bernanke 2009b; Federal Reserve Bank of New York 2009l; Federal Reserve Bank of New York 2009m).

However, a major source of disruptions in the commercial paper market is stemming from money market mutual funds, which are significant participants in this market: Due to large outflows of capital caused by investors withdrawing their shares in these funds, the fund managers are forced to conduct "fire sales" of their assets. To counteract this development, the Fed introduced (on 10/21/2008) the "Money Market Investor Funding Facility (MMIFF)". This instrument is intended to provide funding to currently five private sector SPV, which, in turn, purchase commercial papers issued by highly rated financial institutions and other money market instruments from eligible investors, such as money market mutual funds. Except from funding obtained from the MMIFF, the SPV finances these purchases by selling ABCP to investors worth 10 percent of the amount the investors wish to sell to the SPV (see Bernanke 2009a; Federal Reserve Bank of New York 2009n; Federal Reserve Bank of New York 2009o).

Finally, to address the previously mentioned frictions in the securitization market, the Fed announced on November 25, 2008 to implement the "Term Asset-Backed Securities Loan Facility (TALF)". Any US company that maintains an account relationship with a primary dealer and possesses eligible collateral, namely ABS backed by loans such as auto loans, student loans or credit card loans can obtain TALF loans on predetermined dates. This last characteristic contrasts with the two just mentioned instruments, which are at the discretion of the respective counterparty. Another difference is the fact that the TALF is a joint initiative of the Fed and the US Treasury Department. In particular, the Fed creates a SPV that purchases from the Fed the assets received in connection with the TALF. The "US Treasury's Troubled

Asset Relief Program (TARP)” purchases debt issued by the SPV worth \$20 billion to facilitate the purchases of the first TALF loans. If the amount outstanding of TALF loans exceeds \$20 billion, the Fed committed itself to provide the needed liquidity, limiting its total engagement to \$200 billion (see Federal Reserve Bank of New York 2009p).

Concerning the overall size of these three programs (Chart 29), one can easily see that the CPFF is by far the largest program, also compared to passive QE, with the TALF only in recent months showing any, though still negligible, activity and the MMIFF lacking any transactions. The amount outstanding of the CPFF peaked in mid-January 2009 and is already declining again. This is the result of improving conditions in commercial paper markets, partly caused by the CPFF itself (see Bernanke 2009b).

As mentioned above, the Japanese central bank also adopted measures to promote the market for (asset backed) commercial papers. In contrast to the US, however, they were solely limited to outright purchases of these assets. What is more, the overall size of these actions relative to the overall size of the balance sheet is by far bigger in the US than in Japan: Whereas the Fed granted loans to investors and borrowers in these markets summing up to about 8 percent of total assets on its balance sheet (as of 05/21/2009), which is already less than at the beginning of the year, the BoJ’s purchases of ABS including ABCP accounted only for 0.2 percent of its asset side of the balance sheet (as of 08/20/2004).

5.5. Effects/ Success of QE

5.5.1. Balance Sheet

5.5.1.1. Japan

Conditional on the change of the operational target under the QE regime, CABs held at the BoJ increased dramatically: While CABs amounted to 5 trillion yen in January 2001, this value had risen to 31.2 trillion yen by March 2006 (Chart 30), which is an increase of 524 percent (see BoJ Time-Series Data Search 2009g).

Therefore one has to pose the question to what extent this development affected the balance sheet of the Japanese central bank.

In general, whenever a central bank conducts transactions, regardless of the specific form, the central bank balance sheet is directly affected. What is more, every operation enters the balance sheet twice: once on the asset and once on the liabilities side. So, for example, if the BoJ purchases JGBs worth 100 billion yen on an outright basis to provide liquidity to the

market, the asset side increases by 100 billion yen since obviously JGBs are assets that are added to the existing stock of JGBs holdings. The liabilities side, on the other hand, also increases by 100 billion yen, which comes as follows: The BoJ bought the JGBs from a counterparty and paid for it with yen. In practice, the BoJ credits the counterparty's account at the BoJ with the respective amount. And since CABs are a component of the liabilities side, the increase of 100 billion yen on the asset side is matched by an equal increase on the liabilities side of the balance sheet. Hence the total amounts of assets and liabilities always equal each other. But this example also points at another very important characteristic of central bank balance sheets: There are broad categories to which single items entering the balance sheet are assigned to. More specifically, the categories "autonomous factors" and "monetary policy operations" are contained both on the asset and the liabilities side. The category "reserves held by banks", however, only shows up on the liabilities side because in the balance sheet identity, reserves are endogenous and are therefore expressed as a residual of the other components (Chart 31).

That is, reserves (CABs) equal net monetary policy operations plus net autonomous factors (reserves = net monetary policy operations + net autonomous factors), which is also referred to as the "supply function of reserves". If, for example, the BoJ increases its outright purchases of JGBs (i.e. the net amount of monetary policy operations increases), the BoJ increases, holding everything else unchanged, the supply of CABs (= reserves). The demand for CABs, on the other hand, depends on reserve requirements and the willingness of commercial banks to hold excess reserves. It is crucial for central banks to influence the equilibrium of supply and demand in a way that is consistent with the desired short-term interest rate target (see Bindseil 2004, p. 45-48).

Having still in mind the previously discussed increases of JGB purchases and, as a consequence, of CABs, the enormous expansion of assets and liabilities on the BoJ's balance sheet during the QE regime should come as no surprise. Between April 2001, shortly after the introduction of QE, and January 2006, shortly before the abolishment of QE, the balance sheet of the BoJ expanded from 112.3 to 152.6 trillion yen – an increase of 35 percent (Chart 32 and 33). If we decompose these aggregate figures into its components, it is possible to recognize many of the developments mentioned so far. When focusing on the autonomous factors, one can easily see that net autonomous factors are clearly negative, i.e. the autonomous factors on the liabilities side exceed the ones on the asset side (Chart 33). This is mainly the result of large amounts of banknotes in circulation, which form by far the largest single component of autonomous factors on the liabilities side. As already noted, the BoJ tried

to keep the growth of outright holdings of JGBs in line with the growth of banknotes in circulation. And indeed, the absolute increase of banknotes and JGBs holdings over the period under consideration is, although not equal, rather close (banknotes: +14.65 trillion yen; JGBs: +18.01 trillion yen). The drastic increase in net monetary policy operations of 42 percent is to a large extent based on these purchases of long-term securities, with short-term operations (TBs/FBs) also contributing significantly to this expansion of fund-supplying open market operations. Finally one can see that the BoJ was, at least in April 2001 and January 2006, successful in achieving its CAB targets. On April 30, 2001, the CABs amounted to 5.07 trillion yen ($= \text{net omo} + \text{net autonomous factors} = 79.92 - 74.43 = 5.49$), which is only slightly above the target of 5 trillion yen. At the end of January 2006, CABs had risen to 32.93 trillion yen ($= 114.04 - 81.12 = 32.92$) – a number that is consistent with the target range of 30 to 35 trillion yen (see Bank of Japan 2001a and Bank of Japan 2006b).

To get an impression of how the single components of the balance sheet evolved over time, it is useful to illustrate their development graphically (Chart 34 and 35). The story told by the asset side (Chart 34) is that JGBs are, not surprisingly, the by far most important single component. On the liabilities side (Chart 35), the striking dominance of banknotes in circulation becomes apparent, as well as the enormous expansion of CABs. The fact that in May 2001, on both the asset and the liabilities side some components vanished and some others emerged, is owed to the fact that the BoJ introduced or abolished certain facilities. The sudden disappearance of JGSs accompanied by the emergence of JGBs and FBs/TBs is of rather technical nature since prior to April 2001, both categories made up JGSs but were stated separately from then on (see Bank of Japan 2001b).

5.5.1.2. USA

Initially, the Fed was quite successful in sterilizing the expansionary effects on total reserves and on the overall size of the balance sheet stemming from the newly introduced instruments: As can be seen in Chart 36 and 37, the TAF, TSLF, PDCF and TOP, although surely not irrelevant with respect to their size, did not lead to an increase of total reserves and, as a consequence, neither of the balance sheet.

However, except from the fact that the Fed was successful in counterbalancing the effects of the new instruments *in the first place*, one cannot overlook that, as noted above, total reserves and the total assets/liabilities on the balance sheet skyrocketed in the last quarter of 2008.

Naturally, this pattern is also exhibited by the Fed's balance sheet (Chart 38): Between May 2007, when the American central bank still conducted "business as usual", and June 2009,

after the introduction of several “unconventional” monetary policy measures, the balance sheet more than doubled (+126 percent). The magnitude of this expansion is quite surprising, since it clearly outweighs the one of the BoJ’s balance sheet between 2001 and 2006 (+35 percent), as can be seen in Chart 39. This trend is even more striking with respect to total reserves (same time periods): In Japan, this balance sheet item increased by 549 percent, whereas in the US, it shot up by as much as 7787 percent. Yet one should be careful when comparing changes of different central bank balance sheets or of major components of them since for addressing strains in financial markets, the composition of the balance sheet is at least equally important because one of the main problems was not an overall lack of liquidity in the banking system but a poor distribution of it. Furthermore, the size of the balance sheet does not necessarily reveal anything about the stance of monetary policy as the movements of the size of the balance sheet and the one of the interest rate target do not always coincide. When looking at the different categories of the Fed’s balance sheet, one can see that the basic patterns are roughly comparable to the ones of their Japanese counterparts: In both cases, net autonomous factors are negative and net monetary policy operations are positive, thereby also determining the amount of total reserves since this category is, as explained above, a residual of the two other components. But also with respect to the single items on the balance sheets, it is possible to identify certain commonalities. In both cases, the amounts of foreign currency assets, reverse repurchase agreements and securities held outright increased over the respective periods, while the outstanding amount of reverse repurchase agreements decreased in the Japanese as well as in the American case. There are also some items, however, that are unique to the Fed’s balance sheet, and hence need to be explained. Central bank liquidity swaps, for a start, refer to reciprocal currency arrangements between the Fed and other major central banks such as the ECB and the BoE to provide them with a source of US-Dollar since many of their national banks faced difficulties in refinancing themselves in this currency. These arrangements were introduced in December 2007 as a response to the strains in interbank markets. Nine months later (September 2008), the US Treasury announced to create the so called “Supplementary Financing Program (SFP)”, which should provide some assistance to the Fed’s monetary policy. Under this program, the Treasury issues short-term debt to drain reserves from the banking system. The proceeds are placed in the supplementary financing account at the Fed (Federal Reserve Bank of New York 2009q).

Once again, a close look at the development over time of the single components reveals important insights into the way the Fed responded to stresses in interbank markets. The asset side (Chart 40) reveals that in the beginning, the American central bank was quite successful

in sterilizing the effects of the newly introduced instruments, as it has already been mentioned above. It did so by driving the outstanding amount of repurchase agreements down to zero and also by lowering its stock of securities held outright. Since not the overall amount of liquidity in the banking system was the problem but a maladjustment with respect to its distribution, the Fed's primary aim was rather to supply as many market participants as possible with needed liquidity than to increase the overall liquidity in the system. Yet with the introduction of purchase programs for securitized products and US Treasury securities in November 2008 and March 2009, respectively, this trend had been reversed. What can also be seen is the fact that in contrast to the Japanese case, where in March 2006, only government securities (including JGBs and FBs/TBs) accounted for nearly 65 percent of the asset side, the expansion of the Fed's balance sheet is, at least since October 2008, more broadly based. This is owed to the fact that it explicitly tries to address as many market participants as directly as possible and hence needs a larger set of instruments than the BoJ, which merely tried to achieve its CAB target. The component "Others" includes several other measures such as the previously mentioned central bank liquidity swaps or stabilizing measures for major financial institutions, such as AIG. The liabilities side of the Fed's balance sheet, on the contrary, is a little bit leaner (Chart 41). The single most important component is the amount of currency in circulation. What is striking, though not surprising, is the enormous increase of reserves. And also the supplementary financing account has been expanded rapidly since its introduction.

5.5.2. Long-Term Interest Rates (Yield Curve), Money Market Developments and Inflation

5.5.2.1. Japan

As stated above, central banks facing the zero-bound problem and aiming at lowering long-term interest rates could shape expectations of how long interest rates will effectively remain zero, change the composition of the balance sheet and/or its overall size. With the second pillar, a clear exit strategy based on present and future inflation and the increases of JGBs purchases that not only changed the relative composition but also the overall size of the balance sheet, the BoJ fulfilled all three criteria. But how, if at all, did long-term interest rates as well as monetary aggregates respond? This question will be addressed in the following subsection. It should be noted, however, that the analysis is for the most part, and with respect to the USA completely, of descriptive nature since a detailed analysis based on econometric methods lies beyond the scope of this diploma thesis and is not even available for the Fed's current QE approach. However, there is recourse to existing findings in the literature where it

is appropriate. Therefore, it should be stressed that in those cases where no empirical results have been cited, movements in the described series *could* be the result of Japan's QE policy, but this does not necessarily need to be the case.

Concerning the effect of the QE policy on the JGBs yield curve (Chart 42), some doubts are appropriate to what extent QE actually influenced interest rates at the long end of the maturity spectrum. When considering only the first half of the QE period, one is tempted to conclude that this policy actually had been successful in flattening the yield curve. Shortly before the abolishment of QE, however, long-term interest rates climbed above the ones that had been recorded just before (01/31/01) and during QE (01/30/04). In his survey of empirical evidence on the effects of the Japanese QE policy, Ugai (2006) summed up the findings of several authors by stating that still the most significant effects on long-term interest rates stemmed from the commitment to maintain short-term interest rates (near) zero for a considerable period of time, which is the above mentioned policy duration effect. The empirical results on the expansion of the BoJ's balance sheet by increasing the CABs and the changes in the composition of the balance sheet through increased purchases of JGBs are rather ambiguous: With respect to the first, Ugai (2006) concludes that only the signaling channel might have had a significant effect on long-term interest rates, whereas the portfolio rebalancing effect has not been, concerning to Ugai (2006), regarded as influential by the surveyed authors. With respect to the latter, the results are not clear cut for both the signaling and the portfolio rebalancing effect (see Ugai 2006, p. 43-44).

In the 1990s, the Japanese banking system suffered from balance sheet adjustments due to the burst of the bubble and a large number of non-performing loans. As a consequence, several major banks failed or came into serious troubles. Under these circumstances, financial institutions' funding costs increased dramatically: The spread between the 3 month yen LIBOR and the uncollateralized overnight call rate peaked in October 1999, declined substantially and remained relatively low until the end of the QE regime in March 2006 (Chart 43). However, the course of the spread over time casts some doubts on whether the BoJ had been able to influence yen funding costs at all since neither the ZIRP nor the QE regime are seemingly correlated with substantial declines of the spread (see Ugai 2006, p. 28-29 and British Bankers Association 2009).

When looking at chart 44, given the already discussed pattern of the CABs, it comes as no surprise to see a significant increase of the monetary base during the QE regime. M2, on the other hand, which is a rather broad monetary aggregate and is also used to forecast inflation, did not respond to the expansionary measures undertaken between March 2001 and March

2006. That is, the money multiplier that predicts the relationship between the growth of the monetary base and broader monetary aggregates, declined over time (see Oda et al. 2005, p. 3).

However, as stated above, the primary aim of the Japanese QE regime was fighting deflation. And indeed, in March 2006, when the BoJ officially ended QE by switching back from CABs to the uncollateralized overnight call rate as the main operating target, the price level had increased over the past five months and forecasts also signalled a continuing of (albeit only modest) inflation (Chart 45), thereby fulfilling the above mentioned formal criteria for abolishing the QE regime (see Ito 2005, p. 124).

5.5.2.2. USA

In the US, as already noted several times before, the primary motivations behind the introduction of the numerous new instruments were strains in financial and especially interbank markets, whose severity has been unprecedented at least in the preceding years. This development is also reflected in several spreads between certain interest rates, which serve as a measure for disturbances in interbank markets (Chart 46). Both, the spread between the 3 months LIBOR and the effective federal funds rate as well as the TED spread, which refers to the difference between the 3 month LIBOR and the interest rate applicable to the corresponding US Treasury security, widened considerably during the course of 2007 and 2008 and skyrocketed in October 2008. After these hectic movements, the two spreads declined substantially again, which, as many commentators argue, reflects at least partly easing strains in the interbank markets. However, as in the Japanese case, from a purely descriptive point of view, the different measures undertaken by the Fed do not seem to have a noticeable effect on either of these two spreads.

So apparently the Fed's performance with respect to the interbank market is at least doubtful. But does the picture change with respect to the yield curve, that is, has the Fed been successful so far in lowering long-term interest rates? Chart 47 reveals that in the months after November 2008, when strains in financial markets had just culminated and the American central bank was about to announce its first securities purchase program, the yield curve had flattened considerably. By June 2009, however, it had soared again and is now at the level where it had already been in November 2008. Commentators explain this development with rising risk appetite of investors against a background of positive economic forecasts that makes them willing to shift from low-risk investments, such as US Treasury securities, to riskier asset classes like stocks. Moreover, they argue, are declining bond prices a direct

consequence of the increased supply as governments around the world currently face heightened liquidity needs. Yet as sound econometric analyses on the effects of the QE policy in the US are still missing, the conclusions inevitably remain purely descriptive and the explanations are only based on anecdotal evidence (Frankfurter Allgemeine Zeitung 05/12/09 and 05/28/09).

Finally, one has to pose the question to what extent the enormous expansion of the Fed's balance sheet poses a threat to price stability, which is a frequently raised question. The story told by Chart 48 is that, like in Japan between 2001 and 2006, the pronounced increase of the monetary base did not result in striking growth rates of broader monetary aggregates so far.

6. Conclusion

Especially after the Fed's announcement in March 2009 to conduct outright purchases of long-term US Treasury securities in addition to its usual monetary policy operations, many commentators made oversimplifying cross references to the Japanese Quantitative Easing policy that had been in force between 2001 and 2006, whose most striking feature were purchases of government debt (JGBs). However, as it has been shown in this thesis, the two approaches differ fundamentally from each other on four different grounds (Chart 49): First, the introduction. Secondly, the specific problems that the respective central banks tried to address with their QE regimes and that made these measures necessary in the first place. Thirdly, the main policy target. And fourthly, the relative importance attached to each of the two components (active and passive) of QE.

With respect to the first point, when the BoJ decided to introduce QE in March 2001, it did so by formally announcing the introduction of this policy regime. So there was a starting date and the explicit reference of the words "Quantitative Easing". The Fed, on the other hand, neither used the term "Quantitative Easing" in its official statements (also not "Credit Easing") nor was there a formal starting date.

Concerning the second aspect, one can say that although there are certainly parallels between the particular macroeconomic and financial environments that form the motivation behind the implementation of "unconventional" monetary policy measures by the two central banks under consideration, the differences in the economic performance are nevertheless the factors that shape the respective QE policies the most. In both countries, a severe recession was the initial driving force that made it necessary to deviate from the path of "traditional" monetary policy. Yet except from poor output performances, the two recessions not only have different

origins but differ also from each other with respect to the areas that were hit the most: Whereas the Japanese economy suffered from a prolonged deflation, the distinctive characteristics of the current US recession are severe problems within the banking system (to be sure, also Japan experienced major problems in the banking system. On the contrary, the US is currently concerned about inflation rather than deflation). As a consequence, both QE regimes are targeted at different (main) problems, which is, of course, reflected in the concrete arrangement and the number of unconventional measures introduced in these two countries.

This leads us to the two remaining points mentioned above. Concerning the main policy target, the most salient feature is the fact that the BoJ switched from short-term interest rates to total reserves of commercial banks held at the central bank (i.e. the BoJ). The Fed, in contrast, keeps targeting short-term interest rates. It does so because the main problem is not that overall liquidity in the banking system is lacking but that the liquidity is not distributed in an efficient way as a result of “precautionary hoarding” caused by increased counterparty credit risk concerns and insecurity about the own funding needs. In order to deal with these problems, the Fed tries to engage with market participants as directly as possible to bypass malfunctioning interbank markets. Therefore it introduced a broader range of new instruments than Japan did between 2001 and 2006 and remodeled existing facilities. The expansionary effects of the newly introduced measures were sterilized in the first place. The BoJ, on the other hand, hoped that large total reserves might spur inflation.

This leaves just the fourth point mentioned above: The concrete arrangement of active and passive QE. In general, both central banks widened the range of eligible counterparties and collateral. Apart from that, however, the specific forms of active and passive QE differ fundamentally. QE in Japan consisted to a large extent of active QE. To reach the steadily increased target for total reserves, the BoJ primarily relied upon purchases of JGBs. Although the Japanese central bank also announced that it will conduct outright purchases of Asset Backed Securities and Asset Backed Commercial Papers, the relative amount compared to other items on the central bank balance sheet remained not worth mentioning. Newly introduced facilities that can be attributed to passive QE in the true sense of the word are missing (also in the US, there are only few instruments that comply with the strict definition of passive QE). Only if one applies a somewhat broader definition of passive QE, it is possible to detect measures attributable to this subgroup of QE: First, the BoJ modified its borrowing facility with respect to the spread to the uncollateralized overnight call rate, the range of eligible collateral and the maximum number of days that counterparties are allowed

to borrow under this facility. Secondly, it introduced a securities lending facility in order to provide market participants with a source of assets that can be used in repurchase agreements. Compared with this, the American QE approach is fundamentally different. As noted above, this is owed to the fact that both central banks tried to address different kinds of problems. Concerning active QE, the Fed currently purchases significant amounts of GSE debt and MBS backed by GSE as well as long-term US Treasury securities. Furthermore, it introduced the TAF, which is comparable to “normal” open market operations with the difference that it is not directed at primary dealers but at depository institutions. Yet the American central bank has been the most active on the grounds of passive QE and a third pillar which it calls “direct lending to borrowers and investors”. In these two fields, it introduced a broad range of new instruments that all aim at engaging as directly as possible with as many market participants as possible to undertake to some extent the intermediary function that, under normal circumstances, is performed by the interbank market.

Having in mind the Japanese focus on total reserves and the Fed’s initial efforts to sterilize the effects of its new instruments, one might expect a way more pronounced effect on the balance sheet in Japan than in the US. Surprisingly, however, exactly the opposite holds true: The BoJ’s balance sheet expanded by 35 percent shortly before the end of the QE regime in March 2006, which is quite modest compared to the increase of 126 percent in the US. What is more, it took the Fed considerably less time than its Japanese counterpart to reach this dimension.

The final question that needs to be addressed is how monetary and also fiscal policy in the US on the one hand and in Japan in the current crisis on the other hand compare to the way Japanese monetary and fiscal policy had been conducted in the first 15 years following the outbreak of the previous crisis in Japan.

With respect to the US, it is possible to identify clear cut differences. Nowadays, there is consensus that monetary and also fiscal policy in Japan during the “lost decade” did not respond fast and decisive enough to the crisis. For example, although stock and housing market bubbles burst in 1990 and 1991, it was not before 1995 that the Japanese government introduced a bank bailout plan. What is more, even after the burst of the bubbles, the BoJ continued raising interest rates. As is generally known, it reversed the policy stance later on. However, only in 1999, with the introduction of the ZIRP, it lowered the short-term interest rate target to virtually zero. To be fair, although some of the decisions made by the BoJ and the Japanese government are questionable from an ex post perspective, they appeared to be the proper measures at the time they had been implemented, given the uncertainties regarding the effects that came along with the implementation of the until then unknown QE-policy.

Hence, equipped with the Japanese experiences, the response of the Fed and the US government to the current crisis is somewhat different: It took the Fed merely 16 months to lower its short-term interest rate target to virtually zero. And also fiscal policy responded differently. Taking the outbreak of the subprime mortgage crisis in March 2007 – a quite conservative starting point – it took the US government just a little bit more than one and a half years to initiate and pass a bank bailout plan (“Troubled Asset Relief Program”), which did inject a considerable amount of liquidity into the banking system. All in all, it seems as if the US has “learned their lesson” from the way Japan conducted monetary and fiscal policy in the 1990s and the first years of the new century.

But what about Japan today? Here, the macroeconomic situation in the current crisis is a little bit different than the one in the US. To be sure, the Japanese economy has also been hit very hard by the global economic downturn. In the fourth quarter of 2008, GDP contracted with an annualized rate of 12.1 percent quarter-on-quarter, which is considerably worse than in the US (6.2. percent). And with the CPI fluctuating around zero, the threat of deflation is more than real again. Yet at the outset of the crisis, it seemed as if the Japanese economy would be able to uncouple itself to a certain degree from the developments in other industrialized countries since Japan’s banking system was in a relatively good condition after the restructurings following the previous crisis. What is more, its financial institutions did not have as many “toxic” assets to deal with as commercial banks in the US, for example. The BoJ responded to the current crisis by reductions of the uncollateralized overnight call rate (from 0.5 to currently 0.1 percent) and the basic loan rate (from 0.75 to currently 0.3 percent). It started lowering these key interest rates in February 2007, with a reduction of the basic loan rate. In October 2008, also the short-term interest rate target had been reduced for the first time in the current crisis. These reductions do not seem to be as drastic as in the US. One has to take into account, however, that the Fed started its target rate reductions from a considerably higher basis and hence had a much higher scope for these reductions. Yet these were of course not the only measures implemented by the BoJ. Comparable to the Fed, it started paying interest on (excess) reserves. Furthermore, it introduced new or expanded existing facilities in order to “ensure stability in financial markets” and “to facilitate corporate financing” (Bank of Japan 2009f). It again increased its monthly purchases of JGBs, for example, which it already did several years ago; a time when QE was entirely unknown to monetary policy and thus put the BoJ into a pioneering role (Sheard 2009, Bank of Japan 2009f).

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http://www.federalreserve.gov/releases/h15/data/Business_day/H15_TCMNOM_Y7.txt
http://www.federalreserve.gov/releases/h15/data/Business_day/H15_TCMNOM_Y10.txt
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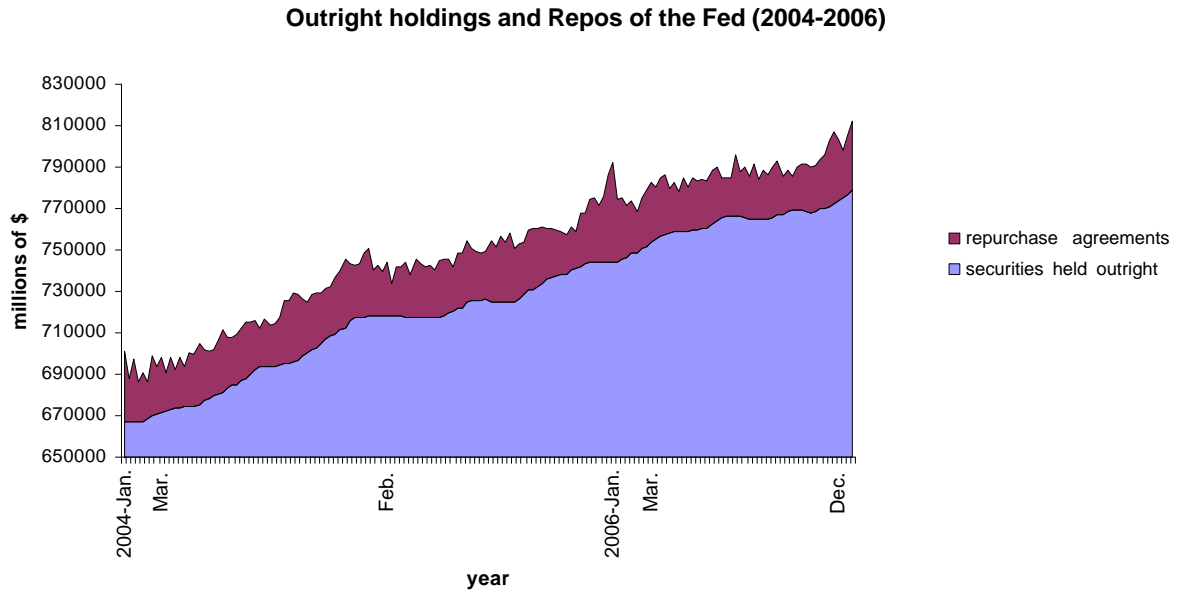
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8. Appendix

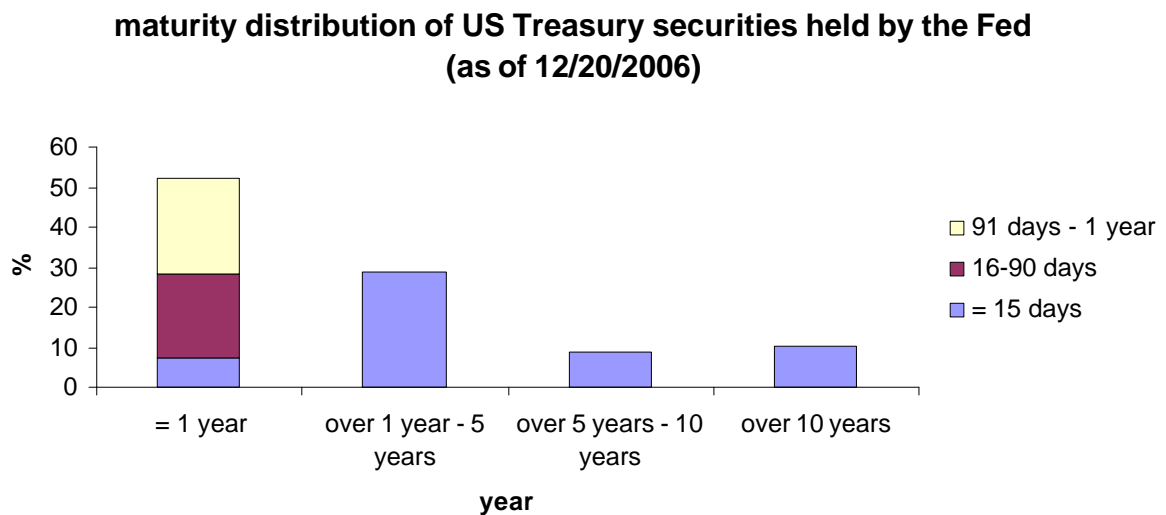
8.1. Charts

Chart 1



(The Federal Reserve Board 2009a)

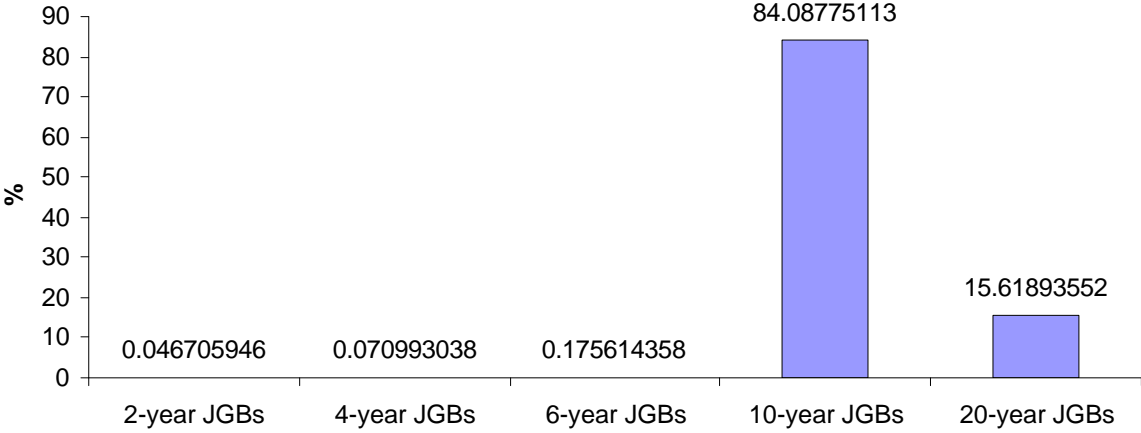
Chart 2



(The Federal Reserve Board 2009c)

Chart 3

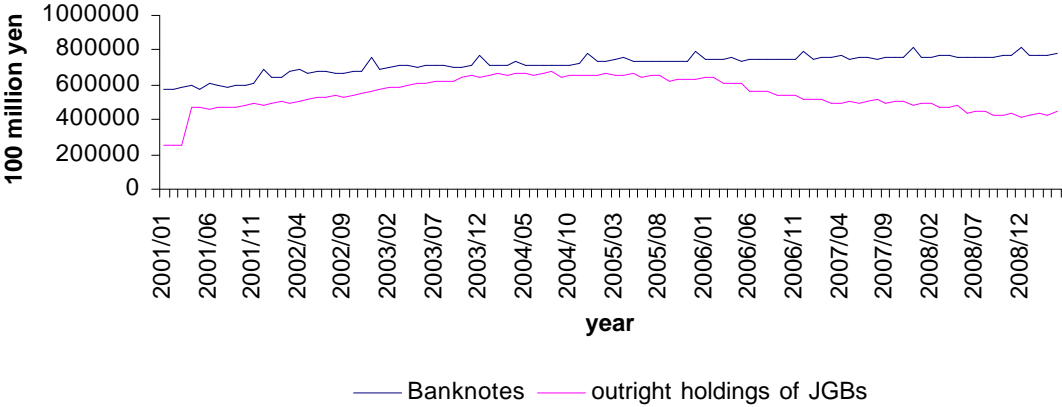
maturity distribution of JGBs held by the BoJ (as of 06/08/2001)



(Bank of Japan 2009c)

Chart 4

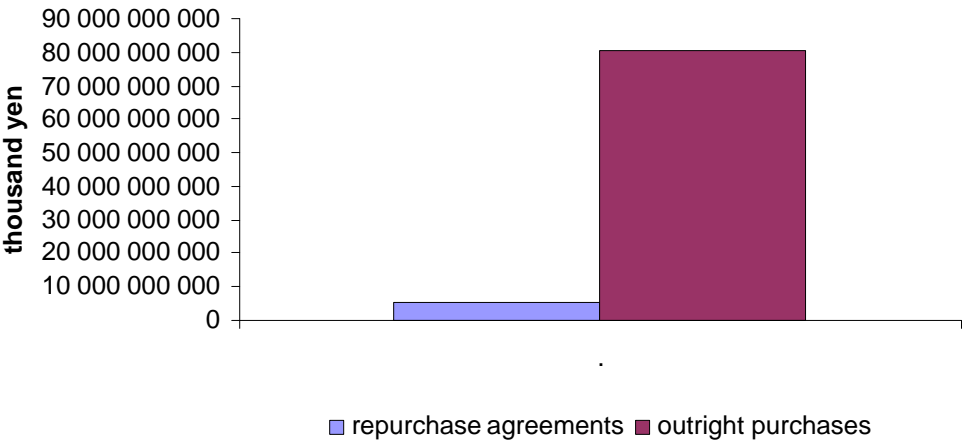
Currency in circulation and outright JGB holdings (01/2001-04/2009)



(BOJ Time-Series Data Search 2009b)

Chart 5

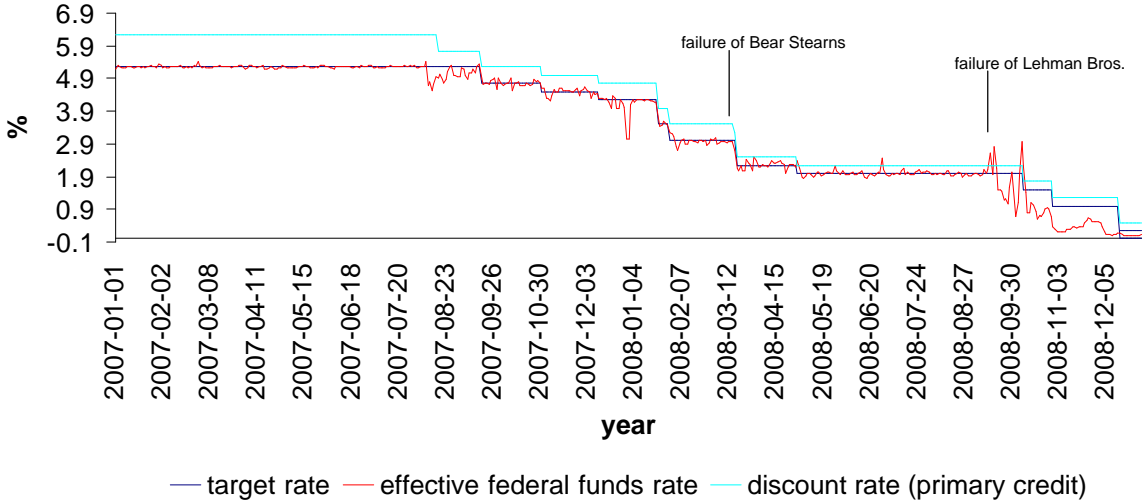
the BoJ's (total) outstanding amounts of liquidity-providing transactions as of 11/30/2006



(Bank of Japan 2006a)

Chart 6

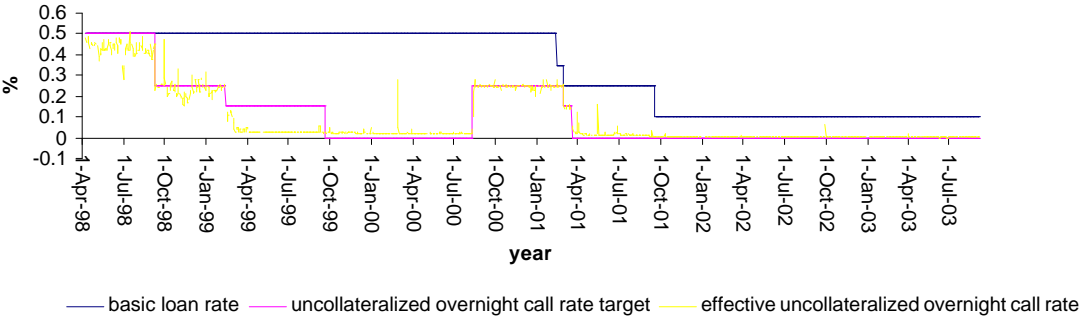
Effective federal funds rate, target rate and discount rate (01/2007-12/2008)



(Federal Reserve Bank of New York 2009a and Federal Reserve Board 2009d)

Chart 7

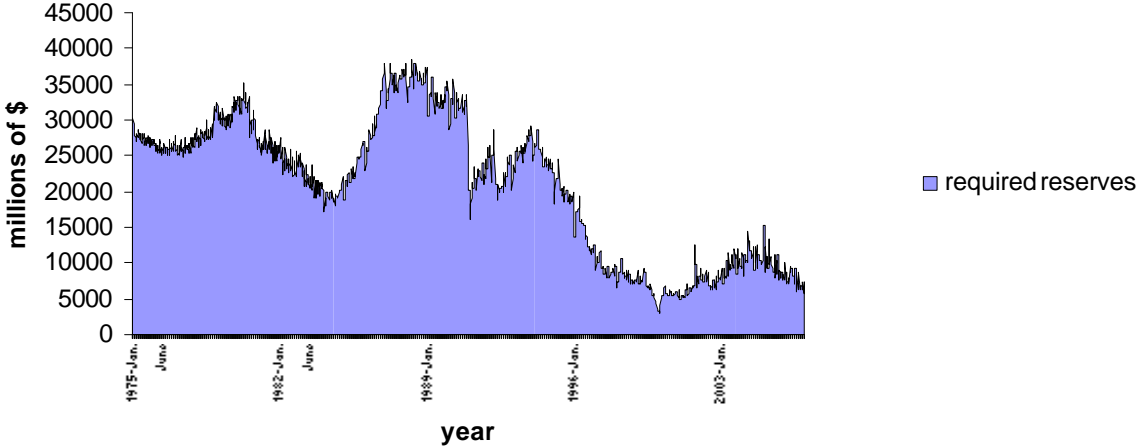
**borrowing facility, effective short-term interest rate and target rate in Japan
(04/1998-08/2003)**



(BoJ Time-Series Data Search 2009m and MPMs for call rate targets)

Chart 8

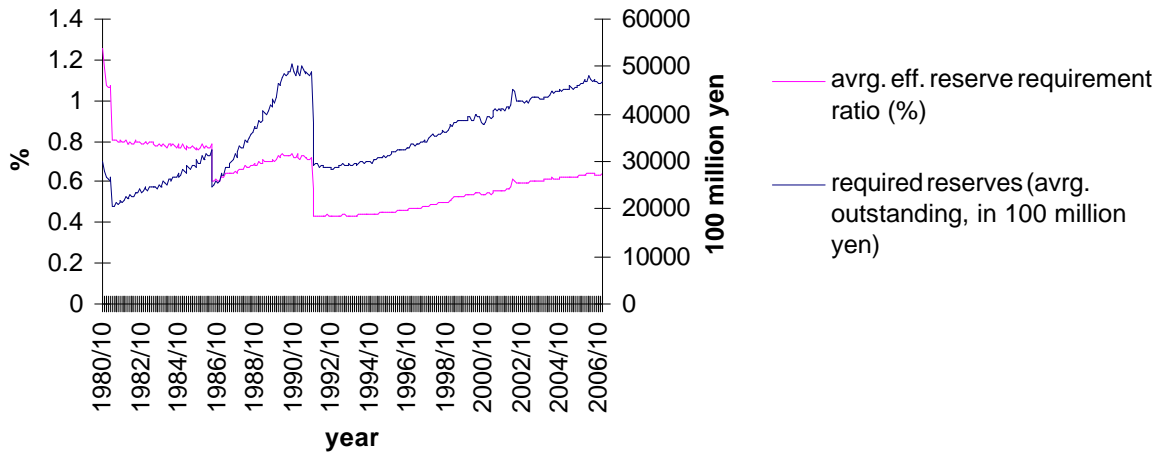
required reserve balances in the US (1975-2006)



(The Federal Reserve Board 2009b)

Chart 9

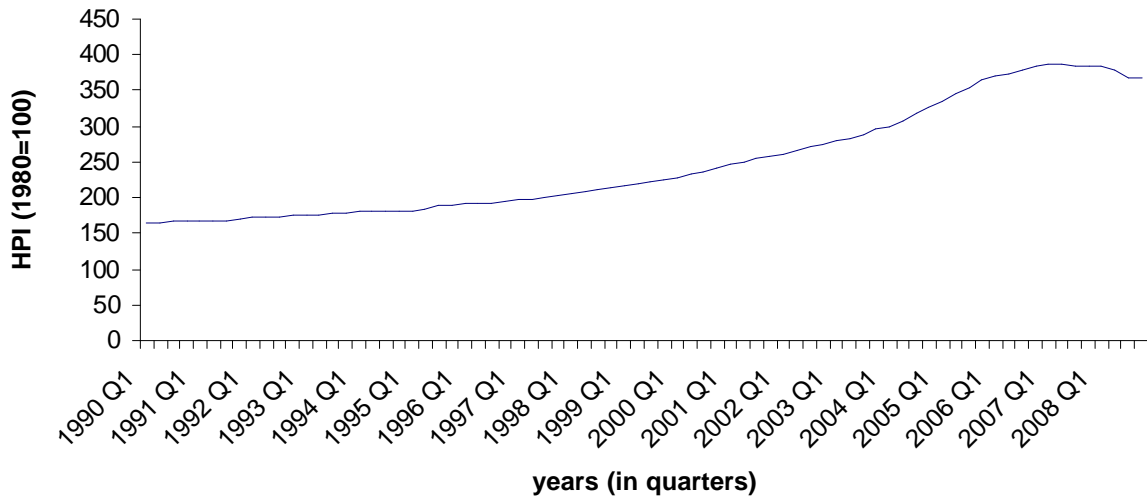
BoJ's reserve requirements (1980-2006)



(BOJ Time-Series Data Search 2009a)

Chart 10

House Price Index (HPI,1990-2008, Quarterly Data)

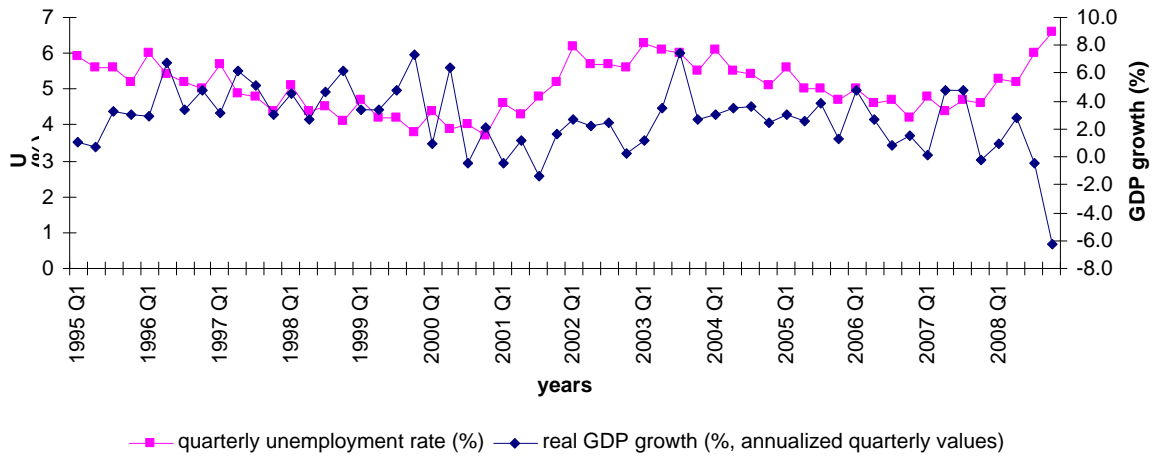


— House Price Index (HPI,1990-2008, Quarterly Data)

(OFHEO 2009)

Chart 11

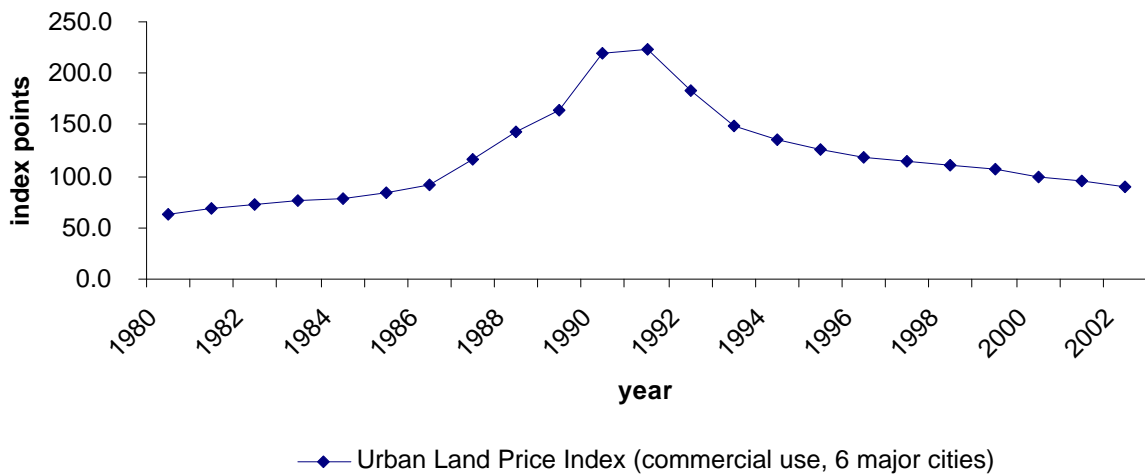
Unemployment rate (%) and real GDP growth (%) in the US (1990 Q1 - 2008 Q4)



(Bureau of Labor Statistics (unemployment rate) and Bureau of Economic Analysis (GDP))

Chart 12

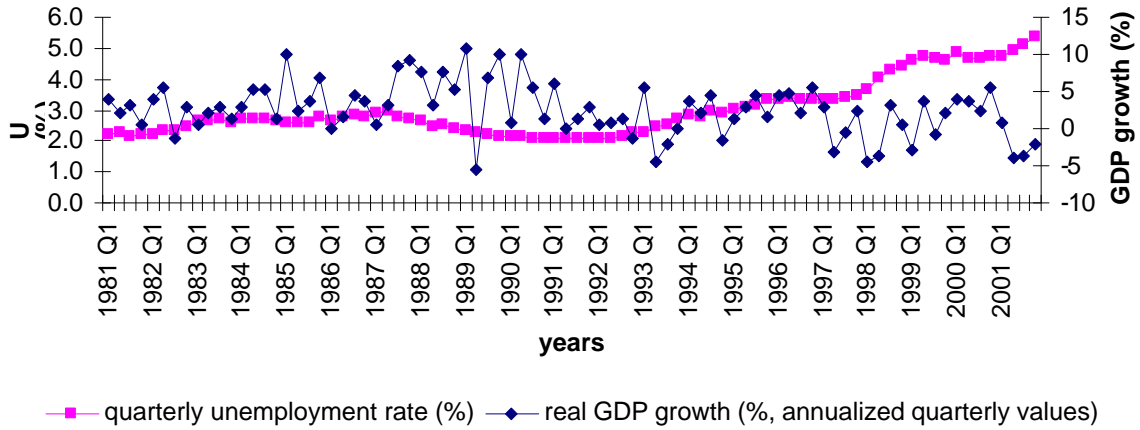
Urban Land Price Index (1980-2002)



(Japanese Statistics Bureau)

Chart 13

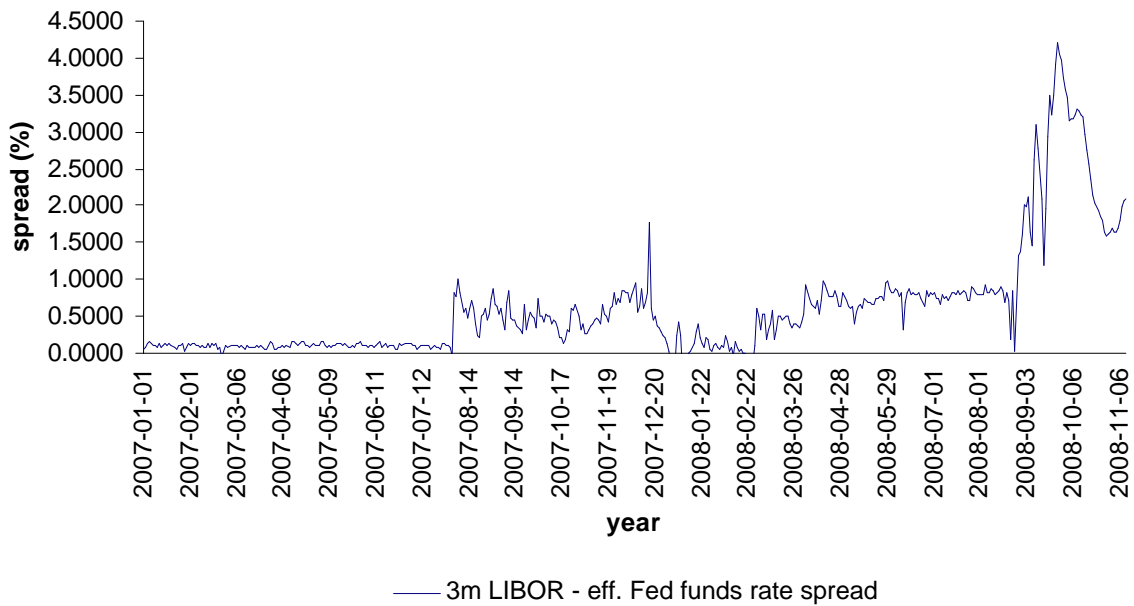
Unemployment rate (%) and real GDP growth (%) in Japan
(1981 Q1 - 2001 Q4)



(Cabinet Office (GDP), Portal Site of Official Statistics of Japan (U))

Chart 14

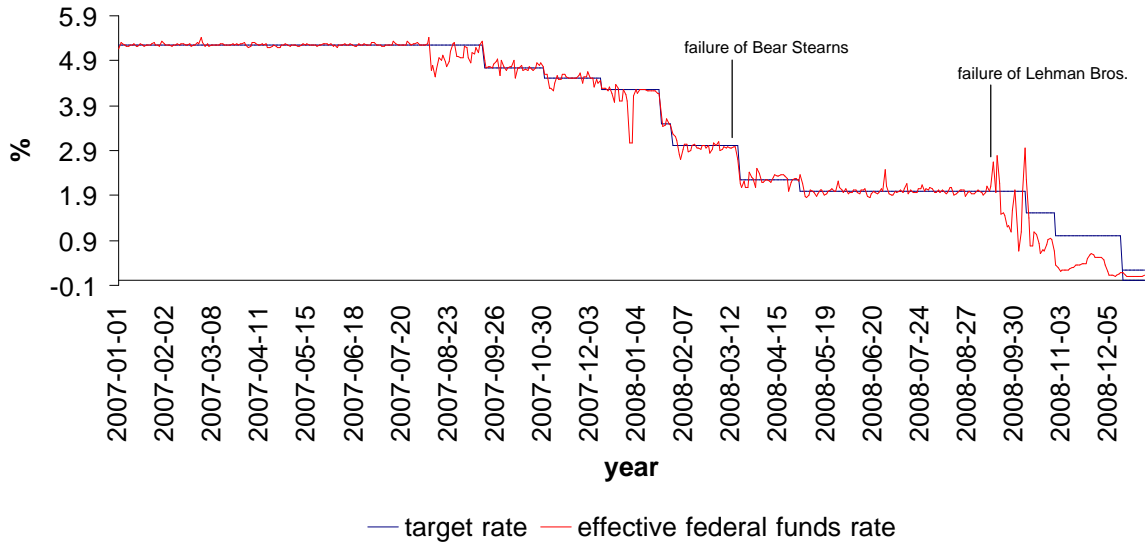
Spread between the 3m LIBOR and the eff. Fed funds rate
(01/2007-11/2008)



(The Federal Reserve Board 2009o and Mortgage-X 2009)

Chart 15

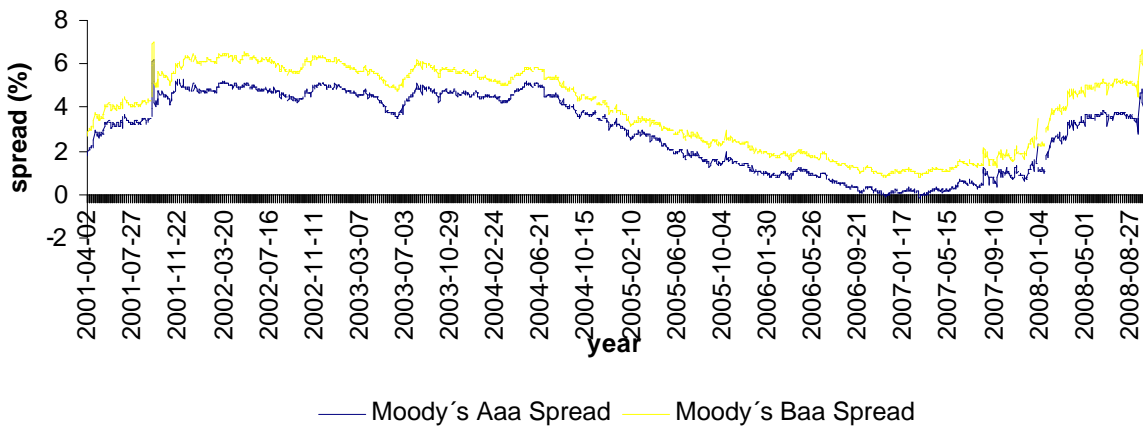
Effective federal funds rate plus target rate (01/2007-12/2008)



(Federal Reserve Bank of New York 2009a and Federal Reserve Board 2009d)

Chart 16

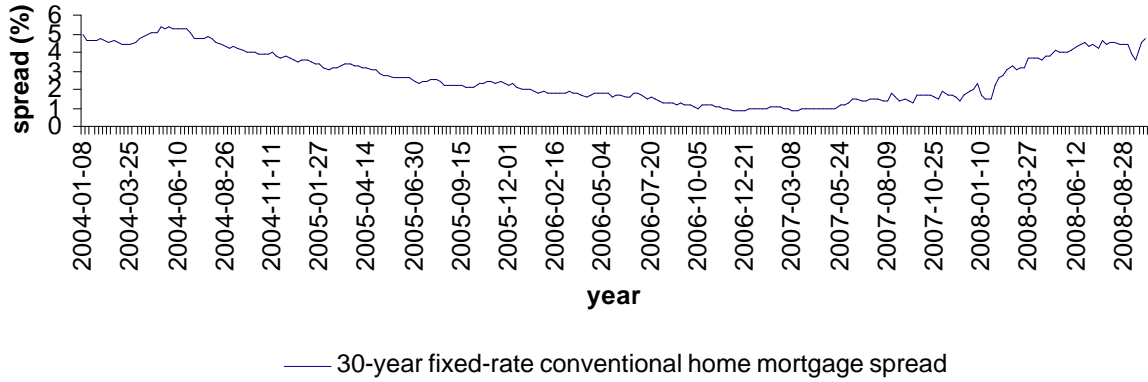
Spread between Corporate Bond Yields and the effective Federal funds rate (04/2001 - 09/2008)



(The Federal Reserve Board 2009d)

Chart 17

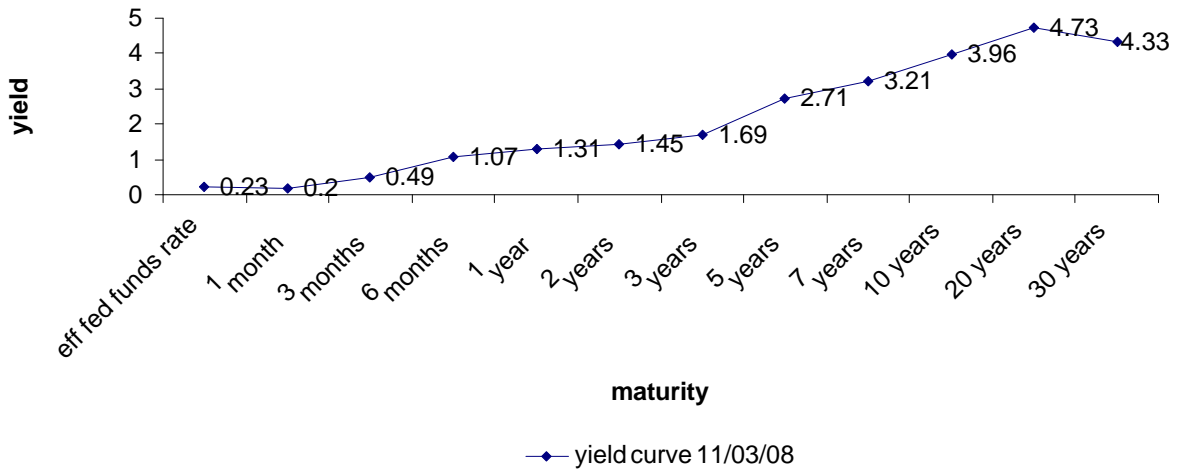
spread between 30-year fixed-rate conventional home mortgage rates and the effective Federal Funds rate (weekly, 01/2004-09/2008)



(The Federal Reserve Board 2009d)

Chart 18

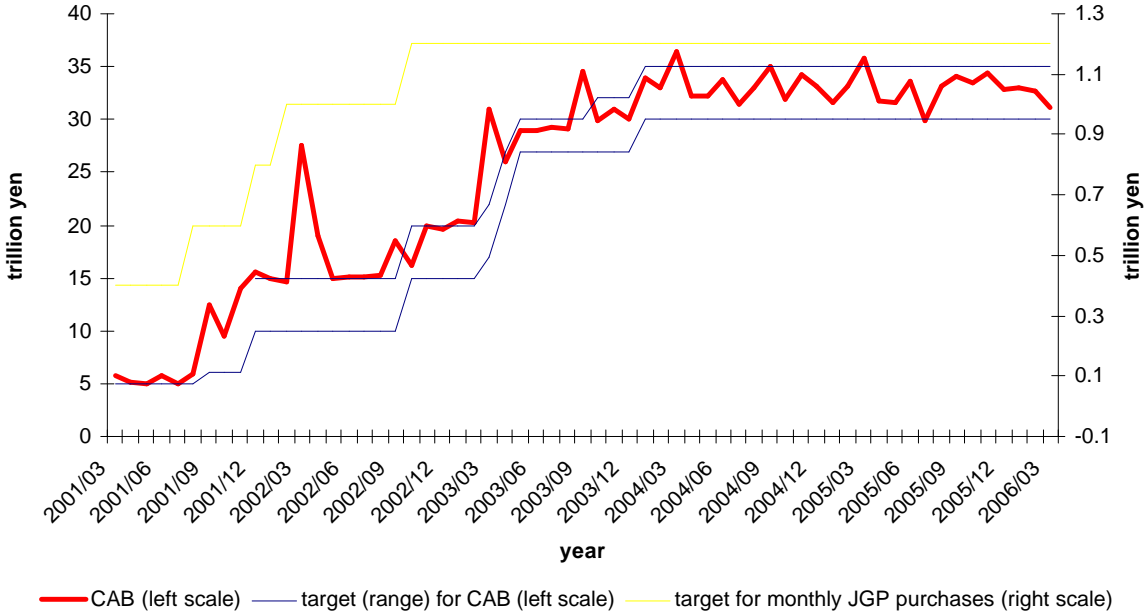
US yield curve (eff. fed funds rate, Treasury securities, 11/03/08)



(The Federal Reserve Board 2009e)

Chart 19

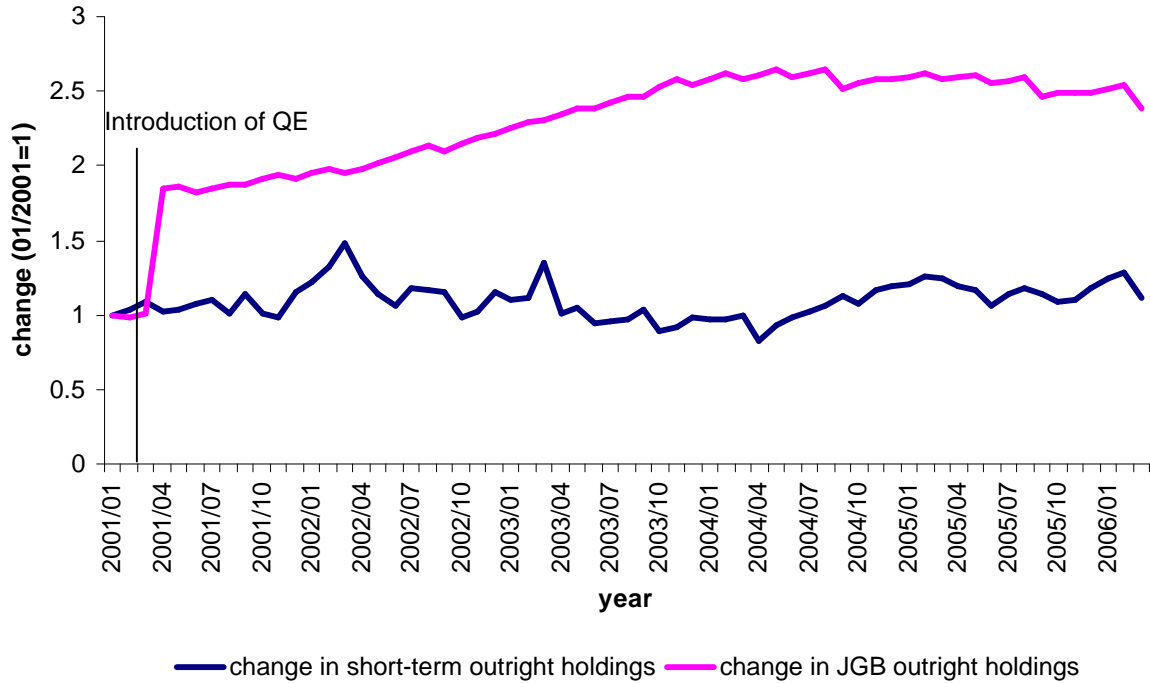
JGB target and CAB (target) during QE (03/2001-03/2006)



(BoJ Time-Series Data Search 2009d for CAB and Ugai 2006, Appendix 1-5 for targets)

Chart 20

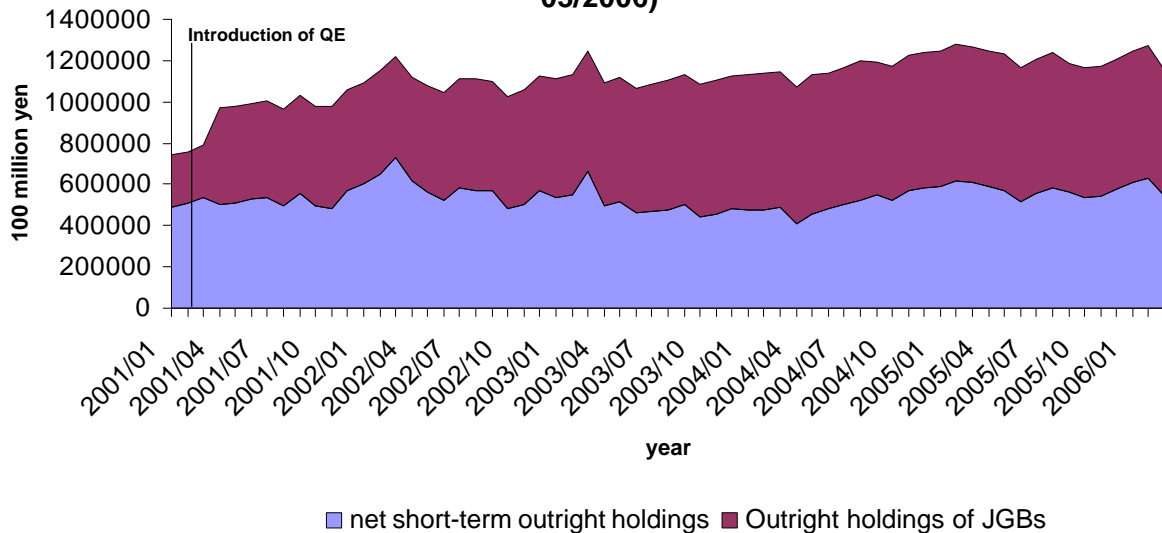
change in amounts outstanding of short- and long-term operations during QE (01/2001-03/2006)



(BoJ Time-Series Data Search 2009c)

Chart 21

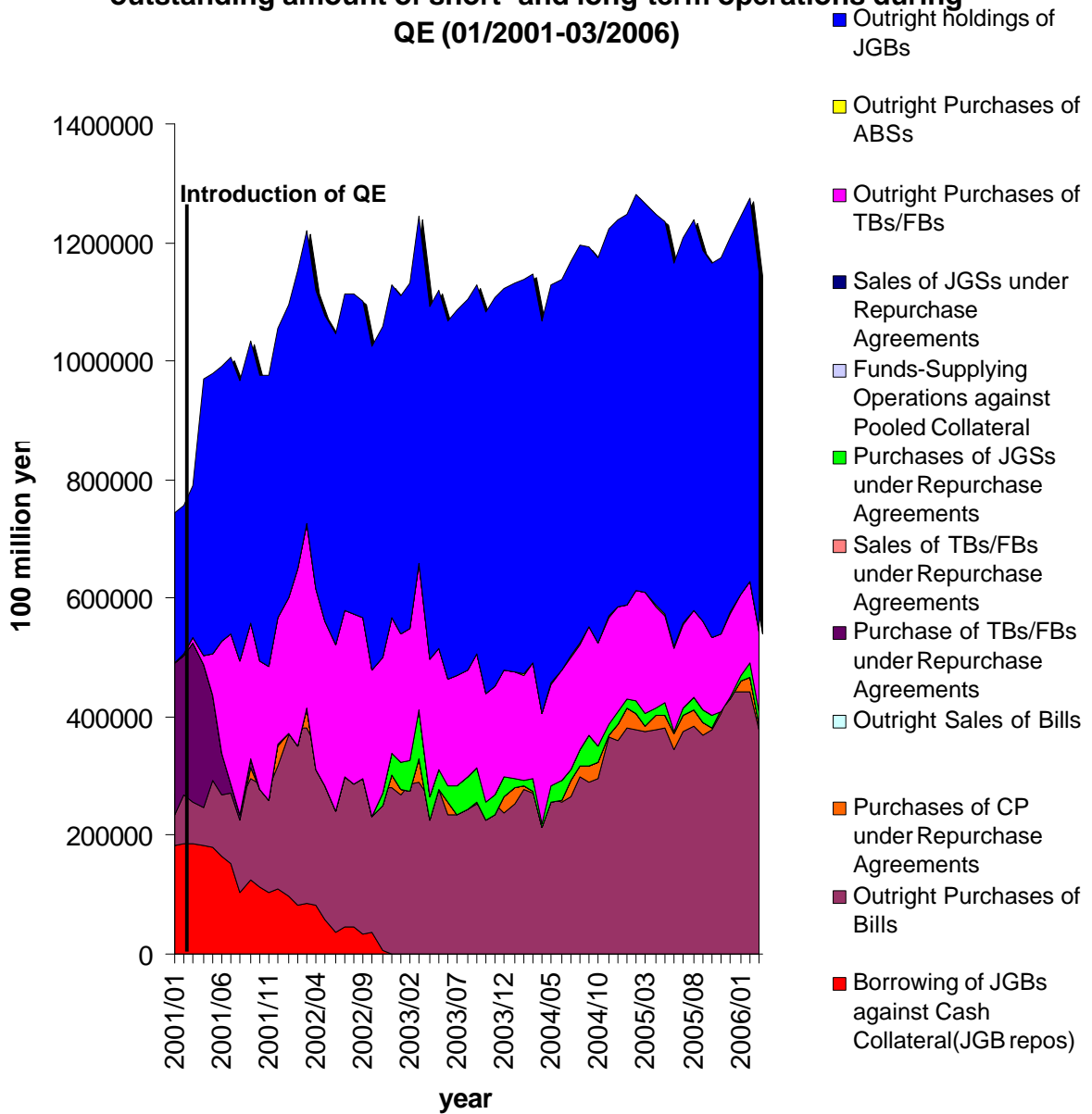
amount outstanding of short- and long-term operations (01/2001-03/2006)



(BoJ Time-Series Data Search 2009c)

Chart 22

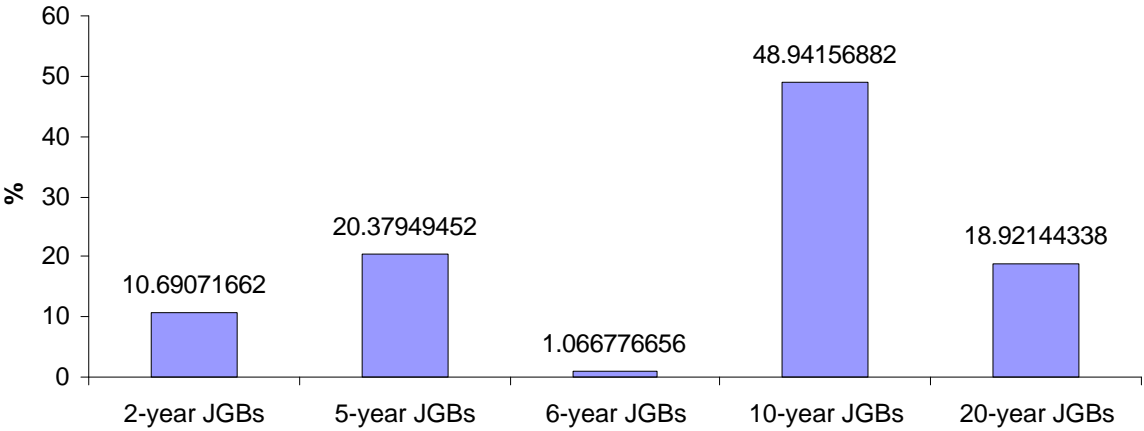
**outstanding amount of short- and long-term operations during
QE (01/2001-03/2006)**



(BoJ Time-Series Data Search 2009c)

Chart 23

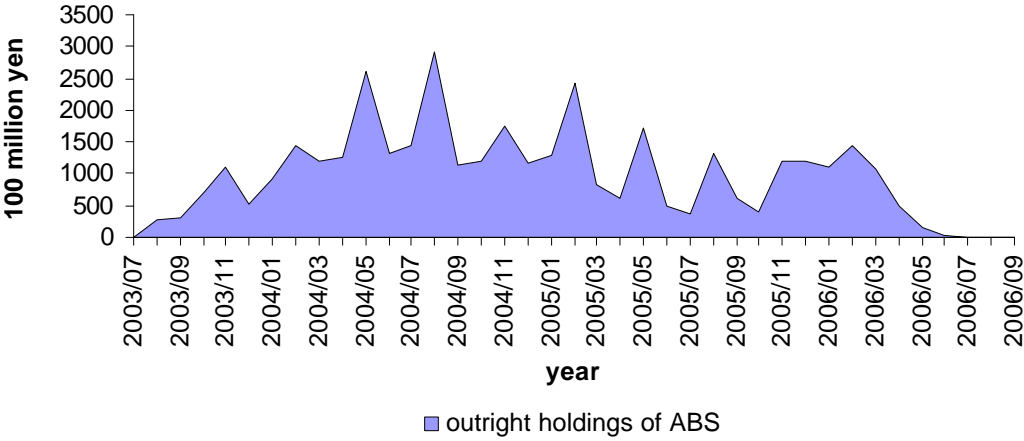
maturity distribution of JGBs held by the BoJ (as of 02/28/2006)



(Bank of Japan 2009d)

Chart 24

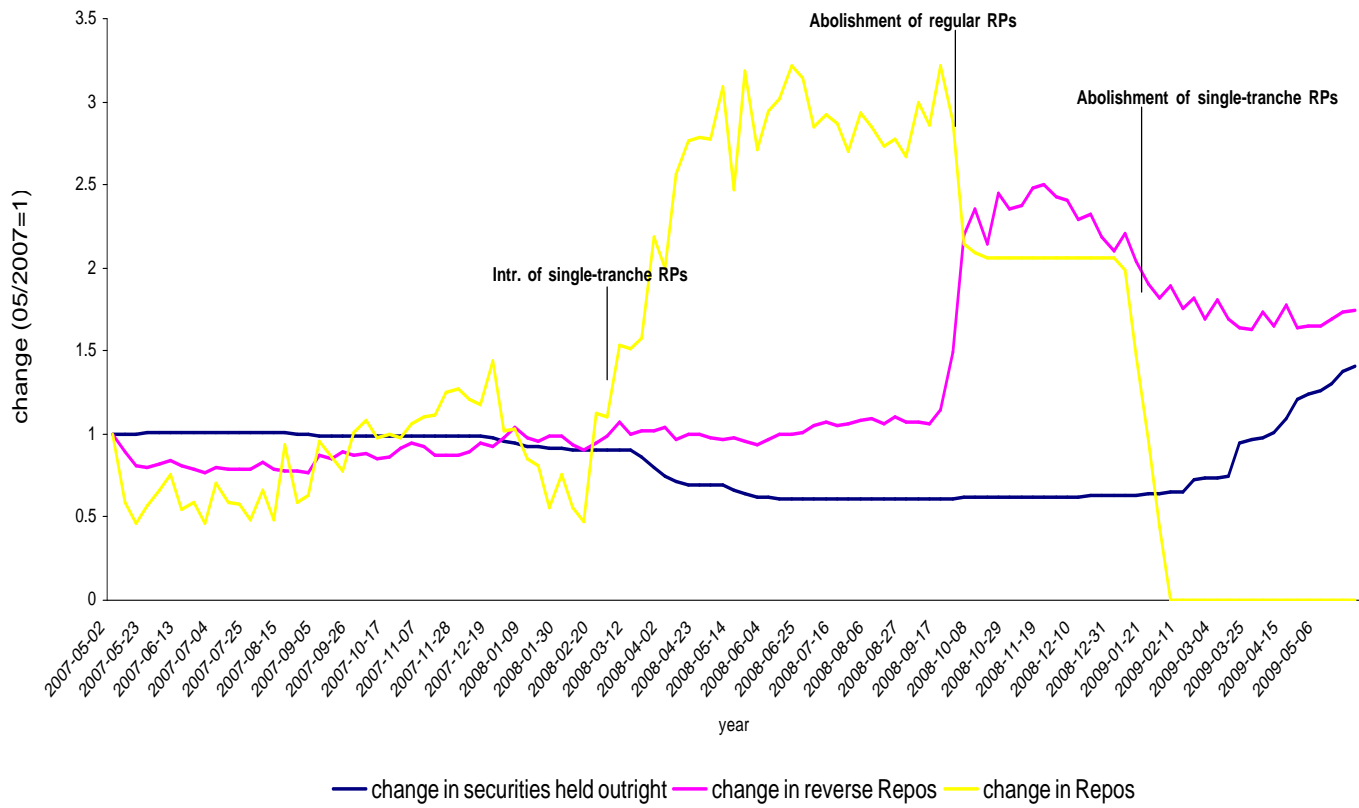
Outright holdings of ABS (07/2003-09/2006)



(BoJ Time-Series Data Search 2009e)

Chart 25

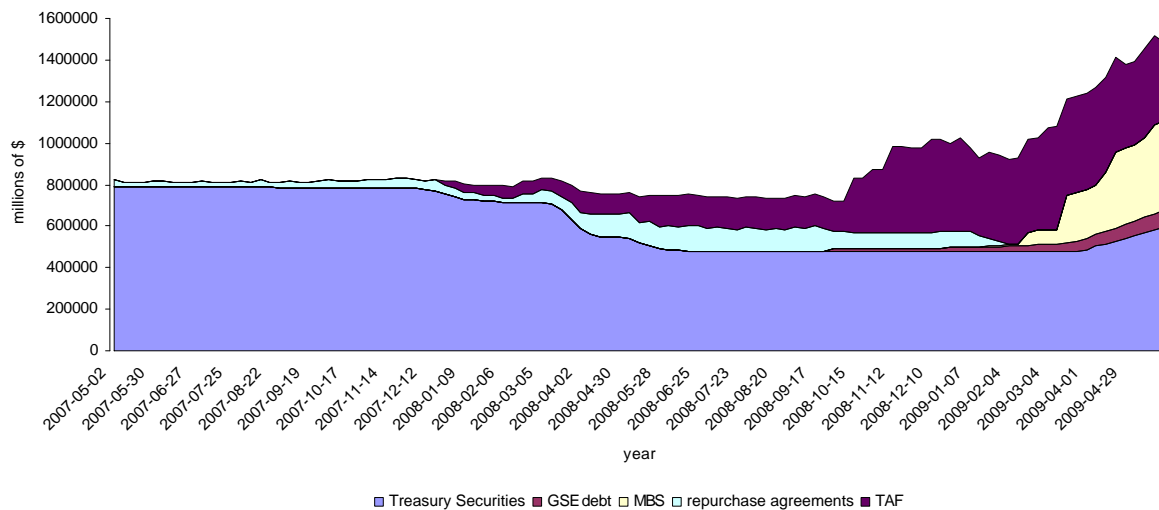
changes in different types of OMOs outstanding (05/2007-05/2009)



(The Federal Reserve Board 2009f)

Chart 26

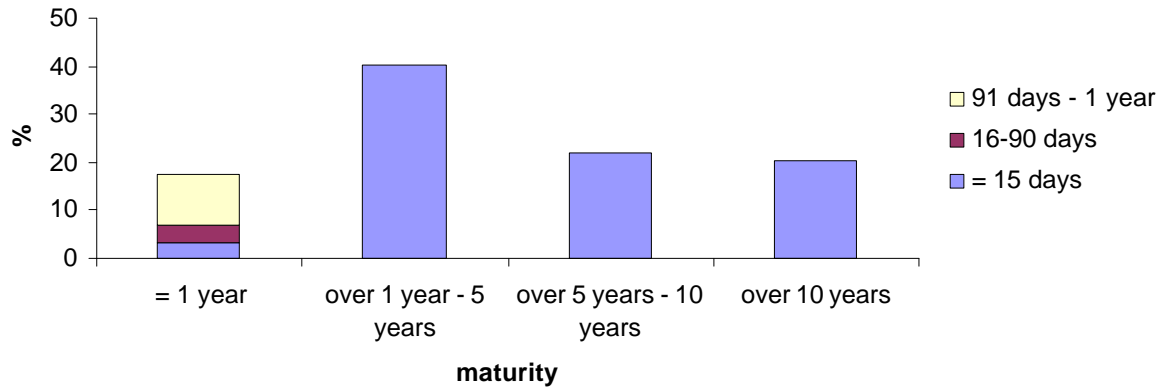
active QE: Securities held outright, repurchase agreements and TAF (05/2007-05/2009)



(The Federal Reserve Board 2009g)

Chart 27

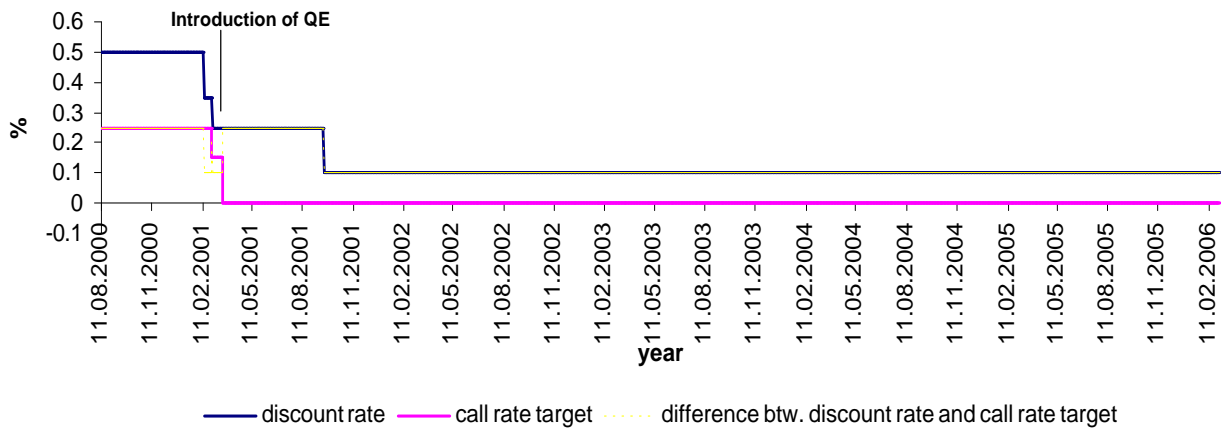
**maturity distribution of US Treasury securities held by the Fed
(as of 05/20/2009)**



(The Federal Reserve Board 2009h)

Chart 28

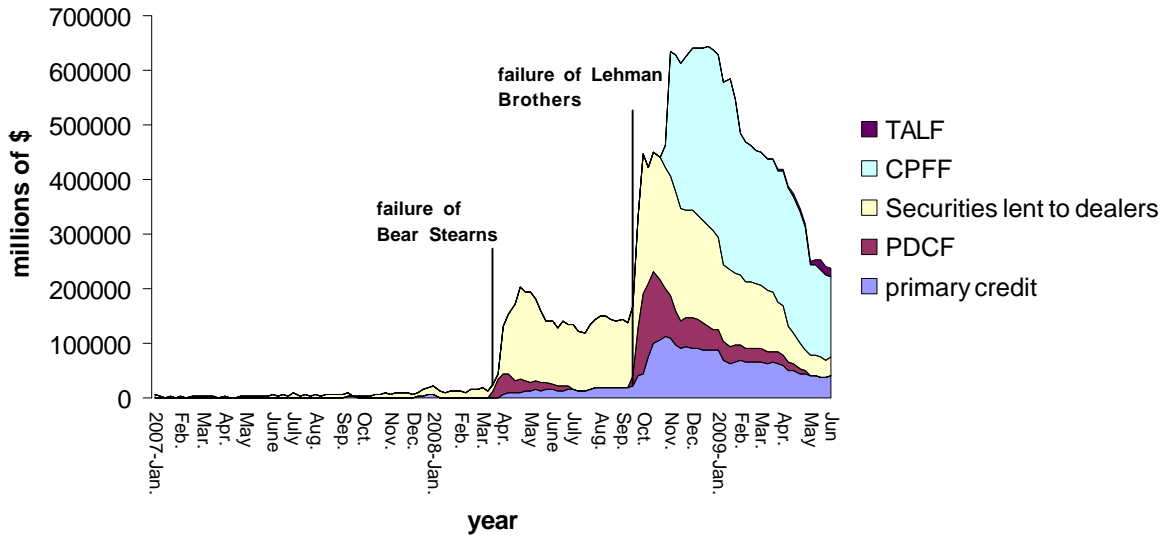
Discount rate, call rate target and the difference (08/2000-03/2006)



(BoJ Time-Series Data Search 2009f and MPMs for call rate targets)

Chart 29

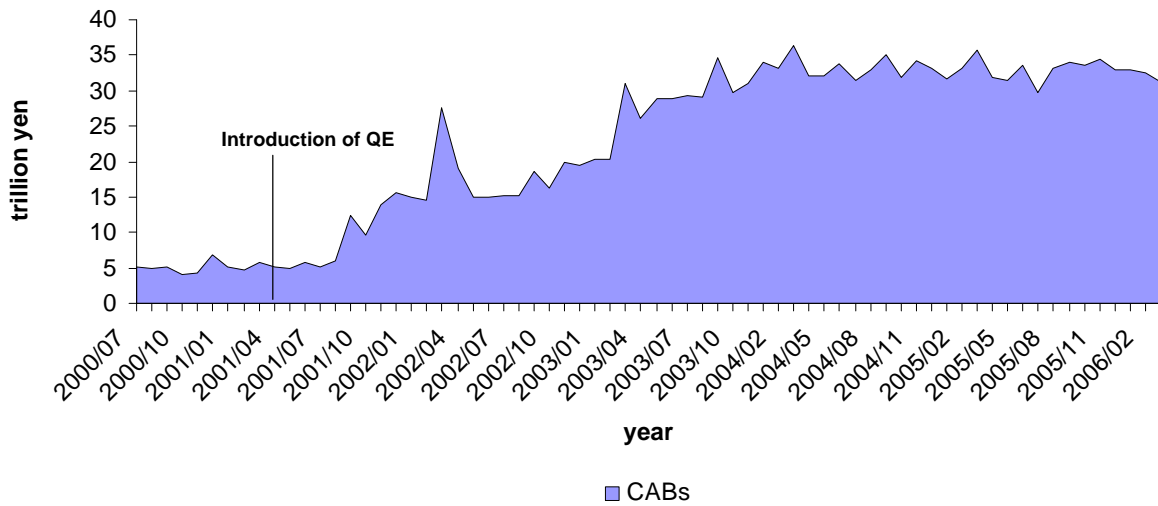
passive QE + "direct lending to borrowers and investors" (01/2007-06/2009)



(The Federal Reserve Board 2009i)

Chart 30

CABs at the BoJ (07/2000-03/2006)



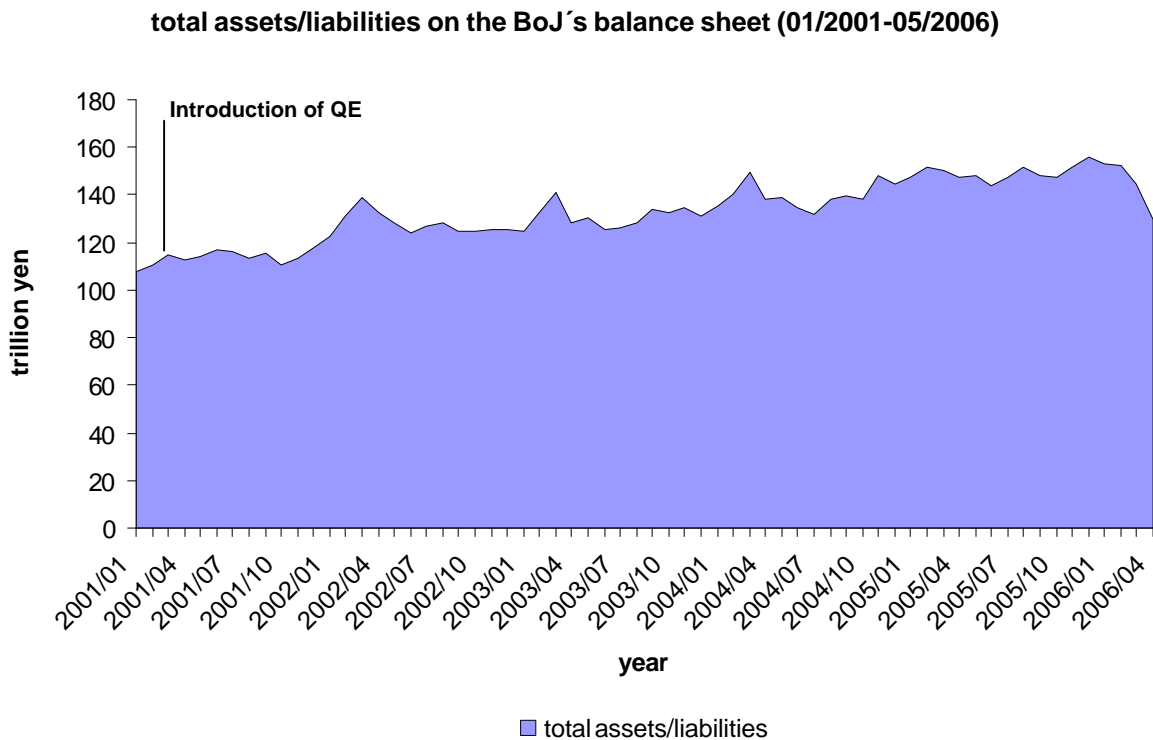
(BoJ Time-Series Data Search 2009g)

Chart 31

Stilized Central Bank Balance Sheet	
Assets	Liabilities
Autonomous factors Foreign currency, Gold Investment assets Other assets	Autonomous factors Banknotes in circulation Government deposits Capital and reserves Other liabilities
Monetary policy operations repos outright holdings of securities liquidity-providing standing facility	Monetary policy operations reverse repos liquidity-absorbing standing facility
	Reserves of banks
total assets	total liabilities

(Bindseil 2004, p. 48)

Chart 32



(BoJ Time-Series Data Search 2009h)

Chart 33

Bank of Japan's balance sheet during QE

Assets (trillion yen)

04/30/2001 01/31/2006 change

Cash	0.29	0.19	-34%
Gold	0.44	0.44	0%
Foreign currency assets	3.27	4.75	45%
Others	1.15	0.65	-43%
	5.15	6.03	17%

Liabilities (trillion yen)

04/30/2001 01/31/2006 change

Banknotes in circulation	60.09	74.74	24%
Government deposits	12.27	6.08	-50%
Others	7.21	6.33	-12%
	79.57	87.15	9%

Repos	22.9	4.55	-80%
JGBs holdings	45.78	63.79	39%
TBs/FBs holdings	18.38	32.14	74%
Others	20.08	46.32	130%
	107.14	146.8	37%

Bills sold	3.71	1.1	-70%
Reverse Repos	24.02	31.66	31%
	27.73	32.76	18%

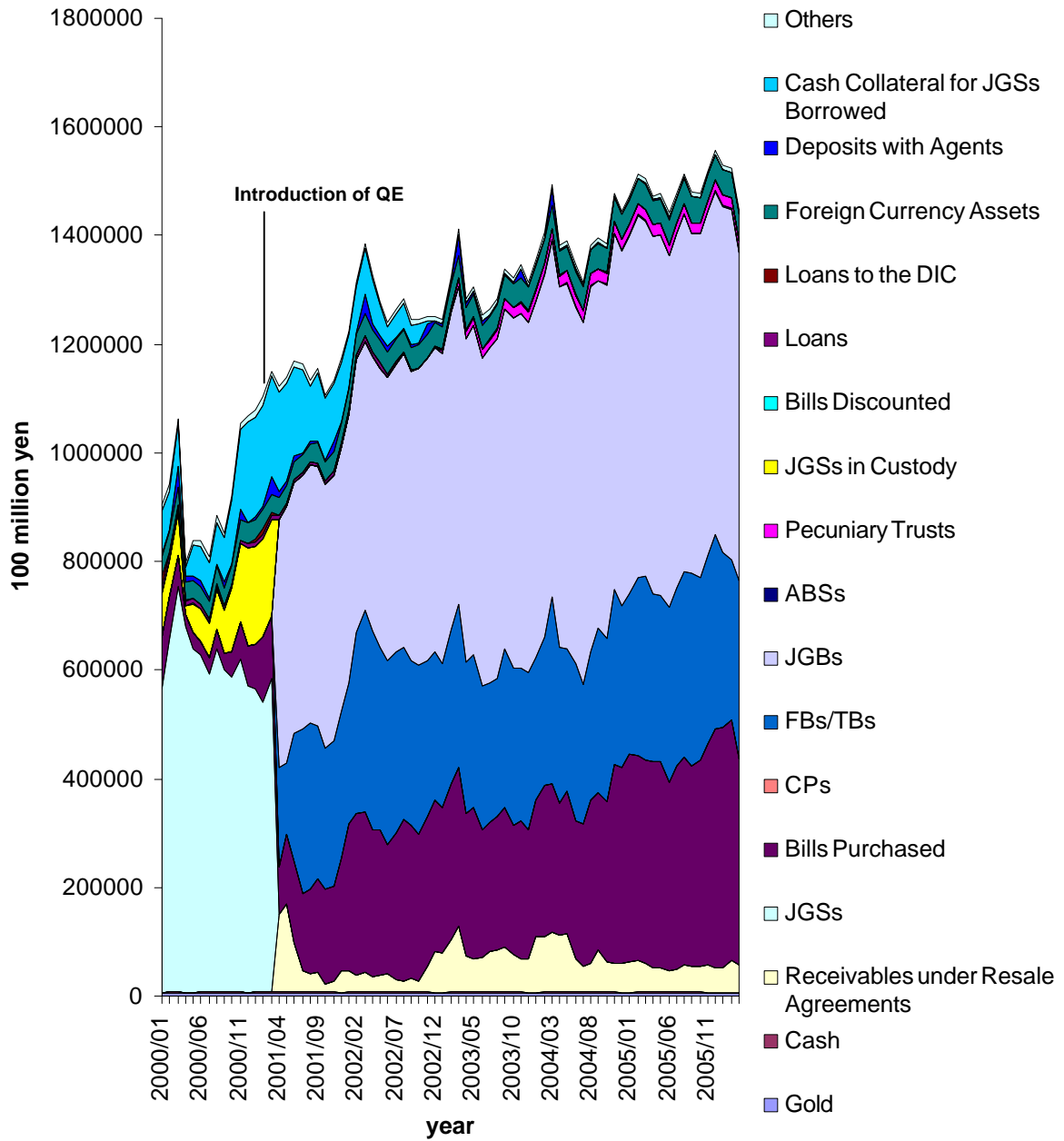
Reserves of banks	5.07	32.93	549%
--------------------------	-------------	--------------	-------------

Total assets	112.3	152.84	35%	=	Total liabilities	112.3	152.84	35%
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(Bank of Japan 2001a and Bank of Japan 2006b)

Chart 34

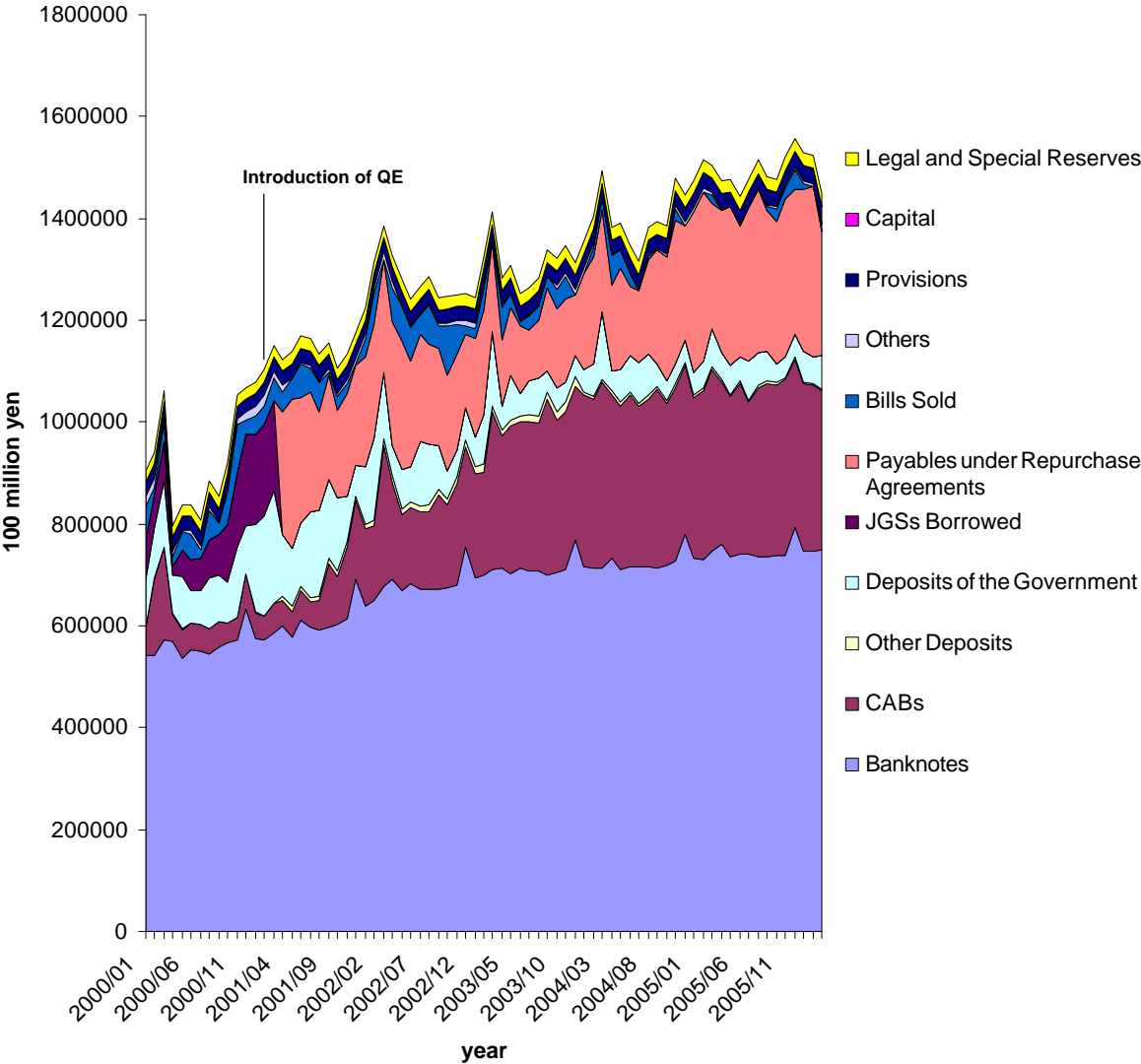
Asset Side of the BoJ's Balance Sheet (01/2001-03/2006)



(BoJ Time-Series Data Search 2009i)

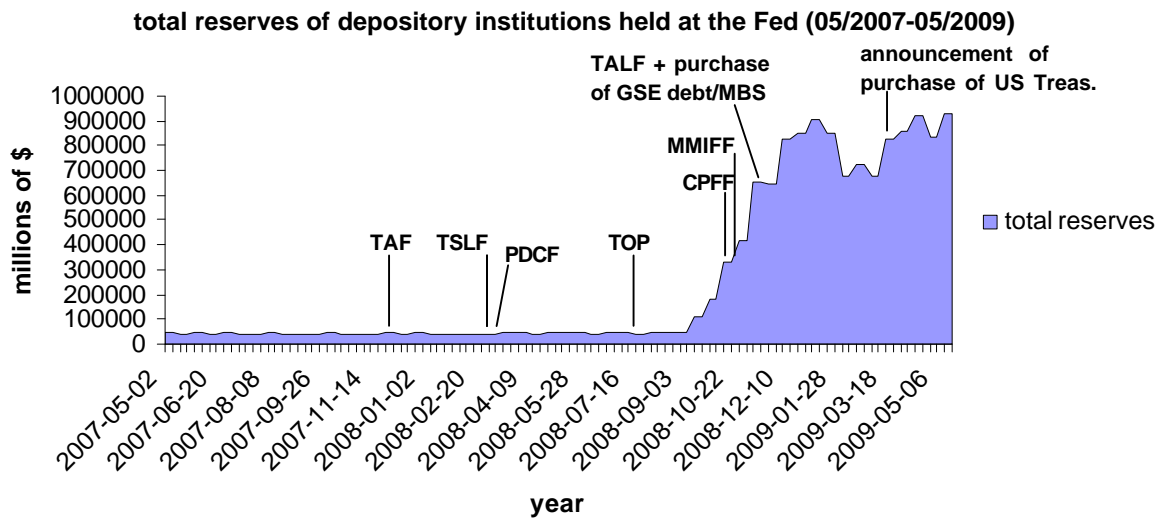
Chart 35

Liabilities Side of the BoJ's Balance Sheet (01/2001-03/2006)



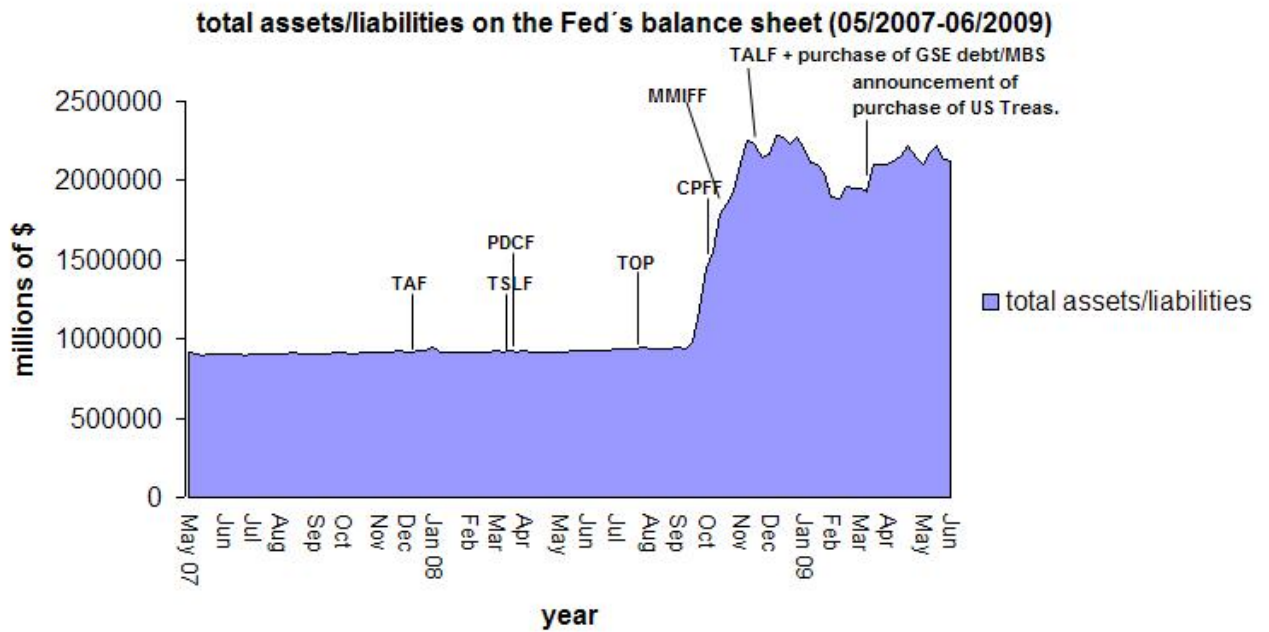
(BoJ Time-Series Data Search 2009i)

Chart 36



(The Federal Reserve Board 2009j)

Chart 37



(The Federal Reserve Board 2009k)

Chart 38

The Fed's balance sheet before and during QE

Assets (millions of \$)

05/03/2007 06/11/2009 change

Cent. bank liquid. swaps	0	165856	N.A.
Gold	11041	11041	0%
Dom.+ for. curr. assets	41225	69864	69%
Others (+loans to AIG,..)	40334	147567	265%
Total	92600	394328	325%

Liabilities (millions of \$)

05/03/2007 06/11/2009 change

Banknotes in circulation	807377	907550	12%
Government deposits	14887	31392	110%
Others	46025	71007	54%
Total	868289	1009949	16%

Repos	38750	0	-100%
Securities held outright	787183	1133524	43%
Standing facility	66	36888	55790%
Newly introduced instr.	0	516618	N.A.
Total	825999	1687030	104%

Reverse Repos	40111	67108	67%
suppl. financing account	0	199936	N.A.
Total	40111	267044	565%

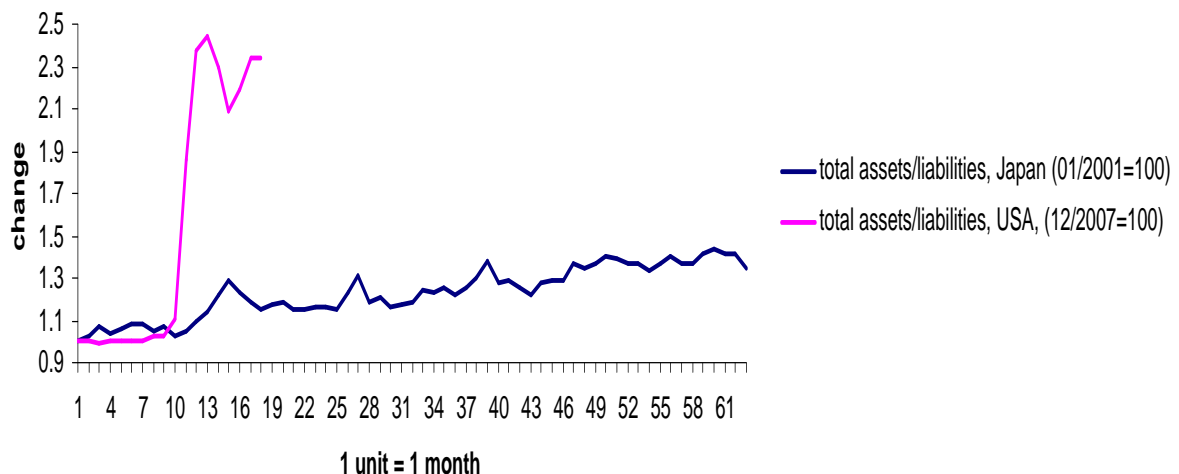
Reserves of banks	10198	804365	7784%
--------------------------	--------------	---------------	--------------

Total assets	918599	2081358	126%	=	Total liabilities	918599	2081358	126%
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(The Federal Reserve Board 2009l)

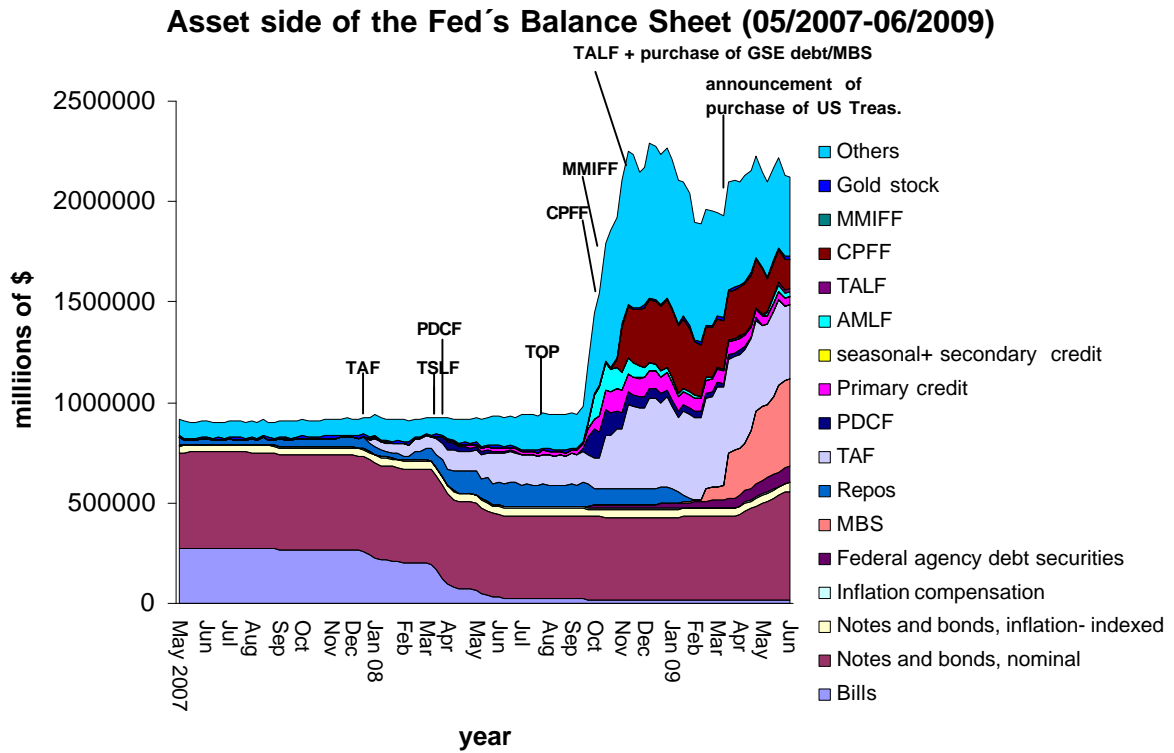
Chart 39

development of total assets/liabilities in Japan (01/2001-03/2006) and the USA (12/2007-05/2009)



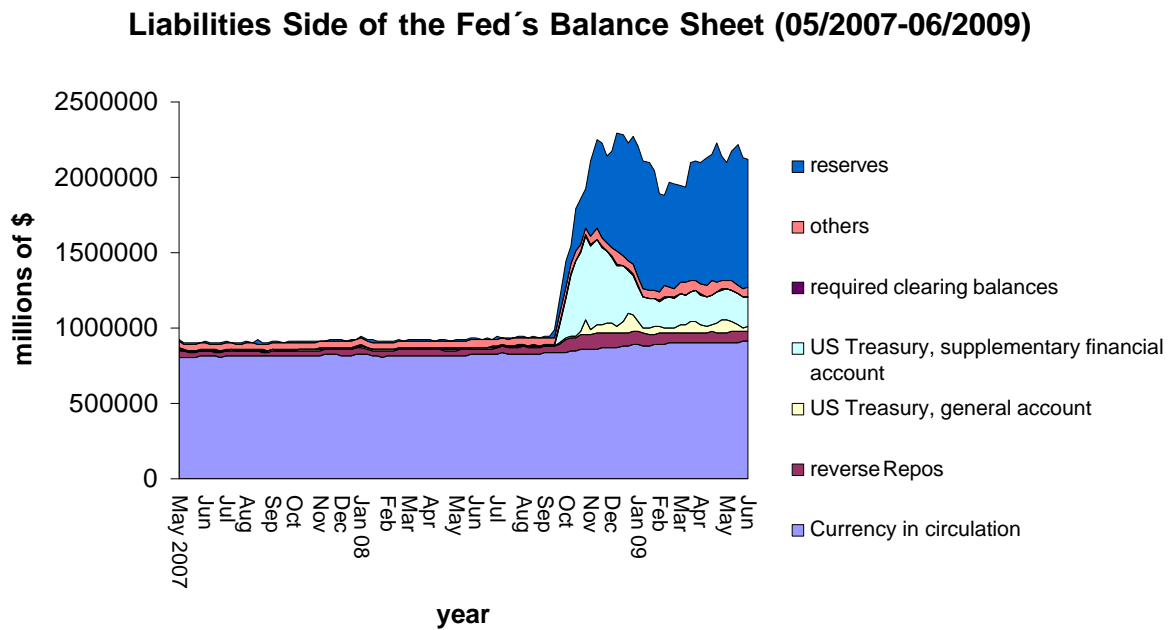
(The Federal Reserve Board 2009k and BoJ Time-Series Data Search 2009l)

Chart 40



(The Federal Reserve Board 2009m)

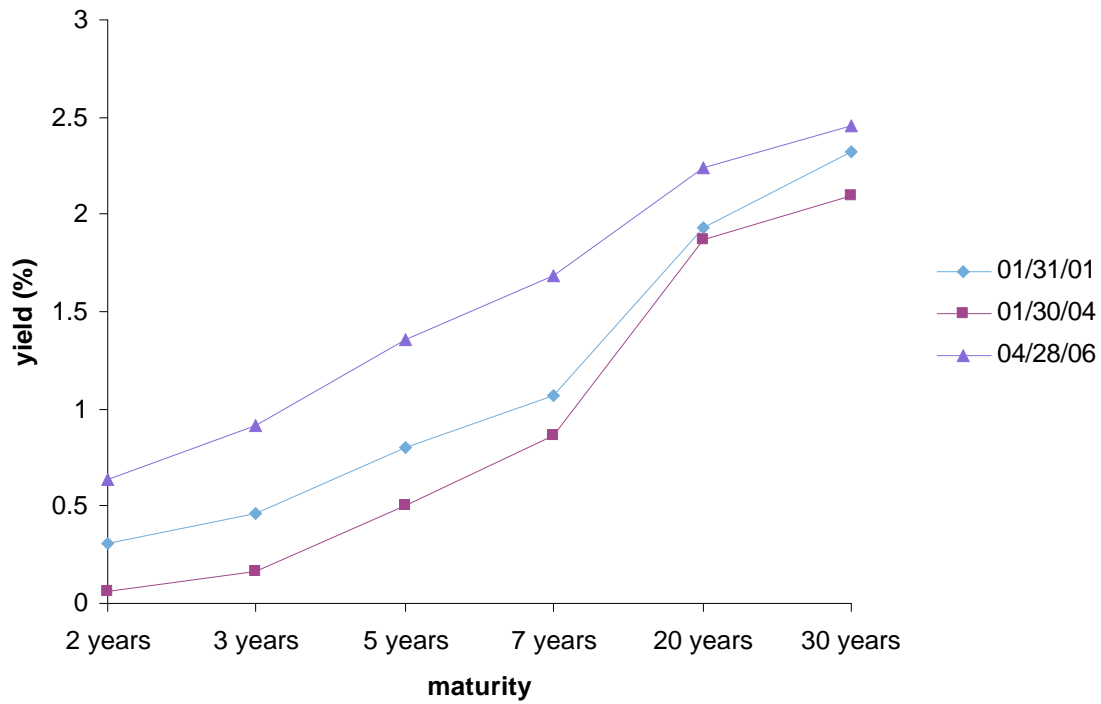
Chart 41



(The Federal Reserve Board 2009n)

Chart 42

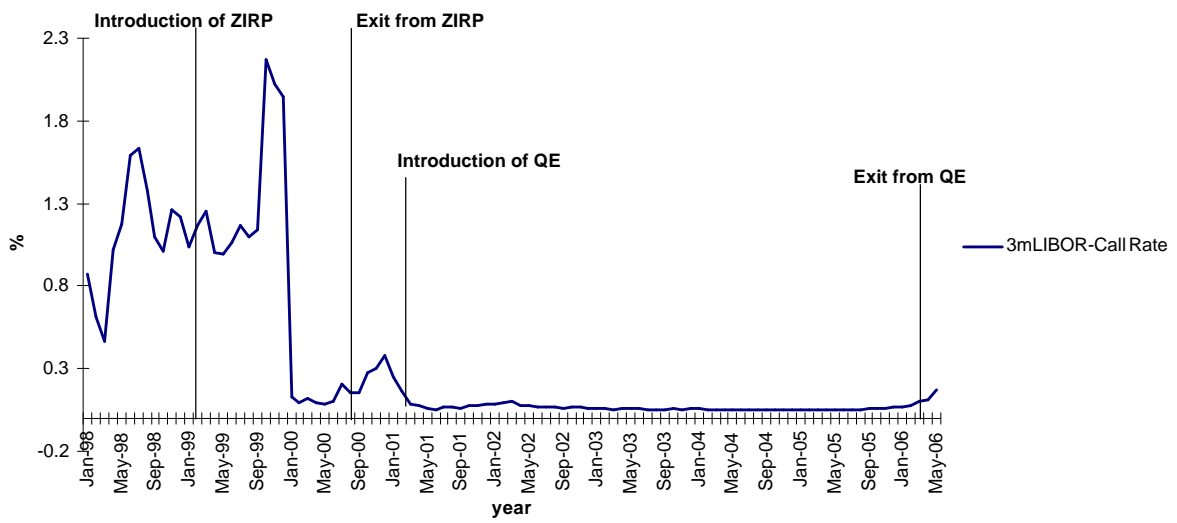
JGBs yield curve before, during and after QE



(Thomson Reuters Datastream)

Chart 43

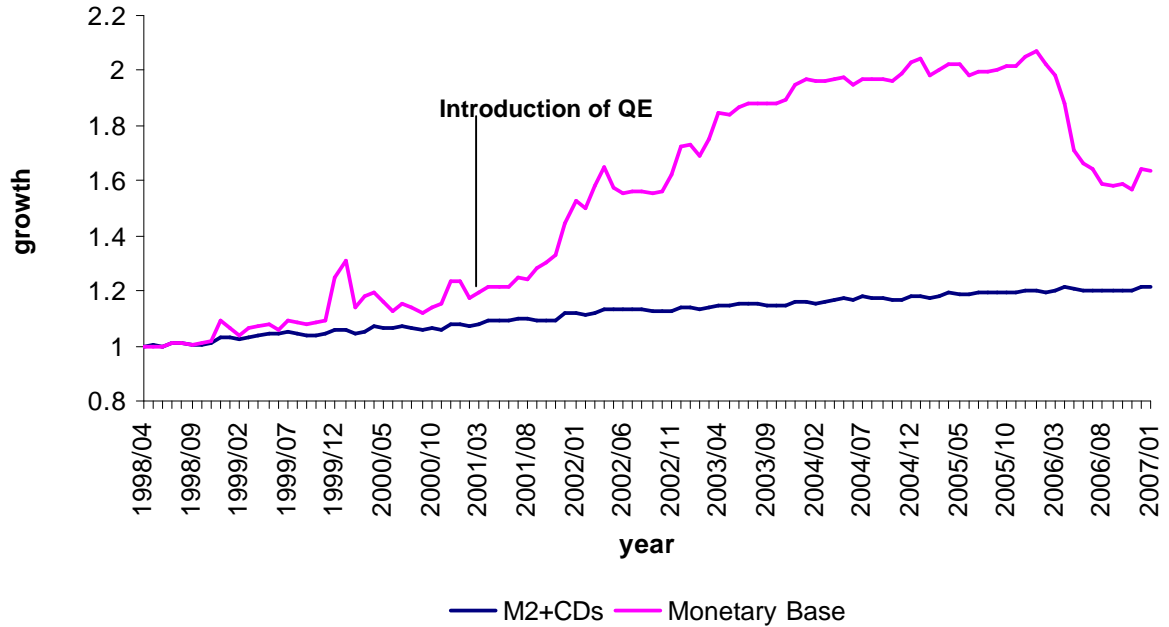
Spread between the 3m JPY LIBOR and the uncollateralized call rate (01/1998-05/2006)



(BoJ Time-Series Data Search 2009j and HousePriceCrash.co.uk 2009)

Chart 44

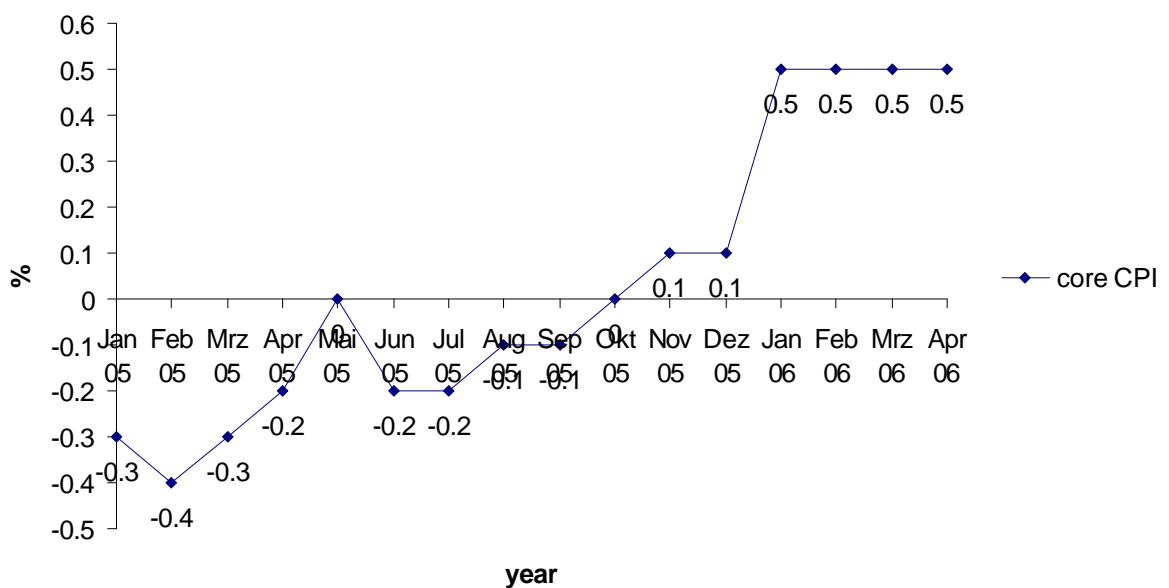
Growth of monetary base and M2+CDs (04/1998-01/2007, 04/1998=100)



(BoJ Time-Series Data Search 2009k; note: M2 and M2+CDs are basically the same. The distinction is of rather technical nature and has already been abolished)

Chart 45

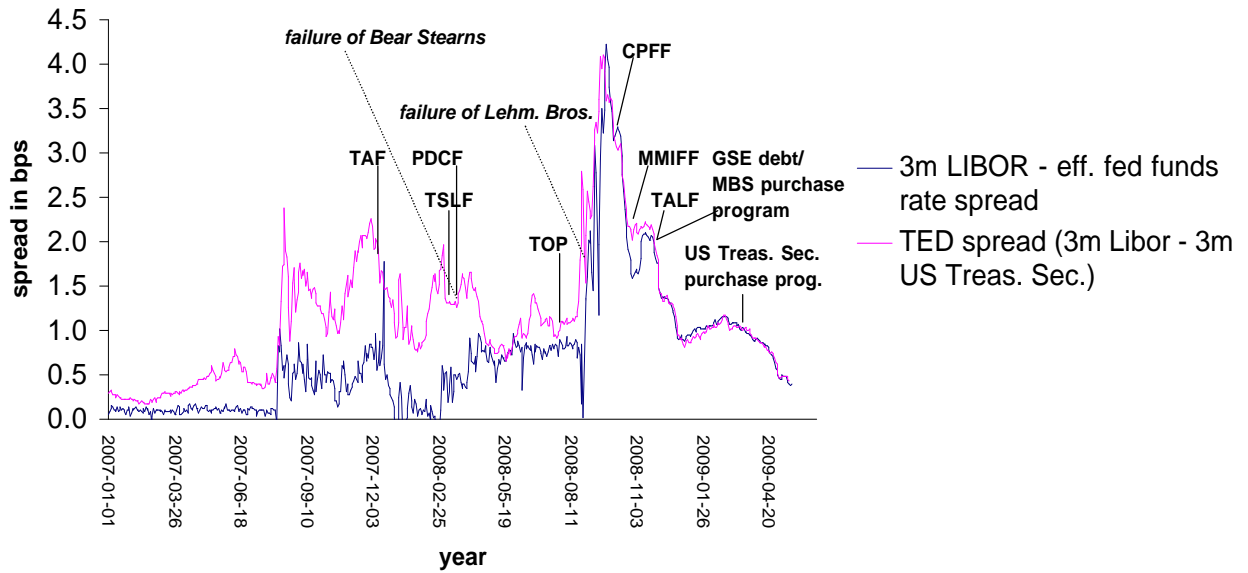
core CPI, over the same month a year earlier (01/2005-04/2006)



(Ito 2005, p. 123)

Chart 46

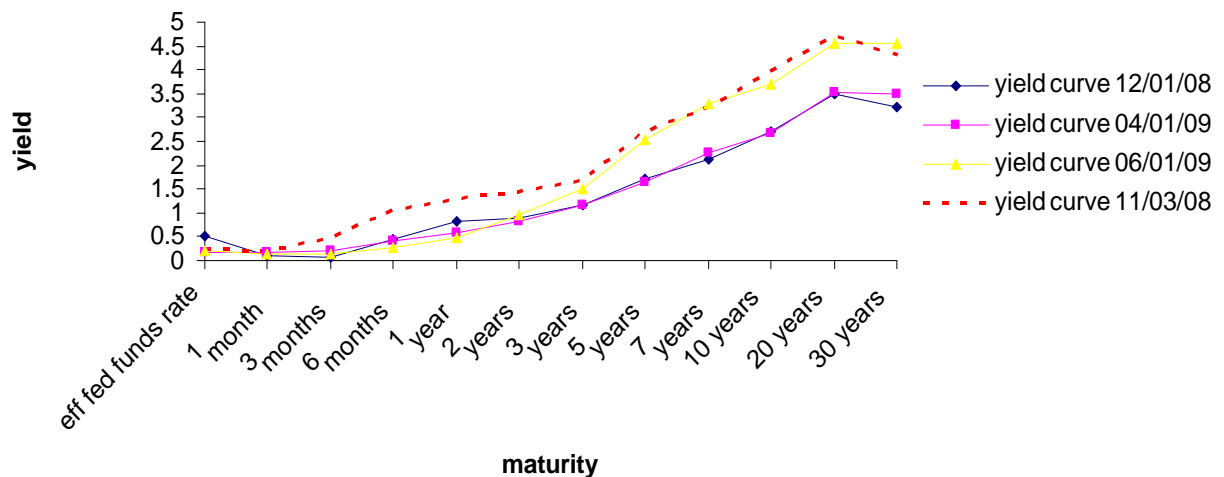
different kinds of 3 months USD LIBOR spreads (01/2007-06/2009)



(The Federal Reserve Board 2009o and Mortgage-X 2009)

Chart 47

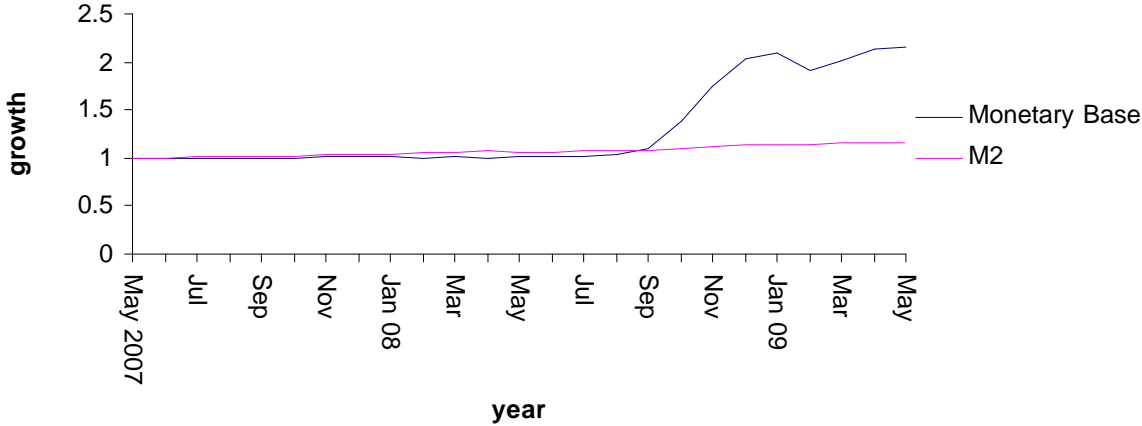
US yield curves (effective fed funds rate, Treasury securities) as of 11/03/08, 12/01/08, 04/01/09 and 06/01/09



(The Federal Reserve Board 2009p)

Chart 48

Growth of monetary base and M2 in the US (05/2007-05/2009, 05/2007=100)



(The Federal Reserve Board 2009q)

Chart 49

	BoJ	Fed
target	reserves	short-term interest rate
official starting date	yes (03/19/2001)	no
primary aim(s)	fighting deflation and recession	fighting recession and financial turmoil
exit based on	inflation	financial market conditions
new facilities/programs	2	10 (so far)
broadening of counterparties	yes	yes
broadening of eligible collateral	yes	yes
active QE		
purchase of gov. sec.	yes	yes
purchase of other assets	yes (ABS and ABCP, but amount very small)	yes (GSE debt, GSE MBS)
passive QE/direct lending		
modific. of discount facility	yes	yes
(introduction/expansion of) securities lending	yes	yes
direct lending to borrowers/investors	no	yes
expansion of balance sheet	35%	126% (so far)

8.2. Abstract (English)

In the current economic and financial crisis, many western central banks introduced “unconventional” monetary policy measures, commonly referred to as “Quantitative Easing (QE)”. However, the Bank of Japan (BoJ) already applied QE between 2001 and 2006. This lead many commentators to make oversimplifying comparisons between the BoJ’s QE approach (2001-2006) and current implementations of QE by other central banks. In particular, this diploma thesis tries to examine the differences between BoJ-type QE and Fed-type QE. It turns out that both approaches differ fundamentally from each other on various grounds: The primary aim of QE in Japan was fighting deflation, whereas the American central bank addresses mostly strains in the banking system. Concerning the concrete measures, one can say that QE by the BoJ consisted to a good deal of active QE in terms of outright purchases of Japanese government securities (JGBs), whereas the Fed currently follows a somewhat broader approach: Since interbank markets are not functioning as desired, it tries to engage with as many market participants as direct as possible. Therefore the Fed has introduced a much broader range of new instruments than its Japanese counterpart did between 2001 and 2006. As a result, the Fed’s balance sheet expansion was considerably larger than the one in Japan.

8.3. Abstract (German)

Angesichts der gegenwärtigen Krise haben viele westliche Zentralbanken zu „unkonventionellen“ geldpolitischen Maßnahmen gegriffen, welche gemeinhin als „Quantitative Lockerung (QE)“ bezeichnet werden. Maßnahmen dieser Art gibt es jedoch schon länger. Denn bereits zwischen 2001 und 2006 verfolgte die japanische Zentralbank (BoJ) eine Politik der quantitativen Lockerung. Dies verleitet viele Journalisten und Marktkommentatoren zu allzu simplen Vergleichen zwischen den derzeit praktizierten QE-Maßnahmen und jenen der BoJ (2001-2006). Aus diesem Grund beschäftigt sich die vorliegende Diplomarbeit mit den Unterschieden zwischen dem japanischen QE-Ansatz und jenem der amerikanischen Notenbank (Fed). Wie sich herausstellt, unterscheiden sich diese in einer Reihe von wichtigen Aspekten: Das vorrangige Ziel der japanischen QE-Politik war die Bekämpfung deflationärer Tendenzen, wohingegen die Fed unkonventionelle Maßnahmen hauptsächlich zur Beseitigung der Probleme innerhalb des Bankensystems einsetzt. Ferner beschränkte sich die BoJ überwiegend auf den Kauf japanischer Staatsanleihen (JGBs), während die Fed einen breiteren Ansatz verfolgt: Da der Interbankenmarkt zur Zeit nur eingeschränkt funktioniert, versucht die amerikanische Zentralbank mit so vielen Marktteilnehmern so direkt wie möglich zu agieren. Deshalb hat die Fed weitaus mehr neue Instrumente eingeführt als seinerzeit die BoJ. Vor diesem Hintergrund ist es wenig verwunderlich, dass sich die Ausweitung der japanischen Zentralbankbilanz zwischen 2001 und 2006 im Vergleich zu jener der Fed in den letzten beiden Jahren eher bescheiden ausnimmt.

8.4. Curriculum Vitae

Name	Matthias Reith
Date of Birth	June 26, 1985
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1991-1995	Primary School “Am Schlossplatz”, Varel (Germany)
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