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the Zero Lower Bound on Nominal Interest Rates:
Exercises in Expectations Management**

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The Bank of Japan's Struggle with the Zero Lower Bound on Nominal Interest Rates: Exercises in Expectations Management*

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Abstract

This paper reviews and evaluates the Bank of Japan (BOJ)'s monetary policy during the period 1998-2005. In doing so, it pays particular attention to the development of academic thinking on what central banks can do at or near zero interest rates and its relationship with the actual policy measures adopted by the BOJ. The paper argues that the BOJ has done most of the things recommended by academic economists. The most important of these is expectations management as crystallized in the so-called zero interest rate policy. The academic origin of this policy can be found in the seminal work of Krugman. The paper points out, however, that this fact, unfortunately, remained unnoticed by many, and explores reasons behind. The paper then goes on to survey the empirical literature on the effects of the measures adopted by the BOJ. The literature has found that the zero interest rate policy has had significant effects on the term structure of interest rates and supported the economy. Finally, the paper discusses possible reasons for the failure of such measures to stop the deflation of the economy within a short period of time. It points out some difficulties inherent in the expectations management approach and problems created by the impaired financial system.

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1. Introduction

This paper aims to carry out an informal review of the Bank of Japan (BOJ)'s monetary policy during the last 6-7 years. This has been an interesting period for any student of monetary policy. Figure 1 places in perspective the difficulties the BOJ has faced. The BOJ roughly doubled base money during the period with no discernible effects on nominal GDP or the price level (the lower half panel of Figure 1), contradicting the standard prediction of monetarism. As a result, the velocity of money has declined sharply (upper chart). More importantly, the period has been one of near zero nominal short-term interest rates. The BOJ has adopted a number of non-traditional monetary policy measures to get around the difficulties generated by near zero interest rates--not just an expansion of base money. The impaired financial system, however, as indicated by declines in bank loans in the chart, has severely limited the effectiveness of the BOJ's policy measures. A brief survey of the measures adopted by the BOJ and the discussion of their effects are provided in this paper.

The period has also been an interesting one in terms of the relationship between academic ideas and actual monetary policy making. Academic thinking, without doubt, has been useful for the BOJ to formulate its policy. Some of the measures adopted had origins in the work of academic economists. The BOJ, however, adopted them not directly at the recommendation of economists, but as a natural evolution of the course of policy they were following. Some did not realize the similarity between the measures adopted by the BOJ and those advocated by academic economists, and continued to argue for the BOJ's use of bold methods to overcome deflation. This gap has only recently begun to be filled by serious economic analyses of the BOJ's monetary policy.

The paper begins, in the next section, with a brief historical summary of the evolution of the economy and the BOJ's monetary policy during the period. The core of monetary policy during the period has been the so-called Zero Interest Rate Policy (ZIRP) introduced early in 1999. The ZIRP has been an attempt to affect expectations of future monetary policy, rather than to change today's policy instrument. In this sense, such a policy is often called an exercise in expectations management or in shaping expectations. The section explains how the BOJ had arrived at the idea of the ZIRP. The BOJ terminated the ZIRP in 2000, but introduced the Quantitative Easing Policy (QEP) in early 2001. I explain what the QEP has been and point out that it has included a version of the ZIRP, which in fact may have been the most important aspect of the QEP.

In section 3, I summarize what now appears to be the academic consensus concerning what central banks can do at or near the zero lower bound (ZLB) on interest rates. The measures adopted by the BOJ are re-summarized in this light. Given the

difficulties banking sector problems have caused for the BOJ, however, it is important to see the BOJ's policy measures from yet another perspective. Many of the monetary policy measures adopted have had the purpose of mitigating financial sector problems and, through that, of contributing to the fight against deflation. This perspective is explained in section 4. In section 5, I go on to discuss in more detail the academic background for the ZIRP. I argue that, among others, a series of work by Krugman was the origin of the ZIRP. Since at the ZLB nominal interest rates cannot be lowered, further stimulus must come through changes in expectations about policy or interest rates when the economy is no longer stuck at the ZLB. Krugman had explained the idea in terms of the quantity of money, not nominal interest rates. The two are, however, the two sides of the same coin. The BOJ has been the first central bank to implement such a policy. The BOJ, however, initially carried out something close to what Krugman was proposing with reference to interest rates, and not to the quantity of money. Perhaps, this is one of the reasons for the apparent communication failure between the BOJ and the outside world in the early stages of the ZIRP.

In section 6 I turn to a review of the recent empirical literature that tries to estimate the effects on the economy of the ZIRP and other measures adopted by the BOJ. Most of this literature has found significant effects of the ZIRP on the term structure of interest rates. The effects have been larger at the short to medium part of the yield curve, consistent with what theory about the ZIRP predicts. Evidence on the effects of other aspects of the BOJ's policy such as targeted asset purchases and the expansion of bank reserves on asset prices is at best mixed. There is, however, some evidence that the BOJ's measures to contain financial sector problems have been partially successful.

Despite some such effects on interest rates and possibly on other asset prices, the BOJ's policy has failed to stop the deflation of the economy within a short period of time. In the last section of the paper I speculate on the causes of the weak effects of the BOJ's policy on the economy. The discussion is divided in two parts. In the first, I point out some of the weaknesses of the ZIRP and other attempts at expectations management. These include the need for non-monetary policy forces to lift the economy and the possible time inconsistency problem of the approach. In the second part, I discuss the way problems in the financial system have hindered the effectiveness of the BOJ's policy. This is a much cultivated area. I argue, however, that the BOJ's policies eased problems for the relatively healthier part of the financial system and for banks, but not for the rest, especially borrowers with low credit standings. As such, they may have fallen short of lifting the economy into positive inflation territory, but at least contributed to avoiding a meltdown of the financial system and an accompanying

deflationary spiral.

2. Recent Development of the Economy and Monetary Policy in Japan

In this section we will provide a brief review of the recent development of the economy and of monetary policy in Japan. Japan's macroeconomic experience during the last two decades has been quite extraordinary. Stock and land prices soared to their peaks in the late 1980s and early 1990s respectively, giving way subsequently to a decade long correction process. In April 2003, TOPIX reached a low of 773.1, the level where it was back in 1984. Declining asset prices have hit the banking system severely. Public money, bank earnings and bank capital amounting to about 20% of GDP have been used to address the bad loan problem. Business fixed investment has suffered from the excesses of the late 1980s and the impaired financial system. The economy has grown at a minimal 1.0% rate on average during 1992-2002, a "lost decade" as some people put it.

The weak economy has affected general prices. The CPI has been declining since 1998. The BOJ started to ease in the summer of 1991, and then lowered the call market rate by almost 800 basis points in the following four years, bringing the rate to below 0.5% in the summer of 1995.

As a result, the BOJ had little room for further reductions in interest rates already in 1995 (**Figure 1**). Roughly speaking, the economy has been in a liquidity trap since then. The BOJ maintained the uncollateralized overnight call rate, the operational target of policy since the mid 1990s to early 2001, as low as approximately 0.5 percent from September 1995 through September 1998 to stimulate the economy and to contain the emerging strains in the financial system. The financial strains became even more serious in the fall of 1998 and the BOJ cut the rate to 0.25% in September 1998. Despite this, the CPI inflation rate moved into negative territory in the second half of 1998. The weakness in the economy, financial stresses and the call for further monetary easing did not dissipate. The BOJ then successively lowered the overnight call rate to virtually zero percent in February and March of 1999. During late March in 1999, the overnight call market rate was at 0.03% and the rate had literally hit the ZLB.

Although there were some improvements in the economy, inflation stayed in the negative range. The BOJ thus continued its exploration for further monetary easing measures. Many options were discussed, including targeting bank reserves/ base money, moving the zero target out the yield curve, the sale of put options on government bonds and so on. These, however, were not adopted for one reason or another. In the end, some of the board members came to the view that the length of time during which a

zero rate is maintained could become an instrument of policy. The so-called zero interest rate policy (ZIRP)--the core of the BOJ's monetary policy since 1999--was introduced in April 1999.¹ The ZIRP was not just a zero short-term interest rate, but a commitment to maintain it until a pre-announced condition was fulfilled. Specifically, the then BOJ Governor Masaru Hayami announced in April 1999 that the Bank would continue the zero interest rate "until deflationary concerns were dispelled". As I discuss in the next section, alternative policy measures discussed at the time shared the same characteristic, i.e., affecting expectations of future monetary policy moves and thus short-term interest rates.

In August 2000, the BOJ lifted the ZIRP and raised the overnight call rate to 0.25 percent, since the economy was recovering and showing some signs of overcoming deflation. In late 2000, however, the economy, reflecting a global decline in the demand for high tech goods, began to deteriorate. This raised deflationary concerns again. The BOJ lowered the policy interest rate to 0.15 percent in February 2001, and then adopted the QEP in March 2001. The QEP is still in effect as of the writing of this article (June 2005).

The QEP has consisted of three pillars. First, the BOJ has maintained an ample liquidity supply by using the current account balances (CAB) at the BOJ as the operating policy target. Second, the BOJ has committed itself to maintaining the provision of ample liquidity until the rate of change of the core CPI (nationwide, excluding perishables) becomes zero percent or higher on a sustained basis. Third, the BOJ has increased the amount of purchases of JGBs from time to time as a tool for liquidity injection. It was projected that increasing the CAB targets beyond the level of the required reserves would normally keep the call rate near zero percent.² Thus, with the commitment to maintain ample liquidity provision until deflation ends, the QEP has contained a version of the ZIRP. The details of this commitment were further clarified in October 2003, with the BOJ stating its intention to continue providing ample liquidity until both actual and expected inflation become zero percent or higher.³ In addition to the ZIRP element, the QEP can be regarded as consisting of liquidity provision beyond that necessary for a zero rate and purchases of long-term government

¹ See, for example, Ueda (2002) for a more detailed account of the BOJ's monetary policy in this period.

² In fact, the uncollateralized overnight call rate declined to 0.001 or 0.002 percent, almost literally to zero percent, during the QEP period, while it declined to at most 0.01 percent during the ZIRP period.

³ For further details on the QEP, see the BOJ's website (<http://www.boj.or.jp>).

bonds.

The target CABs increased from approximately 5 trillion yen at the introduction of the QEP in March 2001, an amount roughly 1 trillion yen greater than the then-required CABs, to a range of approximately 30-35 trillion yen in January 2004. The increases in CABs have been provided mainly by market operations, including the BOJ's purchases of JGBs. The amount of monthly purchases of JGBs has been set and pre-announced by the BOJ. This amount was equivalent to 0.4 trillion yen per month in March 2001 and was gradually increased to 1.2 trillion yen by May 2004.

3. “State of the Art” View on Monetary Policy at the ZLB

Initial discussions on what central bank can do at or near the ZLB were very confusing probably because this was essentially a new subject in the economics profession. A large literature, however, has now developed on this. A useful survey of the literature is provided in Bernanke and Reinhart (2004), who present what now appears to be roughly the consensus view on the issue. They discuss three alternative monetary policy strategies for stimulating the economy without lowering the current policy rate. They are: (i) shaping or managing interest-rate expectations -- that is, providing assurance to the private sector that policy rates will be lower in the future than currently expected; (ii) altering the composition of the central bank's balance sheet to change the relative supplies of securities in the market (targeted asset purchases); and (iii) expanding the size of the central bank's balance sheet beyond the level required to set the short-term policy rate at zero. We will later provide a detailed examination of strategy (i) above as practiced by the BOJ.

On strategy (ii), many concrete proposals have been made, including buying long-term government bonds, equities and foreign exchange. The rationale behind these proposals is not always clear. Most proponents of the approach, however, seem to assume that changes in the relative supplies of assets generate asset price changes, which in turn affect aggregate demand. We should also note that purchases of long-term government bonds as a strategy to affect government bond yields somewhat overlap with strategy (i). Of course, it is possible to argue that strategy (i) affects expected future short rates, while outright purchases of bonds affect the risk premium component of interest rates.

The rationale behind strategy (iii) is also not very clear. Bernanke and Reinhart (2004), however, discuss three possible channels through which strategy (iii) may affect the economy: (a) the portfolio rebalancing effect, whereby increases in the monetary base would lead the private sector to rebalance its portfolios, lowering yields on

alternative, non-monetary assets; (b) altering expectations of the future path of policy rates by a visible act of setting and meeting a high reserve target; and (c) the expansionary fiscal effect, whereby the central bank replaces public holdings of interest-bearing government debt with non-interest-bearing currency or reserves, thus replacing the expected future tax liability for the public with an inflation tax. For channel (c) to produce meaningful effects, the growth rate of base money, however, has to be unusually high. Also, the liquidity supplied will have to be in the economy permanently. Otherwise, there will be a period of negative seigniorage growth. The theoretical rationale behind channel (a) is not obvious. For example, an exchange of base money for treasury bills with a zero rate does not seem to force agents to rebalance their portfolios. At this point, however, it seems fair to say that we need to wait for evidence for/against the presence of such a channel and based on this, to think theoretically about why that is so.

In addition to the above three strategies, some have argued for guiding short rates into negative territory. This would generate obvious effects on the economy. Beyond a certain point, this strategy, however, will require taxing currency. The practical and socio-psychological difficulties involved seem daunting.

The BOJ can be seen to have adopted all three of the strategies as summarized above. Both the ZIRP and the ZIRP element of the QEP are examples of strategy (i). As a possible case of the adoption of strategy (ii), we can point to the BOJ's purchases of JGBs in the QEP period. Such purchases may generate portfolio rebalancing effects, although none of the BOJ's statements have mentioned any intent to produce this sort of effect. The expansion of the CABs at the BOJ in the QEP period is an example of strategy (iii). In section 6 we will review empirical works that test for the presence of the effects of such strategies.

4. Targeting Soft Spots in the Financial System

The above summary of what the BOJ has been doing seems to miss an important aspect. In many instances, the BOJ has been using above strategies to fight deflation, but through a specific transmission channel. That is to say, the last 6-7 years were a period of financial stresses. Liquidity and risk premiums rose in many parts of the financial system from time to time. The rise in premiums led to a sharp contraction in economic activity in late 1998. Similar, though less serious, stresses were felt in 2001 and 2002. As a result, many of the BOJ's recent operations have tried to target "soft spots" in the channels of financial intermediation in order to contain the stresses or the rise in risk premiums. Put differently, under financial instability, interest rates on

instruments involving credit risks can become fairly high even if rates on risk free instruments are near the ZLB. Strategies (i)-(iii) can then be used to contain such rise in interest rates. If successful, the measures would contribute to financial stability and, as a result, to fighting deflation, although at the cost of somewhat undermining the price mechanism in credit markets.

For example, since the credit crunch of 1998, the BOJ has expanded its fund-providing operations using commercial papers (CP) as collateral (strategy (ii)). This move is believed to have added to the liquidity of the CP market and, in turn, led to declines in issuing costs. In addition, the BOJ has started to accept as collateral asset backed securities (ABS) since October 1999.

In the spring of 2003 the BOJ went further by its decision to purchase asset backed CPs (ABCP) and ABSs outright (again, strategy (ii)). This reflected the BOJ's perception that the markets for these instruments were still in their infancy and that they would develop further by some risk taking by the BOJ. The development of the market would allow participation by a wider range of investors and ultimately result in declines in fund raising costs for borrowers and, at the same time, in easier unloading of loans by financial institutions.

Even the ZIRP, strategy (i), may be seen to involve an attempt to contain money market risk premiums by a promise of a zero rate, therefore, the absence of liquidity concerns as long as deflation persists. In addition, the BOJ has expanded the supply of liquidity at any serious signs of financial stress since late 1998 (strategy (iii)). Increasingly, the BOJ has lent long in the money market. As of April 2001, the start of the QEP period, fund supplying operations had maturities of one to three months. In March 2005, some operations were of 11 month maturity. During the QEP period, such operations have been associated with either a rise in the target on the CAB or activation of the special clause in the policy directive, which said that the CABs can temporarily exceed the upper limit of the target range should concerns over financial stability raised liquidity demand. In addition, in some of its operations the BOJ has been taking, to varying degrees, the credit risk of counterparties or of issuers of instruments traded, as explained above. As a result, the distinction between monetary and prudential policies has become less clear.⁴ In other words, monetary policy tools near the ZLB have been

⁴ Separately, the BOJ had established a standby scheme that allows banks to sell equities they hold to the BOJ since December 2002. This again was a measure to target a soft spot in the financial system, i.e., banks' vulnerability to declines in stock prices. Banks can certainly sell stocks in the market. Given the then low liquidity of the market, however, banks may have been reluctant to sell stocks and lower prices themselves. Also, banks reportedly hesitated to sell stocks they own on a large scale in view of the

used by the BOJ partly in an attempt to ensure financial stability, and through it, price stability.

5. The Relationship Between the Literature and the BOJ's Monetary Policy

As I stated in the section 3, it is only recently that the profession has come to regard the Bernanke & Reinhart summary presented in the last section as the middle-ground view on monetary policy near the ZLB. Some very different views were initially expressed by various authors. The academic work, however, that came close to proposing at an early stage what the BOJ has been doing is Reifschneider and Williams (2000). Studying what a central bank can do in a low inflationary environment, they showed that a central bank can do better than, say, simply setting the short rate at the larger of the Taylor rule rate and zero. That is, it succeeds in delivering more economic stability by promising, following a period of deflation and a zero interest rate, to maintain a zero rate for a while even after the Taylor rule rate became positive. In a sense, the longer period of a zero rate compensates for the inability of the central bank to lower the rate into negative territory.

Similar proposals have been made by Eggertson & Woodford (2003). Woodford (1999) already made essentially the same point in which he argued that “it is unlikely that monetary policy can do much to loosen the constraint imposed by the zero bound, except by changing what people expect policy to be like after the constraint ceases to bind.” This is exactly what strategy (i) seeks to achieve. Both Reifschneider & Williams and Eggertson & Woodford advocate the use of history-dependent policies whereby, for example, a period of a zero rate after the Taylor rule rate turns positive becomes longer, the longer the Taylor rule rate stays in negative territory. Somewhat unfortunately, the BOJ's commitment is not explicitly history-dependent, except that phrases like “until deflationary concerns disappear” or “until inflation becomes stably above zero” have flavors of history dependence. We will come back to this point later.

The most pioneering work in this field, however, is a series of papers by Krugman, for example, Krugman (1998). Other works that followed can be regarded as restatements and/or refinements of the Krugman thesis. Krugman realizes that in a liquidity trap it is useless to expand base money. Even if the economy is in a liquidity trap today, however, there is a chance that, say, due to an exogenous rise in the natural rate of interest, the economy will be out of the trap tomorrow. Once the economy is out

stock issuers' fear of possible M&A type implications of the move. Stocks have been bought at the request of banks; hence, the purchases have not been used as an instrument of liquidity supplying operations by the BOJ.

of the trap, a higher supply of base money raises the price level. Thus as long as the probability of the economy escaping the trap tomorrow is non-zero, a promise today to increase base money permanently may raise inflation expectations. A higher supply of money will actually affect the expected price level only when it is at, or it is promised to be raised to, unnecessarily high levels. The essence of this argument may be seen to be the same as that of Reifschneider and Williams. One is presented in terms of money, and the other, in terms of the interest rate—two sides of the same coin. In fact, Krugman (1998) argues that “if one views monetary policy in terms of nominal interest rates, a credible commitment to inflation can seem to be a pure bootstrap policy; interest rates need never fall; all that is required is a promise not to raise them when the economy expands and prices begin to rise.” Auerbach & Obstfeld (2005) make a similar remark about the importance of increasing base money permanently. To repeat, these authors essentially advocate the use of strategy (i), expectations management, rather than strategy (iii), expansion of base money.

The BOJ started its ZIRP in April 1999, i.e., before the Reifschneider and Williams paper or the Woodford paper appeared. Thus, the ZIRP was not presented as clearly as in these works, especially relative to the Taylor rule. The resemblance to the Krugman proposal, however, was noted at a very early stage. For example, Ueda (1999) pointed out that “our stance is close to the one advocated by Paul Krugman. He argues in one of his recent articles that to achieve his recommendations, all one needs is to promise not to raise rates even if the economy starts to recover so long as the recovery is weak.”

Thus, it is fair to say that the BOJ has been the first central bank to practice a version of strategy (i) as advocated by these authors. One weakness of the BOJ approach was that the absence of the announcement of the target rate of inflation made the degree of commitment ambiguous. The BOJ exited from the ZIRP in August 2000 after a tough discussion as to the appropriateness of timing. One cannot escape from the impression that the absence of an inflation target made the discussion confusing.

To summarize, the BOJ did not adopt the ZIRP at the recommendation of a particular group of academic economists or by reference to their work. After the inception of the ZIRP, however, it quickly realized the similarity of the policy to what Krugman was advocating. Unfortunately, this similarity was left unnoticed by many academic economists, some of whom continued to recommend that the BOJ adopt a “bold” approach to end deflation. The lack of healthy dialogue between the BOJ and academia at an early stage seems to have been partially due to the vagueness of the

BOJ's approach, but equally to Krugman's exposition of strategy (i) in terms of the quantity of money rather than of the interest rate. Some people misunderstood the Krugman proposal to be advocating strategy (iii) rather than strategy (i).⁵

6. The Effects of the BOJ's Monetary Policy

The Effects of Strategies (i)-(iii)

Let us provide a brief overview of the literature that has tried to estimate the effects of the BOJ's recent monetary policy. First, some authors have tried to estimate the effects of the most important element of the recent BOJ's approach, i.e., expectations management, on the yield curve and the economy. This literature includes Oda & Kobayashi (2003), Bernanke, Reinhart and Sack (2004), Baba et al (2005), Oda & Nagahata (2005) and Oda & Ueda (2005). All these papers use a macro-finance approach to estimate the effects of the ZIRP on the term structure of interest rates.

As we discussed above, whether the ZIRP has affected expected future short-term interest rates is a subtle question than it first appears. Even without any commitment from the central bank, the market normally forms expectations about future monetary policy stance, i.e., the path of short rates. An expectation of deflation naturally leads to lower expected future short rates. Thus, one needs to show that the ZIRP have affected market's expectations over and above such natural response of the market to the economy. The above literature makes an explicit assumption about the market's perception of future monetary policy and estimates the levels of interest rates in the absence of ZIRP. Such estimates then provide a benchmark against which to gauge the effects of the ZIRP.

In Oda & Ueda (2005) they use a macro-finance model that combines a small macroeconomic model with a finance theory approach to the determination of risk premiums on long-term government bonds. The model consists of an aggregate demand and supply equations and a monetary policy rule. The policy rule determines the short-term interest rate, while aggregate demand is dependent on a moving average of past short-term interest rates. In the absence of commitment, the monetary policy rule is set to be a modified Taylor rule that incorporates slow policy adjustment and the zero bound constraint on interest rates. That is, the short rate is explicitly assumed to be nonnegative. The BOJ's commitment to maintain a zero short rate until consumer price

⁵ As discussed in the previous section, the transmission channel (b) of strategy (iii) achieve something close to what strategy (i) tries to do. It seems fair to say, however, this use of strategy (iii) merely strengthens the effectiveness of strategy (i), rather than having an independent effect on asset prices. Empirical evidence reported in the next

inflation becomes positive (the ZIRP) is modeled as maintenance of a zero rate until inflation exceeds a small positive number (henceforth, the threshold rate.) They assume that the threshold rate is variable over time and let the data determine its time path.⁶ The model is estimated by the maximum likelihood method using data from 1980:Q1-1999:Q1, that is, the data from the pre-ZIRP period.

They next assume that the estimated coefficients stayed the same after 1999:Q2 and carry out simulations that gauge the impact of the ZIRP. Aggregate demand and supply curves contain demand and supply shocks, respectively. These shocks generate uncertainties concerning future short rate movements through the policy rule. The levels of long-term interest rates that contain resulting risk premiums are a function of the time-varying prices of the two risks and the threshold rate that determines the degree of the commitment effect. Given a set of these parameter values, Monte-Carlo simulations are done to derive the term structure of interest rates. Parameters of the model are chosen so that the term structure of interest rates thus derived matches best with the data. They then calculate the expectations component of interest rates by running the simulations again at chosen values of the parameters, but by assuming that people are risk neutral. The difference between the actual and the estimated expectations component is the risk premium component of interest rates.

In order to see what would have happened in the absence of the ZIRP, they run simulations again for the period after 1999:Q2, but with the modified Taylor rule replacing the ZIRP. The differences between the simulation results with the ZIRP and the modified Taylor rule are their estimates of the effects of the ZIRP on the term structure of interest rates.

Figure 2 compare the estimated levels of interest rates with and without the zero rate commitment. The figure presents the results for the expectations theory component. By looking at the figure, we find evidence of the effects of the ZIRP on expected future short rates. The expectations component of the rates is lower with the commitment at all maturities. The differences between the two cases have been larger since the third

section is consistent with such an interpretation.

⁶ An alternative would be to assume that the threshold rate is fixed. This is probably closer to what the BOJ has been saying. Given that the ZIRP was the first implementation of such a policy framework, however, the market's perception about the precise nature of the framework seems to have evolved over time. Under the RZIRP, the nature of the commitment has become more precise. The commitment to maintain ample liquidity supply until inflation becomes positive on a sustained basis must mean that the threshold rate is positive rather than strictly zero. The October 2003 change in the commitment to include a reference to expected inflation may have raised the threshold rate, although explicit formulation of the policy framework since then requires slightly different modeling. Needless to say, what is estimated as a change in the threshold rate may reflect a change in other parameters of the model that are not allowed to vary in this analysis.

quarter of 2002. In year 2003 expected future short rates without the zero rate commitment went up sharply probably in response to improving economic conditions. But the commitment can be seen to have contained the increases to a significant extent. In general, the ZIRP implies a promise to maintain a zero rate for a while even after the modified Taylor rule rate has turned positive. Thus, the difference in expected three year rates, say, between the modified Taylor rule and ZIRP is small if the Taylor rule rate is expected to remain negative for three years or more. It becomes larger as investors start to price in the possibility of the Taylor rule rate turning positive within three years. If the commitment is believed to produce a temporary period of higher inflation rates further into the future, the difference in rates at the ten year horizon, say, could be smaller than at the three year horizon. This may have been the situation in 2003 as can be seen in the figure.

In any case, it is at least clear that the ZIRP has produced strong effects on the expectations theory component of interest rates over and above those the combination of the modified Taylor rule and the stagnant economy have generated. The effects of the commitment on the risk premium component are much smaller. But the authors find some such effects on three to five year rates.

The authors also examine whether or not other aspects of the QEP, purchases of JGBs and/or expansion of the CAB target, have had any effects on interest rates. They fail to find any significant effects of the BOJ's purchases of JGBs on either the expectation or risk premium component of interest rates. In contrast, they find some evidence that the expansion of the target levels of the CABs have reduced the levels of the expectations component of interest rates. The interpretation of this result is not straightforward. One interpretation would be that increases in the target on the CAB provided a signaling effect as to the willingness of the BOJ to make stronger commitment to a zero rate (channel (b) of strategy (iii)). It is also possible that other communication channels such as the governor's comments in press conferences that came out at the same time as the announcement of the changes in the target have been the driver of the effects found. Or else, indicators pointing to economic weakness may have led the market to raise the threshold rate, on the one hand, and, on the other, the BOJ to increase the target on the CAB. Unless the first interpretation is correct, the correlation they have found is a spurious one.

In a separate work Bernanke, Reinhart and Sack (2004) also try to analyze the effects of the BOJ's policy on interest rates, using a macro-finance approach. In the event study analysis they carry out, they find that the BOJ has not been using policy statements in a strategic manner to affect market expectations. As they admit, however,

this may be due to a small sample size problem. In the same analysis they also find statistically significant links between the BOJ's purchases of JGBs and JGB yields on the one hand, and between the QEP and stock prices, on the other.

In addition, Bernanke, Reinhart and Sach estimate a benchmark term structure model to look at the effects of the ZIRP and the QEP on interest rates. There is also a macro-finance model in which the prices of risks of underlying factors are estimated based on the no-arbitrage assumption. Although their model does not take into account the ZLB constraint, they carry out simulations using the estimated model to predict the term structure of interest rates under the assumption that investors take into account the ZLB constraint. The simulations assume that investors demand higher yields on bonds as rates approach the ZLB because there are smaller chances of capital gains. Interestingly, the predicted yield curves lie above the actual yield curves after 1999. The deviation of the predicted from actual, however, narrows in November 2000 after the termination of the ZIRP, and widens again in June 2001 with the introduction of the QEP.

The Effects of Attempts to Target Soft Spots in the Financial System

In contrast to the above, there has been less analysis of the prudential policy aspect, as surveyed in section 4, of what the BOJ has been doing. Yet, some authors have looked at the effects of the BOJ's policies on risk premiums.

For example, Baba, Nakashima, Shigemi and Ueda (2005) have looked at the relationship between the BOJ's monetary policy and risk premiums banks pay in the money market. Specifically, they have analyzed movements over time of the dispersion of NCD (negotiable certificates of deposits) rates banks pay. As shown in Figure 3, the dispersion rose to very high levels during the period of a financial crisis in 1997-1998, declined sharply during the ZIRP period, rose somewhat at the termination of the ZIRP, and declined again during the QE period to a level lower than that during the ZIRP period. They also show that the decline in the dispersion cannot be fully attributed to improvements of credit standings of Japanese banks after 1999.

Consequently, the BOJ's monetary policy seems to have lowered the risk premiums demanded of banks in the money market. The exact mechanism by which monetary policy lowered the dispersion of money market rates needs to be studied further. It is quite likely, however, that the ZIRP, by its promise to keep a zero rate until deflation ends, has brought down concerns over liquidity availability and thus lowered risk premiums. The further decline in the rate dispersion during the QEP period indicates the role played by increased quantity of base money. Whether it is purely a

result of large excess reserves, or of some targeted asset purchases carried out during the period is difficult to determine. An example of the latter would be the very long-dated fund supplying operations carried out during the period. As of April 2001, the start of the QEP period, fund supplying operations had maturities of one to three months. In March 2005, some operations were of 11 month maturity. Such lengthening of the tender of operations seems to have had some direct effects on money market interest rates.

Baba *et al.* (2005) have looked at spreads on CPs and corporate bonds during the period and compared them with those in the U.S. today and back in the 1930s. It is interesting to point out that the U.S. in the 1930s also witnessed some short-term interest rates falling to near zero levels. For example, the TB rate was virtually zero in the mid 1930s. The authors find that the spreads in today's Japan are much lower than those in the U.S. today or in the 1930s. They do not go on to discuss the reason for this finding. The BOJ's massive operations in CPs, however, must have had a significant impact on their yields—use of strategy (ii). The BOJ has not purchased corporate bonds directly. Hence, any effect the BOJ's policy may have had on corporate bond spreads must have been spillover effects from declines in yields on instruments the BOJ has had more powerful influence on such as JGBs. In any case, with the exception of 1998, prohibitively large increases in risk premiums in the money and bond market seem to have been avoided.

The results of the works surveyed in this section do not match one for one, but they seem to be in broad agreement that the commitment channel contained in the ZIRP, strategy (i), has been effective since 1999. The commitments made by the BOJ have affected expected future short rates and, as a result, current medium- to long-term rates on government bonds. There is some evidence that liquidity expansion may have strengthened the commitment channel and/or affected stock prices. It may also have led to declines in risk premiums in the money market. Evidence is mixed on the effects of targeted asset purchases on asset prices, especially so, on the relationship between purchases of long-term government bonds and bond yields. There is evidence that the BOJ's attempts to contain risk premiums in the financial system have had some success, especially in terms of reducing risk premiums in the money market.

7. Limitations of the Measures Adopted

Despite evidence of the presence of the effects of the BOJ's monetary policy on the economy as surveyed in the last section, casual observation suggests that these

effects have not been as large as one would have hoped. After all, the economy is still in deflation at the time of the writing of this article. It has shown signs of improvement since the middle of 2003; it remains to be seen, however, whether these improvements are self sustainable, leading inflation into positive territory. Let us discuss here some possible reasons behind the limited power of the BOJ's policies to stimulate the economy.

The discussion will be divided into two parts. First, I discuss some of the essential difficulties associated with the expectations management approach, the core component of the BOJ's policy during this period. Second, I turn to the review of how financial sector problems have limited and affected the BOJ's policy measures during the period.

Problems with Expectations Management

The approach to managing or shaping expectations of future monetary policy as described above has its own limitations. First, it requires forces other than monetary policy to lift the economy out of the liquidity trap. This is evident in our presentation of the Krugman framework. Should the probability of the economy getting out of the liquidity trap tomorrow be zero, a promise of a higher money supply will do no good. This means that, depending on what will happen to exogenous shocks, or in other words, to the natural rate of interest, the economy under strategy (i) could be stuck at a zero interest rate for an embarrassingly long period of time. The problem would be even more serious with a strong history-dependent rule. The BOJ has been essentially unable to exit from the ZIRP for more than 6 years.⁷ Needless to say, however, the situation would have been worse if the BOJ had followed a simple Taylor rule type policy.

The second serious problem with the expectations management approach is that it may not be time consistent. This is again clear in our presentation of the Krugman proposal. It is a promise of monetary expansion when the economy is out of the liquidity trap that generates easing effects. A central bank, however, that finds that the economy is out of the trap may not want to carry out the promised monetary expansion. In other words, a central bank that uses the approach needs to commit to a higher inflation target than usual, or accept the risk of inflation temporarily overshooting the target. In either case, the central bank has an incentive to renege on its promises. Some may want to point to the August 2000 termination of the ZIRP as an example of such difficulties.

The above two problems combined generate a further problem when the terms of

⁷ I mean with the exception of the August 2000-March 2001 period.

policy board members are finite. For example, in the BOJ case the terms are five years. If a policy like the ZIRP involves a strong commitment about policy instrument for a period longer than five years, and if the policy had an element of time inconsistency, it raises obvious problems. M. King (2004) discussed a similar problem by saying that whether or not collective decision making today can bind those of future decision makers is a difficult question. Needless to say, this problem is mitigated by staggering the appointments of board members. People, however, seem to have weak memories of, and attachment to, measures that they did not directly vote for.

It remains to be seen how serious these issues will be for the BOJ in its fight against deflation. After all, in order to mitigate the difficulties generated by these problems, the BOJ's current commitment includes a fairly specific set of necessary conditions for an exit from the QEP—actual core CPI inflation needs to become positive on a sustained basis and inflation forecasts of board members also need to become positive.

Banking Sector Problems and Monetary Policy

We have pointed out that severe banking problems have lowered the effectiveness of the BOJ's monetary policy during the period. To be sure, declines in bank loans have partially been a result of the weakness of the economy, but they have also been due to the balance sheet problems of lenders and borrowers caused mainly by decreases in asset prices. This mechanism has acted as a negative financial accelerator. That is, declines in land and stock prices and the weak economy led to a vicious cycle, through their effects on the balance sheets of lenders and borrowers.

As I have discussed in this paper, the BOJ has naturally tried to alleviate financial sector problems using various options available. Many of the measures adopted, strategies (i)-(iii), have had the dual role of generating favorable monetary policy effects and of containing financial sector problems. As we saw in the last section, risk premiums, especially, in the money market, have declined to very low levels. Thanks partially to these efforts, the repeat of the 1998 type credit crunch has been avoided.

Despite the containment of risk premiums in the bond market, the sense that many firms were credit constrained remained. In order to understand this, one needs to understand the segmented nature of the Japanese credit market. During most of the period under discussion, banks continued to lend to companies with good credit standing. The corporate bonds market for these borrowers has also existed and spreads have not risen to prohibitive levels. Essentially, these borrowers have not faced serious credit constraints except for 1997-1998.

Other than this segment of the financial system, there has not been much new lending. The bond market for firms with ratings below BBB has not existed. Nagahata and Sekine (2002) present evidence that the balance sheet problems have exerted significant negative effects on the investment activities of companies that do not have access to the bond market, that is, small and medium sized companies. Capital limitation has made it difficult for banks to fully realize loan losses. As a result, the secondary market for loans has not developed much.

The BOJ's easing as we have reviewed in this paper did have the effect of lowering, or containing the rise in, risk premiums in relatively sound parts of the financial system. Such declines in risk premiums in the money and bond markets, however, have not led to risk taking elsewhere, i.e., to increased bank lending to those borrowers who have not had access to the open money and capital markets. Instead, funds that have left the Japanese money and bond markets have been invested in relatively safe instruments such as U.S. treasuries, with the currency position hedged. In this sense, the BOJ's operations have not been able to address fully the problems in the weakest parts of the financial system, or their ability to generate easing effects has been constrained by the latter. Things would have been different had Japan possessed more developed open capital markets. It seems fair to say, however, the measures adopted by the BOJ as discussed here have at least had the effect of preventing the meltdown of the financial system and an associated acceleration of the deflation of general prices.

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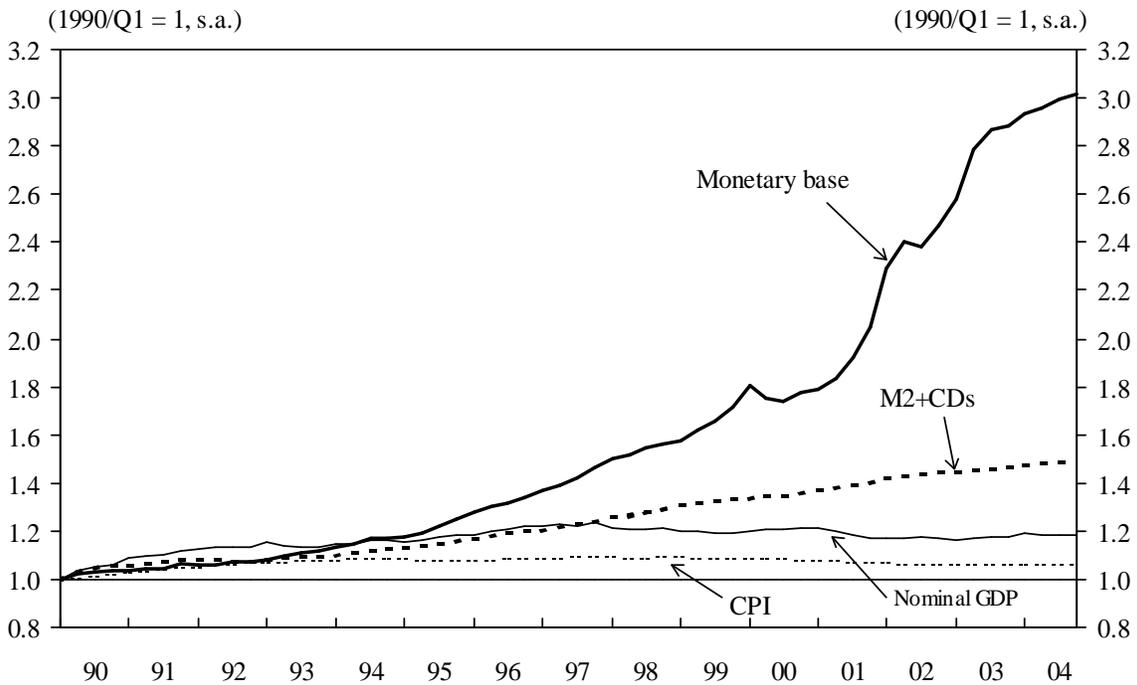
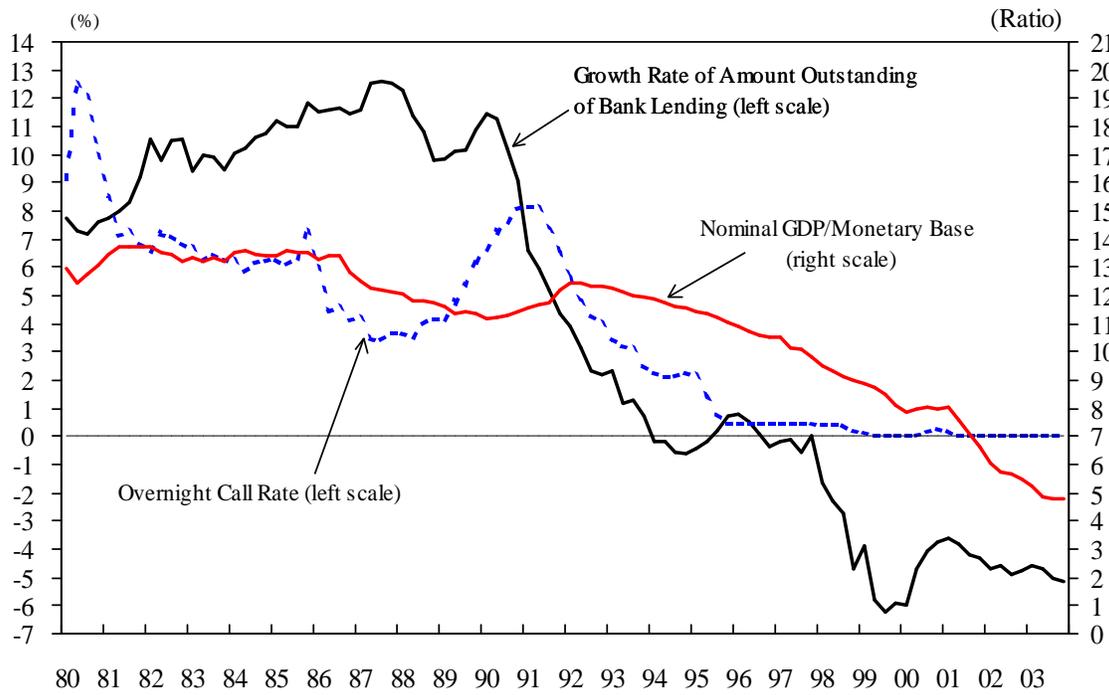
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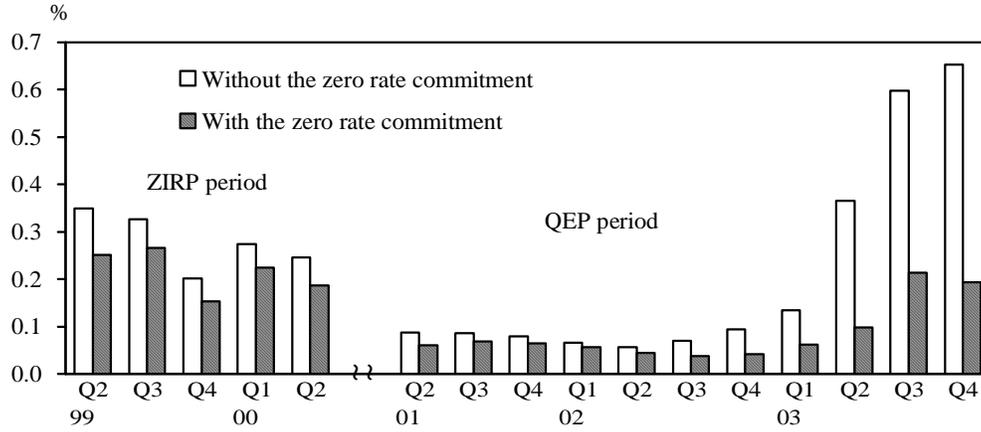
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Figure 1: Monetary Indicators, Economic Activity and Price Development

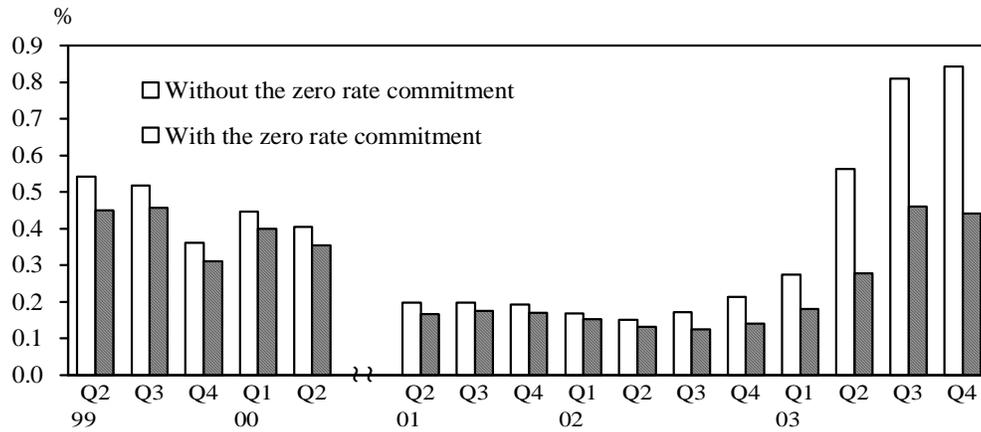


**Figure 2: Expectations Theory Components of Medium / Long-term Interest Rates
Effects of the Zero Rate Commitment**

(i) Three-year interest rate



(ii) Five-year interest rate



(iii) Ten-year interest rate

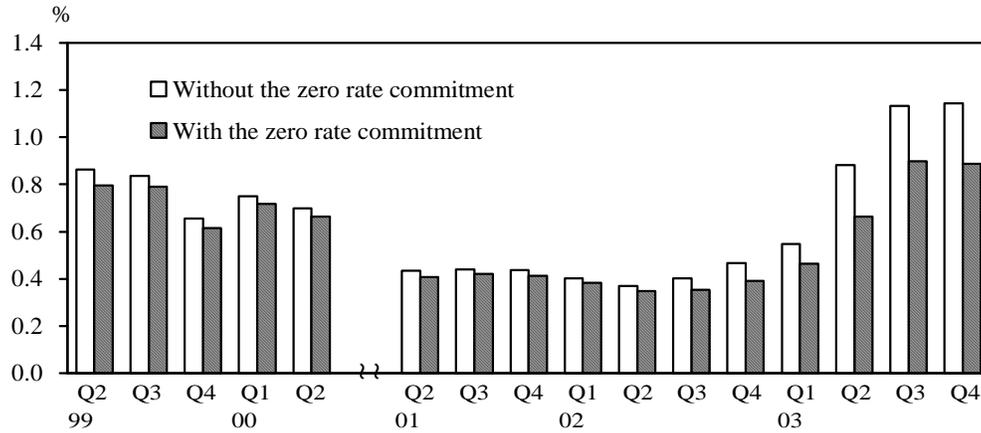
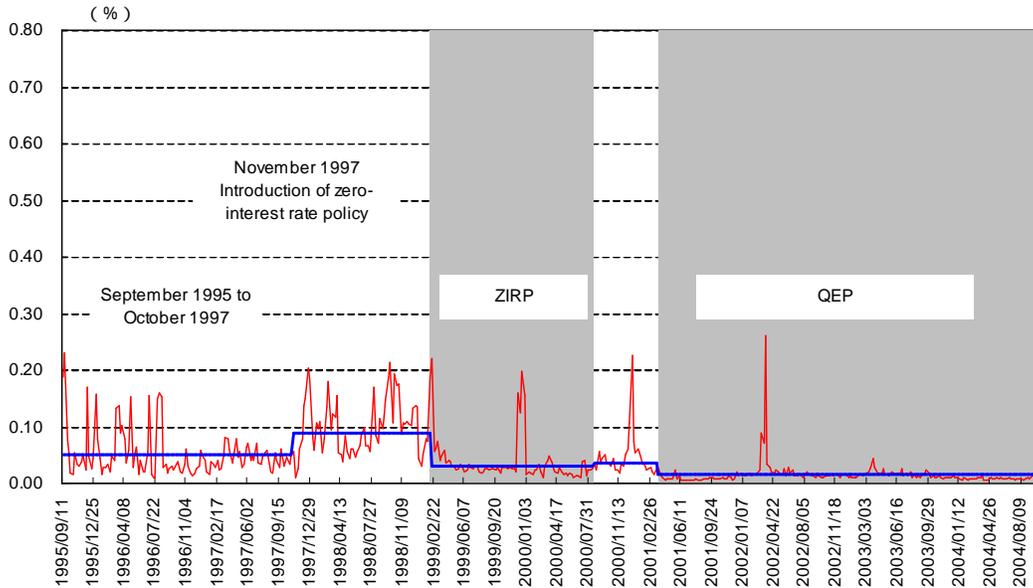


Figure 3: Dispersion of Interest Rates on Newly Issued NCDs among Major Banks



Footnote for Chart 3

Notes: 1.

The above data are for the following major city banks, long-term credit banks, and trust banks for which weekly data are available throughout the above periods: Sumitomo Mitsui Banking Corporation, the Bank of Tokyo-Mitsubishi, UFJ Bank, Resona Bank, Shinsei Bank, Aozora Bank, the Mitsubishi Trust and Banking Corporation, the Sumitomo Trust & Banking, Mizuho Trust & Banking, UFJ Trust Bank, and the Chuo Mitsui Trust and Banking Company. Data for Fuji Bank and Mizuho Bank are excluded, as a large portion of their NCDs were issued to local governments. For Sumitomo Mitsui Banking Corporation prior to its merger, data for the former Sumitomo Bank are used.

Note: 2.

The following periods are considered to be “event periods” and data for these periods are excluded from the calculation: (1) the end of 1999 (Y2K problem); (2) the end of 2000 (preparation for the introduction of Real Time Gross Settlement); (3) the end of fiscal 2001 (the partial removal of blanket deposit insurance). When there are missing data for a given bank in a calculation period, that bank is excluded from the calculation.