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How Should the Recent Increase in Japan's Monetary Base Be Understood?*

Introduction

Monetary base is the quantitative monetary indicator which represents the amount of currency supplied by a central bank. In Japan, it is composed of the current account balances held at the Bank of Japan (the Bank) and cash in circulation.

The rate of increase in Japan's monetary base started to rise from the second half of 2001, reaching some 30% year-on-year in March-April 2002, the highest rise since the first oil shock (Chart 1). As a result, the ratio of monetary base to nominal GDP has increased to 17%, the second highest figure in about 100 years (since 1900) next to the Second World War period (Chart 2). Internationally, the ratio of monetary base to nominal GDP (average 14%, during 2001) is now twice as large as that of the United States (6%) and the Euro area (7%) (Chart 3).

This high increase rate in monetary base has been realized by increases in both the current account balances held at the Bank and cash in circulation (Chart 4). The Bank changed the main operating target for money market operations from the uncollateralized overnight call rate to the outstanding balance of the current accounts held at the Bank in March 2001, and since then has raised the target level of current account balances several times.[1] On the other hand, the rate of increase in cash in circulation started to rise gradually from the second half of 2001, and since the beginning of 2002 has been posting year-on-year rises of over 10%.

Thus, currently, Japan's monetary base continues to rise at a very high tempo. A high rate of increase in monetary base is normally accompanied by a high rate of increase in money stock, high inflation, and high nominal economic growth (Chart 1(2)). But, at this time, such relationships cannot be observed. Bearing this in mind, this paper explains the basic nature of monetary base and the factors behind its movements.

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* This is an English translation of the Japanese original paper released on August 2, 2002. Opinions presented here are based on data and information available when the original was written.

[1] The operating target of the outstanding balance of the current accounts held at the Bank has been raised from 5 trillion yen (March 2001), to 6 trillion yen (August), to above 6 trillion yen (September), and finally to 10-15 trillion yen (December). In addition, in February 2002, the Bank decided its basic direction, namely, 'for the time being, to secure the financial market stability towards the end of a fiscal year, the Bank will provide more liquidity to meet a surge in demand irrespective of the target of current account balances, around 10 to 15 trillion yen', though the target amount remained unchanged.

Summary

Monetary Base

- **Monetary base is generally defined as 'all central bank liabilities to the financial corporations and other sectors'. In Japan, it is the quantitative monetary indicator which represents 'the amount of currency supplied by the Bank of Japan (the Bank)' and consists of the current account balances held at the Bank (accounting for 10-20%) and cash in circulation (banknotes and coins, 80-90%). These two components share the common features: (i) both are currency with the highest liquidity (convenience as a method of payment); (ii) both are liabilities of the Bank or the government; (iii) both are supplied through the Bank; and (iv) neither bear interest rates.**
- **In supplying monetary base, the Bank purchases financial assets with relatively lower liquidity in exchange. In other words, the supply of monetary base does not mean 'the supply of income, ' but 'the supply of liquidity'.**
- **The recent rate of increase in monetary base is the highest since the first oil shock. As a result, the ratio of monetary base to nominal GDP is now the second highest figure in the last 100 years, following the Second World War period. In order to understand such a phenomenon, it is useful to divide the whole period into two sub-periods: one of short-term interest rates significantly above zero and one of nearly zero short-term interest rates.**

Current Account Balances at the Bank

- **During a period when the Bank guides short-term interest rates to a level significantly above zero, the current account balances held at the Bank are almost equivalent to required reserves, which are legally required to be held by financial institutions subject to reserve requirements. This is because, required reserves are sufficiently large, and as a result, liquidity in excess of such required reserves is not usually demanded unless interest rates are extremely low.**
- **On the other hand, during a period of nearly zero short-term interest rates, the Bank can realize current account balances exceeding required reserves. In fact, after adopting the current account balances at the Bank as the main operating target in March 2001, the Bank raised its target amount several times with the result that the outstanding balance of the current accounts at the Bank has greatly increased. The fact that the Bank was able to increase the provision of massive amount of funds implies that there was corresponding demand for such funds on the part of financial**

institutions. The decline in short-term interest rates, which arose from an ample fund provision, and various expansions of fund provision methods by the Bank contributed to the increase in demand for current account balances. Also, precautionary demand for liquidity increased following the September 11 terrorist attacks and uncertainty over financial system. In addition, under extremely low interest rates, many market participants stopped dealing funds and started holding excess reserves because they could not obtain sufficient returns in the money market when taking into account transaction costs. The situation of a fund surplus has become the usual condition, and this tendency has been strengthened due to inactive funds transactions. This contributed to the phenomenon whereby, once the current account balances at the Bank increased, they did not tend to decrease even after direct causes disappeared.

Cash in Circulation

- **Demand for cash is usually affected by interest rate and transaction levels. In daily operations, the Bank passively pays or receives cash according to demand determined by economic transactions. However, over the medium and long term, the determinants of demand for cash (interest rates and transaction levels) are influenced by monetary policy.**
- **Since the beginning of 2002, the year-on-year rise in cash in circulation has been over 10%. Background to this phenomenon is a drop in deposit rates to nearly zero and fewer customer visits to deposit at banks, avoiding transaction costs. In addition, the partial removal of blanket deposit insurance (for time deposits, etc.) in April 2002 heightened the relative attractiveness of holding cash by slightly raising the risk premium on deposits, which is recognized by economic agents (households, firms, etc.), and by lowering risk-free deposit rates excluding premiums.**
- **Under nearly zero interest rates, the slope of the cash demand curve has become flatter. Therefore, the decrease in deposit rates and change in recognition of risks have shifted a part of funds from deposits to cash, contributing to a big increase in the growth rate of cash, even though each change itself was small.**

Money Multiplier

- **The ratio of money stock to monetary base is termed the 'money multiplier,' and it is often used to argue the influence of monetary base on money stock. The money multiplier depends on the ratio of current account balances at the central bank to bank deposits, and the ratio of cash to bank deposits. These ratios are determined**

from portfolio selection by economic agents, and such selection is determined especially by the levels of interest rates.

- **Since March 2001, while the increase tempo of monetary base has significantly accelerated, the increase in money stock has been limited and the money multiplier has shrunk considerably. This is because, under nearly zero interest rates, both the ratio of current account balances at the central bank to bank deposits and the ratio of cash to bank deposits tend to fluctuate sharply, as the above explanation of the current account balances at the Bank and cash in circulation shows. In such an environment, the relationship between monetary base and money stock becomes unstable and highly uncertain. It should be noted that further multi-faceted investigation is needed in order to analyze the relationship between monetary base and economic activity.**

1. Basics of Monetary Base

1.1 Definition of Monetary Base

According to "Monetary and Financial Statistics Manual" of IMF (International Monetary Fund), monetary base is conceptually defined as 'all central bank liabilities to the financial corporations and other sectors (excluding central government holdings of central bank liabilities other than currency)'.[2] Monetary base is sometimes called 'base money' or 'high-powered money'. In compiling monetary base statistics, specific components are not necessarily standardized due to institutional differences between countries. In Japan, monetary base is the sum of the current account balances at the Bank of Japan (the Bank), which are held by banks, securities companies, etc., and cash in circulation, which is composed of banknotes in circulation and coins in circulation held by economic agents other than the Bank (Chart 5), and it is the indicator of 'currency supplied by the Bank'.

monetary base = current account balances at the Bank + banknotes in circulation + coins in circulation

(69.3 trillion yen) (6.4 trillion yen) (58.8 trillion yen) (4.1 trillion yen)

cash in circulation

Note: Figures in parentheses are average outstanding balances in 2001.

The outstanding balance of monetary base of 69.3 trillion yen in 2001 breaks down as 6.4 trillion yen in the current account balances held at the Bank (9.2% of monetary base), 58.8 trillion yen in banknotes in circulation (84.4%), and 4.1 trillion yen in coins in circulation (6.0%).

Current Account Balances at the Bank Current account balances at the Bank are the outstanding balance of current accounts held by financial institutions which have contracts for current account service with the Bank (655 institutions as of end-March 2002). Many of these institutions are depository financial institutions, such as banks and *shinkin* banks, but some non-depository financial institutions, such as securities companies and money market brokers, also have current account balances at the Bank (Chart 6). Not all depository financial institutions have such contracts with the Bank, for example, agricultural cooperatives and labor banks do not.

[2] International Monetary Fund, "Monetary and Financial Statistics Manual," 2000, p.65.

Among depository financial institutions, banks, *shinkin* banks with over 160 billion yen deposits, and *Norinchukin* bank are legally subject to the reserve requirement system. These financial institutions subject to reserve requirements are legally obliged to hold a fixed portion (the reserve requirement ratio) of liabilities (deposits, etc.) as deposits at the Bank. These are normally held as current account balances at the Bank.

Previously, among current account balances at the Bank, only reserve balances held by institutions subject to reserve requirements were included in monetary base statistics, but the definition was changed to its current one in May 2000.[3] This was because, under the so-called 'zero interest rate policy' which started in February 1999, the current account balances held at the Bank by financial institutions not subject to reserve requirements (account holders at the Bank except institutions subject to reserve requirements) had increased (see in **3.1.1**), and the use of the current account balances held at the Bank including their holdings has become more appropriate as the indicator of 'currency supplied by the Bank'. The share of current account balances at the Bank in monetary base has increased following the adoption of 'quantitative easing', reaching about 20% since the beginning of 2002.

Cash in Circulation Cash in circulation comprises banknotes and coins, including amounts held by financial institutions. Banknotes account for about 80-90% of monetary base and determine its overall movement. Coins in circulation are those issued by the government and supplied to the economy through the Bank's windows, so coins held by the Bank are not included. Coins in circulation are not liabilities of the Bank, but in Japan are included in monetary base.[4] The share of coins in circulation in overall monetary base is less than 10%.

1.2 Common Features of Monetary Base Components

The components of monetary base in Japan, the current account balances held at the Bank, banknotes, and coins, have the following features in common:

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[3] Figures before March 1981 represent 'reserve balances + coins in circulation + banknotes in circulation'.

[4] Banknotes and the current accounts held at the Bank are consistently treated as liabilities of the Bank in financial reports of the Bank and various statistics, but coins are treated differently according to statistics. For example, in 'the Japanese Government Balance Sheet' prepared by the Ministry of Finance, issued coins (the sum of coins in circulation and coins held by the Bank) are treated as liabilities of the government. On the other hand, in System of National Accounts (SNA) and Flow of Funds Accounts, while coins in circulation are treated as liabilities of the government, they are also treated as liabilities of the Bank. This means that these latter statistics regard coins in circulation as liabilities of the Bank to the government, and at the same time they also regard the same amount of credits of the Bank to the government in order to treat all cash in circulation as liabilities of the Bank.

They have the highest liquidity. Current account balances at the Bank and cash are in use against the background of nationwide credibility, and their acceptance is never refused as a method of payment. In particular, cash has legal validity. Thus, monetary base has the highest liquidity in that it has outstanding convenience as a method of payment.

They are debts of the Bank or the government. Both current account balances at the Bank and banknotes are liabilities of the Bank. Also, coins issued by the government are liabilities of the government. Therefore, each component of monetary base bears no default risk.

They are supplied through the Bank. Each component of monetary base is supplied through the Bank's windows[5], never by other institutions. In this sense, the Bank is the monopolistic supplier of monetary base.

They bear zero interest rates. Neither component of monetary base in Japan bears interest.[6] In general, financial assets which boast convenience as a method of payment and have high liquidity are in demand even under low interest rates. The fact that monetary base, except the 'required reserve' which must be held by law, is generally in demand despite zero interest rates evidences that monetary base has the greatest liquidity of any financial asset.

In order to better understand the above characteristics, it is useful to compare monetary base with other financial assets. When considering money stock as an alternative financial asset, these two assets differ as follows:

Nature as Currency M2+CDs, the representative indicator of money stock, is composed of cash currency in circulation, deposit money (current deposits, ordinary deposits, etc.), quasi-money (time deposits, etc.), and CDs (certificates of deposit). Among these, since cash currency in circulation is part of monetary base, its liquidity is the same as monetary base. However, with respect to the other components, liquidity is different. That is, current deposits, which form part of deposit money, are available for drawing checks, and ordinary deposits are very convenient as a method of payment since, for example, they can be used for withdrawing public utility charges or for paying salaries. On the other hand, while quasi-money and CDs have the nature of currency in that they can be easily turned

[5] Clause 2 of Section 4 of 'Law Concerning the Unit of Currency and the Issuance of Coins' provides that 'the issue of coins is effected by granting produced coins to the Bank of Japan, under order of the Minister of Finance'. Therefore, when coins are provided to the economy, they must be supplied through the Bank's windows.

[6] In the Euro area, required reserves, which comprise a portion of the current accounts at the central bank, bear interest rates. This is different from Japan's case.

into cash or deposit money, they are inferior in liquidity to cash currency in circulation and deposit money since they cannot be used as a method of settlement .

Debtors/Suppliers of Monetary Base Deposit money, quasi-money, and CDs, components of money stock other than cash currency in circulation are the liabilities of depository financial institutions and are different from monetary base in that they are supplied through the windows of each financial institution. The Bank and depository financial institutions are the providers of money stock (Chart 6). Thus, the number of suppliers of money stock is greater than monetary base, and the outstanding balance of money stock (M2+CDs) is 647.1 trillion yen (2001 averaged), about nine times larger than that of monetary base.

On the other hand, in defining currency by holder, there is no restriction as to who can be a holder of monetary base. However, holders of money stock are defined as individuals, business firms, local governments, and local government enterprises/corporations. So, they do not include depository financial institutions or non-depository financial institutions (insurance companies, etc.) (Chart 7). Therefore, cash held by these financial institutions is a part of monetary base, but is not part of money stock. Also, the current account balances held at the Bank are not a component of money stock.

With or Without Interest Rate Among the components of money stock, current accounts supplied by private financial institutions do not carry interest rates, but other deposits do, in principle. In particular, time deposits have higher interest rates than ordinary deposits. These interest rate differences mainly reflect the difference in liquidity among each kind of deposit.

It is necessary to note that the above characteristics are not necessarily specific to monetary base. Depending on the economic environment, the level of similarity to other financial assets can vary, and the concept and the definition can differ according to each country's situation. For example, short-term Japanese government securities do not work as currency, and differ from monetary base in that they bear interest. But, short-term Japanese government securities can easily be turned into currency, and are highly liquid. In addition, the interest rate is nearly equal to zero (1-year treasury bills are mostly under 0.01%). Thus, the similarity of monetary base and short-term Japanese government securities has heightened.

2. Supply of Monetary Base

In supplying monetary base, the Bank obtains financial assets with relatively lower liquidity in exchange. In other words, the supply of monetary base by the central bank does not mean

'the supply of income' like 'dropping money from helicopters' but 'the supply of liquidity'.

A concrete image of the supply of monetary base by the Bank is shown in 'Monetary Base and the Bank of Japan's Transactions' statistics published by the Bank. These statistics are derived from rearranging items on the Bank's balance sheet.[7] There are many items representing the Bank's various transactions, but in order to obtain an overall image, items here are categorized into four: 'Outright purchases of Japanese government bonds (JGBs)', 'Short-term operations', 'Loans', and 'Transactions with the government and others.' (Chart 8). Among these, 'Outright purchases of JGBs', 'Short-term operations', and 'Loans' are transactions with financial institutions for the purpose of money market operations, etc. by the Bank. On the other hand, 'Transactions with the government and others' summarizes transactions between the Bank and the government, for example, the government's deposits to the Bank and the Bank's underwriting of FBs (financing bills) [8].

Chart 8 (2) is a conceptual chart of the Bank's balance sheet and shows the correspondence between monetary base and the above four categories. For example, if the Bank purchases JGBs, it results in an increase in monetary base. Given that other conditions stay the same, 'Transactions with the government and others' results in an increase of monetary base if the asset side of the balance sheet (e.g. underwriting of FBs) increases, but results in a decrease of monetary base if the liabilities side of the balance sheet (e.g. government deposits) increases.[9]

Chart 9 (1) shows fluctuations in transactions regarding monetary base and the above four categories since 1997. While 'Outright purchases of JGBs' has steadily increased, with the outstanding balance corresponding to more than half of monetary base, 'Short-term operations' was mainly used to adjust short-term fluctuations like seasonal fluctuations. However, even in the period when the minus range of 'Transactions with the government and others' increased since fiscal 1999[10] and in the period when supply of monetary base accelerated since March

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[7] For an outline of the Bank's balance sheet, see "Nihonginkou no seisaku, gyoumu to balance sheet" (Policy, Operations, and the Balance Sheet of the Bank of Japan) in *Bank of Japan Monthly Bulletin*, Japanese version, July 2002.

[8] 'Principal terms and conditions for the Bank's transactions with the government', decided by the Bank's Policy Board, restricts the use of underwriting of FBs (financing bills) to exceptional cases, for example, when there is unexpected fund demand from the government. And, even when the Bank actually underwrite FBs, the measure is only temporary, and the government must refund them by issuing only FBs at auctions from following occasions.

[9] Chart 8 (2) nets out asset and liability accounts for short-term operations and transactions with the government and others.

[10] The increase in the minus range of transactions with the government and others reflected a change in the environment surrounding government finance, such as, (i) decrease in underwriting of FBs following the switch to public tender for FB issuance, and the new establishment of domestic designated deposit accounts of the government, and (ii) increase in the fund surplus (government deposits + JGB purchases against the Bank under repurchase agreements) by the Fiscal Loan Fund (previously, the Trust Fund Bureau Fund), in preparation for the outflow of funds due to massive postal savings maturing.

2001, 'Short-term operations' was actively utilized. 'Short-term operations' includes various operations, but among them, TBs/FBs purchasing operations under repurchase agreements and repo operations during fiscal 2000 and TBs/FBs outright purchase operations and bill purchase operations during fiscal 2001 increased remarkably (Chart 9 (2)). The Bank has developed various measures to strengthen money market operations, including the introduction of new operations and new loan methods, the expansion of eligible collateral, and increasing the frequency of various operations (Chart 10).

3. Recent Movements in Monetary Base and Determinants of the Quantity

This section divides monetary base into current account balances at the Bank and cash in circulation, and explains the recent movements of each and the determinants of the quantity.

3.1 Current Account Balances at the Bank

3.1.1 Recent Movements in the Outstanding Balance of the Current Accounts at the Bank

In order to overview the movement of the outstanding balance of the current accounts held at the Bank during these few years, this subsection divides those years into four periods (Chart 11).

(1) Before January 1999: The average outstanding balance of the current accounts held at the Bank was mostly less than 4 trillion yen, almost the same as required reserves. Around October 1998, however, uncertainty over financial system intensified, and the difference between the outstanding balance of the current accounts at the Bank and required reserves temporarily expanded to around 300 billion yen.

(2) From February 1999 to August 2000 (so-called 'zero interest rate policy' period): The Bank encouraged the uncollateralized overnight call rate to move as low as possible, dropping to 0.02%, the lowest rate for call transactions at that time. The outstanding balance of the current accounts at the Bank moved around 5 trillion yen, with the difference from required reserves being about 1 trillion yen. The contribution of financial institutions not subject to reserve requirements (e.g. money market brokers) to the increase in the current account balances at the Bank was remarkable (Chart 12). From end-1999 to the beginning of April 2000, potential Y2K problems were of concern, and more ample funds were supplied with the current account balances at the Bank, temporarily amounting to more than 23 trillion yen (January 4th).

(3) From August 2000 to February 2001: After the Bank raised the target call rate to

0.25%, the current account balances held at the Bank returned to about 4 trillion yen, almost the same as required reserves, except that around the beginning of 2001 when RTGS (real-time gross settlement) was introduced to BOJ-NET (the Bank of Japan Financial Network System), the difference between current account balances at the Bank and required reserves expanded to about 1 trillion yen (average for the reserve maintenance period of December 2000). During this period, current account balances held by institutions not subject to reserve requirements (e.g. securities companies) increased.

(4) Since March 2001 (so-called 'quantitative easing' period): The Bank adopted the new easing framework, whereby the outstanding balance of the current accounts became the main target, and was raised several times. Due to the ample fund provision, the call rate has since almost permanently moved to nearly zero, the lowest level being 0.001%, which was lower than during the 'zero interest rate policy' period. The outstanding balance of the current accounts at the Bank went far beyond reserve requirements, and, by the end of fiscal 2001, under the direction of money market operations preparing for a possible further increase in liquidity demand, amounted to 27 trillion yen (March 29th). At the beginning of the introduction of new framework in money market operations, as seen during period (2) above, the increase in current account balances held by non-depository financial institutions (money market brokers, etc.) was notable, but, as the total outstanding balance increased, current account balances held by depository financial institutions (foreign owned banks in Japan[11] and domestic banks, etc.) also increased (Chart 12).

During this period, 'under-subscription', where the total amount of bids fell short of the amount offered by the Bank, occurred frequently. Under-subscription was also seen during period (2), but disappeared after abandonment of zero interest rate (period (3)), and then again occurred frequently during period (4), especially in May 2001 and January-March 2002. However, so far, even if under-subscription occurs with respect to individual operations, no crucial problem has arisen in realizing target outstanding balance of current accounts at the Bank, since the Bank diversified the variety of fund provision operations according to market conditions and increased the number of operations each day.

Summing up these observed facts, the outstanding balance of the current accounts mostly corresponded to required reserves during the periods when interest rates were significantly above zero ((1) and (3) above). However, during the period of nearly zero interest rates ((2)

[11] During this period, many foreign banks, with a relatively higher ranking than domestic banks, financed yen with slightly negative interest rates by using foreign exchange swaps, and held the funds as the current accounts at the Bank.

and (4) above), the outstanding balance of the current accounts held at the Bank could exceed required reserves. However, regardless of period, the outstanding balance greatly increased when some events, such as uncertainty over financial system or changes of system, caused anxiety about liquidity financing in financial markets.

3.1.2 Theoretical Consideration of Demand and Supply of Current Account Balances at the Bank

In order to provide background for theoretical understanding of the observed facts in the previous subsection, this subsection explains the shape of the demand curve and supply curve of the current account balances held at the Bank. As explained below, the Bank engages in money market operations by controlling the supply amount, targeting the level of interest rates or the outstanding balance of the current accounts held at the Bank. These money market operations form the starting line of the transmission channel of monetary policy.

Demand Curve for Current Account Balances at the Bank

By holding current account balances at the Bank, financial institutions can receive liquidity service, which enables them to use the funds for settlements. On the other hand, holding current account balances at the Bank is accompanied by the opportunity cost of giving up dealing funds in the short-term market, etc. If institutions increase their outstanding balance of the current accounts at the Bank, the marginal value of liquidity provision service decreases and opportunity cost, which these financial institutions will pay, also decreases. In a graph where the vertical axis is the short-term interest rate and the horizontal axis is the outstanding balance of the current accounts held at the Bank, the individual demand curve for the current account balances held at the Bank for each individual financial institution becomes basically downward sloping (Chart 13).

However, for financial institutions subject to reserve requirements (Chart 13 (1)), demand exists up to the amount of required reserves to meet reserve requirement, and there is an almost vertical sloping curve at that amount in the short-run. But beyond this, there is a downward sloping demand curve. Therefore, as the chart shows, the demand curve for the current account balances at the Bank takes a shape which connects two discontinuous curves. On the other hand, for institutions not subject to reserve requirements, since they have no demand for required reserves, there is only a downward sloping demand curve for liquidity service (Chart 13 (2)).

In the end, the horizontal summation of these individual financial institutions' demand curves is the demand curve for the overall market (Chart 13 (3), DD curve).

Determinants of Demand for the Current Account Balances at the Bank

Thus, the DD curve is composed of required reserves and fund demand which exceeds required reserves. Taking into consideration that the current account balances held at the Bank have recently exceeded required reserves, the determinants of demand for the current account balances at the Bank over required reserves are summarized as follows:

(a) Levels of Short-term Interest Rates: Short-term interest rates are costs which financial institutions pay in order to hold the current account balances at the Bank with no interest rate, that is, the opportunity cost of giving up dealing funds in the money market. When short-term interest rates decrease, demand for the current account balances at the Bank increases moving to the lower-right along the DD curve (Chart 14 (1)).

There are two notable points about short-term interest rates. The first is that, conceptually, short-term interest rates in this subsection refer to risk-free interest rates, which purely correspond to liquidity service supplied by the current account balances held at the Bank. On the other hand, in the call market, the interest rate is influenced by, for example, credit risks. Therefore, put more strict way, the short-term interest rate of the horizontal axis in the graph can slightly deviate from the actual call rate.

The second point is that short-term interest rates are the interest rates used by financial institutions to finance or to deal funds with other financial institutions, and that, through arbitrage, these rates tend to converge to the cost of financing in the Bank's market operations. The cost of financing in market operations includes not only the contracted interest rates, but all the costs and benefits, including various office costs related to bid participation. One example of a benefit is the opportunity for returns, which are obtained by participating in market operations. If a financial institution can sell TBs/FBs or JGBs to the Bank at better prices than its own perspective, the institution regards it as an opportunity for returns.

(b) Levels of Transaction Amounts/Anxiety about Liquidity : When levels of transaction amounts rise reflecting the activated economic activity or the advent of period ends, the necessary funds for settlement (i.e. transaction demand) increase. If anxiety about a possible liquidity shortage increases, for example, due to uncertainty over financial system, then precautionary demand to hold greater liquidity increases. If these factors are magnified, then the DD curve shifts to the right (Chart 14 (2)).

(c) Inactive Market Transactions due to Transaction Cost Burden: The fund positions of financial institutions which participate in the money market are not necessarily uniform. Some financial institutions have excessive funds while others have insufficient funds.

Normally, transactions are carried out between them, and fund biases are resolved through markets. However, under a nearly zero interest rate environment, many institutions with excessive funds prefer holding excess reserves because they cannot obtain sufficient returns by dealing funds in markets when considering transaction costs[12]. So, financial institutions with insufficient funds cannot finance their funds from those with excessive funds, and are inclined to rely on the Bank's fund provision operations. As a result, the demand for the current account balances at the Bank increases.

These demand increases due to inactive transactions in money markets are the factors which shift the DD curve to the right. The rightward shift is magnified when interest rates are low, but is more difficult to be seen when interest rates exceed certain levels. Therefore, shifts to the right due to this factor are considered to be accompanied by flattening of the DD curve as Chart 14 (3).

Fund Supply Curve of the Bank

Basically, the fund supply curve of the Bank can be illustrated as a vertical line which stands on the target outstanding balance of the current accounts at the Bank, like an SS curve in Chart 13 (3).[13] Short-term interest rates are determined by the intersection of the SS curve and the DD curve.

The SS curve forms a shape which combines this vertical line and horizontal line which extends to the right at the level of the official discount rate. This is because, due to the use of 'Lombard-type' lending (complementary lending facility), the official discount rate becomes the ceiling for short-term interest rates, even if market interest rates face some upward pressure.[14] This situation is represented in Chart 13 (4) as the case of an increase in funds demand at the end of the period. In this chart, if the DD curve shifts substantially to the right, market interest rates go up, but, by using 'Lombard-type' lending for amounts over the outstanding balance of fund provision from operations, the increase in short-term interest rates stops at the level of the

[12] When dealing funds in the uncollateralized call market, direct costs are (i) the commission of money market brokers, (ii) charge for using *Tanshi Yakujo Kakunin* System (the money market's contract confirming system) (200 yen each time), (iii) charge for using BOJ-NET (40 yen each time), etc. Suppose that the contracted interest rate is 0.001% and commission is half of that. Then, when dealing 10 billion yen overnight, the gross return is 274 yen, and the sum of the above costs is 377 yen, so there is a loss of 103 yen. Actually, other costs, such as informational communication costs or labor costs have to be included in overall costs.

[13] When the operating target of money market operations is the short-term interest rate (e.g. call rate), the SS curve is represented as a horizontal line at the target interest rate level.

[14] 'Lombard-type' lending is a standby lending facility introduced in February 2001, through which the Bank extends loans on the request of financial institutions with the conditions pre-specified by the Bank. The official discount rate is applied to the lending rate. Because use of this lending facility must be accompanied by submitting eligible collateral, the official discount rate becomes the ceiling for the short-term interest rate imposed on transactions with collateral.

official discount rate.

Understanding the Observed Fact

By using the above framework of demand and supply curves, this subsection will try to understand the observed fact, that is, that required reserves mostly correspond to the current account balances held at the Bank during a period when interest rates are significantly above zero, but the current account balances become much larger than required reserves during periods of nearly zero interest rates.

Chart 15 is the sample plot which represents daily data of the call rate (vertical axis) and the current account balances at the Bank (horizontal axis) since April 1998. This sample plot does not necessarily represent the accurate shape of the demand curve at any particular point in time because the demand curve might shift due to changes in transaction amount levels and other factors, such as anxiety about liquidity. In fact, the set of plotted dots is a fairly broad curve, even if outliers are neglected. However, it clearly shows that the curve represented as the set of dots is nearly vertical around the amount of required reserves (about 4 trillion yen), but becomes fairly flatter above the level of this amount and the corresponding interest rates become under 0.05%.

The reason the demand curve for the current account balances at the Bank becomes nearly L-shaped, though still downward sloping, is that demand from financial institutions not subject to reserve requirements is very small and the required reserves of financial institutions subject to reserve requirements are sufficiently large, so liquidity beyond this amount is normally not demanded unless interest rates are very low. Considering such a market structure, if the Bank targets the current account balances far above required reserves, the call rate declines to nearly zero unless there exist some substantial demand shift factors. Therefore, in order to guide the call rate to a level significantly above zero, the Bank cannot diverge the current account balances from required reserves.

As explained above, it is only when short-term interest rates are nearly zero that the Bank can increase the current account balances far above the amount of required reserves. During the 'quantitative easing' period, the Bank supplied even larger current account balances, several times required reserves, rather than during the 'zero interest rate policy' period. The fact that the Bank was able to increase the provision of massive amount of funds implies that there was corresponding demand for such funds on the part of financial institutions. So, next, it is important to consider the background as to why such a large amount of the current account balances at the Bank was demanded during the 'quantitative easing' period.

As explained earlier, the range of the DD curve which exceeds required reserves is

determined by (a) levels of short-term interest rates, (b) levels of transaction amounts/anxiety about liquidity, and (c) inactive market transactions due to the burden of transaction costs.

Levels of Short-term Interest Rates: The call rate, the representative for short-term interest rates, was no lower than 0.02% during the 'zero interest rate policy' period, but declined to 0.001% under the Bank's further ample fund provision during the 'quantitative easing' period. Financial institutions are not very conscious of the costs of holding large amounts of excess reserves due to very low interest rates, which increased demand for the current account balances held at the Bank.

As stated above, costs and benefits of operations are included in short-term interest rates, but under extremely low interest rates, they become more important and market participants take the opportunity of returns seriously. From this viewpoint, in the case of short-term operations, there is relatively little room that desirable conditions for operation counterparties will arise under a nearly zero short-term interest rate environment. On the other hand, in the case of the outright purchase of JGBs, the interest rate level is high and likely to fluctuate, so room for returns from operations is relatively large and active bids are likely to occur. In fact, all bid shortages in the previous subsection occurred with short-term operations, but not for the outright purchase of JGBs. The Bank judged that using these characteristics of the purchase of JGBs was necessary for smooth fund provision, and thus increased the outright purchases of JGBs on three occasions since 2001.[15] Other measures to expand fund provision methods, seen in section **2**, are those that lower costs and increase the benefits of participating in market operations.

Anxiety about Liquidity: The background to the increase in the outstanding balance of the current accounts at the Bank after the terrorist attacks of September 11, 2001 and at the end of fiscal 2001 is considered to be the increase in financial market participants' uncertainty with respect to funding, thereby raising the precautionary demand.

Inactive Market Transactions Due to Transaction Cost Burden: Shifts in the demand curve to the right due to anxiety about liquidity were supported by demand arising from market participants wanting to avoid the burden of transaction costs and thus giving up dealing funds. Chart 16 indicates that, since the introduction of 'quantitative easing', the

[15] In March 2001, the Bank decided that 'The Bank will increase the amount of its outright purchase of long-term government bonds from the current 400 billion yen per month, in case it considers that increase to be necessary for providing liquidity smoothly. The outright purchase is, on the other hand, subject to the limitation that the outstanding amount of long-term government bonds effectively held by the Bank, i.e., after taking account of the government bond sales under gensaki repurchase agreements, be kept below the outstanding balance of banknotes issued.' Consequently, the Bank increased the amount of purchases from 600 billion yen per month (August 2001), to 800 billion yen per month (December), to 1 trillion yen per month (February 2002).

outstanding balance of transactions in the call market has decreased from about 25 trillion yen to about 15 trillion yen. The tendency to give up dealing funds in the call market has gradually increased, parallel with the rise in the outstanding balance of the current accounts at the Bank and the situation of a fund surplus becoming normal among broader number of market participants. After the increase in demand for liquidity due to some factors, such as, the terrorist attacks in the US and the end of fiscal year factor, a large outstanding balance of the current accounts at the Bank was realized even after these factors had diminished. The background to this was that some portions of demand which had once increased remained in the market just like unmelted snow due to inactive market transactions becoming normal.

3.2 Cash in Circulation

3.2.1 Movements of Cash in Circulation

With respect to cash in circulation, a long-term time-series (Chart 17 (1)) shows that the increase rate of cash, on average, almost corresponded with the growth rate of nominal GDP until the first half of the 1980s. However, divergence between these two variables became notable after that, especially during the period of low interest rates from the second half of the 1990s. That is, until the first half of the 1980s, the ratio of cash in circulation to nominal GDP (Chart 17 (2)) was moving relatively stable, but steadily rose except during the period of high interest rates from 1990 to 1992.

When focusing on recent movements, we see that the increase rate of cash has been generally high since 1995. But, on closer examination (Chart 18 (1)), it can be seen that the increase rate rose in four phases, (1) from the second half of 1995 to 1996, (2) from autumn 1997 to 1998, (3) from end-1999 to mid-2000, and (4) from mid-2001.

These phases reflect either deposit rates being lowered or the occurrence of some events that raised the relative safety of cash versus other financial assets such as deposits, or both. Phases (1) and (4) were periods when deposit rates were lowered, and phases (2) to (4) represent periods when some events raised the relative safety of cash.

Looking at the movement of deposit rates during these phases (Chart 18 (2)), in (1), the 1-year time deposit rate was first lowered to far below 1% as a result of the Bank's monetary easing in 1995. In (4), the Bank adopted the current account balances as the main operating target, and thus, under the nearly zero short-term interest rate environment, the ordinary deposit rate and 1-year time deposit rate fell below 0.1% and were further lowered.

On the other hand, regarding events which raised the relative attractiveness of cash versus other financial assets, phase (2) corresponds to when uncertainty over financial system was

magnified by the bankruptcy of big financial institutions (Hokkaido Takushoku Bank, Yamaichi Securities Company, etc.). Phase (3) is the period when people worried over potential Y2K problems, and phase (4) corresponds when public opinion became more critical of Japanese financial institutions' non-performing loans at the end of fiscal 2001. In phases (2) and (4), the surge of public anxiety about Japan's financial system is inferred from the fall of bank stocks (Chart 18 (3)).

Phases (2) to (4) correspond to periods when financial institutions held cash, preparing for payments to individuals or firms in case of emergency. As seen in **1.2**, cash in circulation, which is a component of monetary base, includes the amount held by financial institutions (its share is less than 10% of cash in circulation), but cash currency in circulation of money stock statistics does not include this amount. Therefore, the difference between these two variables corresponds to the amount held by financial institutions. Comparing the percentage changes from the previous year for cash in circulation and cash currency in circulation (Chart 19), they are mostly the same, but significantly differ in phases (2) to (4), and especially in (3) and (4).[16]

In phase (4), the partial removal of the blanket deposit insurance (for time deposits, etc.) in April 2002 was also considered to have contributed to the increase in cash. However, deposits for settlement, which are current accounts or ordinary deposits, are still guaranteed. In fact, since end-2001, when the partial removal of the blanket deposit insurance was approaching, the minus range of percentage change from the previous year with respect to time and savings deposits, etc. (quasi-money + CDs) has widened, whereas the increase rate in cash and liquid deposits, etc. (deposit money + postal savings) has increased, implying a shift between these asset categories (Chart 20).

3.2.2 Theoretical Consideration of Demand and Supply of Cash in Circulation

From the viewpoint of daily operations, the Bank passively supplies cash, which is requested by financial institutions, etc., in exchange for the current accounts at the Bank. As explained above, because cash held by financial institutions accounts for less than 10% of overall cash in circulation, a large portion of requests from financial institutions to the Bank reflects the cash payment requests from households and firms to financial institutions. Thus, the supply of cash is determined by demand for cash which is requested by the economy at any given point in time.

Demand for cash is basically considered to be determined by the same factors as is demand for settlement funds in the current accounts at the Bank: (a) levels of short-term interest rates, (b) levels of transaction amounts and others, and (c) inactive fund transactions due to the burden

[16] In Chart 19 (2), the difference between two variables increased in a negative direction from end-2000 to the beginning of 2001. This is because the movement of the percentage change from the previous year was disturbed by a large positive shock in phase (3) Y2K problems of the previous year.

of transaction costs (see **3.1.2**).

Among these, the short-term interest rate used to analyze cash in circulation is widely considered as corresponding to the time deposit rate. When economic agents such as households make portfolio selection decisions, time deposits are considered a typical alternative financial asset to cash. However, time deposits have a certain liquidity, though inferior to cash and ordinary deposits, and involve credit risks for financial institutions. The short-term interest rate here is compensation for liquidity, and, conceptually, is the interest rate attaching to non-liquid financial assets with no credit risk. Therefore, it is necessary to note that the interest rate is not necessarily equal to the actual time deposit rate.

When describing about (c) inactive fund transactions due to the burden of transaction costs, such costs are time and labor for households to deposit their cash in the bank. Considering the transaction cost of taking time to go to banks or ATMs, depositing a surplus cash in the bank deposits does not pay under extremely low interest rates. In such cases, households hold cash instead of depositing until the amount on hand becomes large.

The small cost to go to banks to deposit funds, rarely recognized when interest rate levels are to some extent high, is recognized when interest rates approach zero. Therefore, in the real world with small but positive transaction costs, compared with the case without transaction costs, the cash demand curve shifts significantly to the right and becomes flatter.

Chart 21 is the relation between the ratio of cash to nominal GDP and 1-year time deposit rate, and illustrates the downward sloping relationship. This chart roughly shows the determination of cash demand. That is, when nominal GDP, which is a substitute for transaction amount, increases, cash increases proportionally, and when interest rates decline, cash increases even if nominal GDP is constant.

However, when interest rates are very low, the demand curve becomes much flatter. Basically, this is because more economic agents tend to prefer holding a large amount of cash, though non-interest bearing, as deposit rates (opportunity cost of holding cash) approach zero. In such cases, they hold any amount of cash as an alternative to deposits under almost the same level of interest rate, so the relation where lower interest rates increase demand for deposit becomes flatter. In addition, the existence of transaction costs is considered to work as a factor making the demand curve slope still flatter.

Given the shape of the cash demand curve, under a nearly zero interest rate environment, the relative attractiveness of cash and other financial assets (deposits, etc.) slightly changes. With a very small change in the opportunity cost of holding cash, large shifts between these two assets are likely to occur, in contrast to under a high interest rate environment (Chart 22). As stated above, deposit rates were lowered with the partial removal of the blanket deposit insurance. Short-term interest rates, which are risk free rates after excluding risk premium,

dropped because households recognized the risk of having time deposits over 10 million yen, even though small. As a result, the relative attractiveness of cash to deposits was magnified, causing households to make shifts from deposits to cash. Since the second half of 2001, the decline in deposit rates and change in risks subjectively recognized can be understood to have contributed to the large increase in demand for cash under a flat demand curve, even though each change was small.

4. Money Multiplier Movements

Finally, based on factors behind movements of the components of monetary base (the current account balances held at the Bank and cash in circulation), this subsection will attempt to consider the relation between monetary base and money stock.

The money multiplier, which is the ratio of money stock to monetary base, can be represented as the following equation by using the ratio of cash to bank deposits (c) and the ratio of the current account balances held at the Bank to bank deposits (r). The ratio of cash to bank deposits is determined as the result of the portfolio selection of households and others, and the ratio of current account balances at the central bank to bank deposits is determined as the result of decisions regarding the composition of banks' assets and liabilities.

M = C + D M: Money stock C: Cash D: Bank deposits

B = C + R B: Monetary base R: Current account balances at the central bank

$\mathbf{c = \frac{C}{D}}$ **c: Ratio of cash to bank deposits**

$\mathbf{r = \frac{R}{D}}$ **r: Ratio of current account balances at the central bank to bank deposits**

From these relationships, $\mathbf{\frac{M}{B} = \frac{C+D}{C+R} = \frac{\frac{C}{D}+1}{\frac{C}{D}+\frac{R}{D}} = \frac{c+1}{c+r}}$.

Therefore, $\mathbf{M = \left(\frac{c+1}{c+r}\right) \cdot B}$. $\mathbf{\left(\frac{c+1}{c+r}\right)}$ **is called the 'money multiplier'.**

From the standard explanation, the central bank controls the quantity of monetary base through market operations, and money stock, which is monetary base times the money

multiplier, is determined through the credit creation mechanism. However, it is not appropriate to say that 'central banks set monetary base as the operating target and conduct monetary policy of increasing money stock, say, 10% by increasing monetary base 10%'. There are two principal reasons.

The first reason concerns the statement that 'the quantity of monetary base is controlled by the central bank'. As seen in **1.2**, the central bank is the monopolistic supplier of monetary base. The central bank controls the quantity of the current account balances at the central bank through market operations with grasping the daily amount of cash payments at its windows. However, this fact is not related to the argument about what the operating target is in daily money market operations. In Japan, the short-term interest rate was the operating target, but since March 2001, the Bank of Japan has adopted the current account balances as the main operating target. On the other hand, in other developed countries, such as the US (Federal Reserve System), the Euro area (European Central Bank), UK, and Canada, central banks adopt short-term interest rates as their operating targets. The influence on the money market and economy can be different, depending on which variable the central bank adopts as its operating target. The reason many central banks adopt short-term interest rates is that they place importance on the effect of stabilizing the money market by restraining large movements in interest rates. Nevertheless, the operating targets of money market operations vary from country to country and also from period to period.

The second reason is that, the money multiplier can exhibit big changes, even if neglecting movements due to changes in the reserve requirement rate (Chart 23 (1)). Money multiplier changes are especially large in a phase of extremely low interest rates. Recently, despite the large increase in monetary base, the increase rate in money stock has stayed at a low level, which means the money multiplier has moved to offset the increase in monetary base.

Movements in the money multiplier can be broken down into movements in its determinants, the ratio of cash to bank deposits and the ratio of the current account balances at the Bank to bank deposits. Of these two variables, the former gradually declined until the 1980s, but then increased in the 1990s with the increase speed recently accelerating (Chart 23 (2)). This is because, as the above explanation regarding cash in circulation shows, the degree of preference for cash versus bank deposits increases when deposit rates decrease, given other conditions remaining constant. There seems to be a negative correlation between the ratio of cash to bank deposits and interest rate (time deposit rate) at least since the mid-1980s.[17] On the other hand, the ratio of the current account balances held at the Bank to bank deposits was relatively stable until the end of the 1990s (Chart 23 (3)). This was, as seen in the previous section, because the

[17] One of the reasons the positive relation between these two variables did not appear until the first half of 1980 might be the influence of the regulation on deposit rates at that time.

current account balances held at the Bank correspond to required reserves in an environment when interest rates are significantly above zero. As a result, the money multiplier is mainly determined by movements in (the inverse of) the ratio of cash to bank deposits, and tends to have a positive correlation with interest rates. The sample plot in Chart 24 showing interest rate (vertical axis) versus money multiplier (horizontal axis) shows an upward sloping relation on the whole.

However, after interest rates declined below 0.5% in 1995 (bottom-left of Chart 24), the relation between these variables became quite flat compared with previous periods, and the range of changes in the money multiplier to interest rates became substantial. Dividing into two ratios, the increase trend of the ratio of cash to bank deposits has steepened since 1995, and the ratio of the current account balances at the Bank to bank deposits has moved substantially since 1999 (Chart 23 (2), (3)).

The phenomenon whereby these two ratios fluctuate considerably in a period of low interest rates is clearly understood by the explanation in the previous section. Under a very flat cash demand curve in a low interest rate phase, even subtle changes in deposit rates or risks subjectively recognized generate large shifts between cash and bank deposits, and the ratio of cash to bank deposits shows highly uncertain movements. The ratio of the current account balances at the Bank to bank deposits is determined by the reserve requirement rate under short-term interest rates significantly above zero, but becomes unstable (apart from the reserve requirement rate) under nearly zero short-term interest rates.

As explained above, monetary base and money stock are not linked at a fixed rate, and in a nearly zero interest rate environment, the two ratios change considerably, and the money multiplier also changes in an unstable and unpredictable way. In such situations, even if monetary base increases by a large amount, money stock will not necessarily increase in the same way.

5. Concluding Remarks

This paper first considered the basic characteristics of monetary base, and then analyzed factors behind movements of its components (the current account balances held at the Bank and cash in circulation) by dividing the whole period into significantly above zero and nearly zero short-term interest rate periods. Because the main conclusions were already summarized at the beginning of this paper, this last section picks up two points to note for the understanding of conclusions.

The first point concerns the argument whether the Bank actively determines the supply of monetary base or passively supplies responding to predetermined demand. In daily operations,

the Bank passively responds to payment requests of cash from private financial institutions. During the period targeting significantly above zero short-term interest rates, the current account balances held at the Bank are mostly determined at the same amount as required reserves.

But these facts do not mean that monetary policy cannot influence the amount of monetary base. Normally, the amount of deposits, which forms the basis for calculating the amount of required reserves, and interest rates and the level of transactions, which are determinants of cash demand, can be influenced by monetary policy. Detailed analysis is beyond this paper, but, generally speaking, the influence of monetary policy on monetary base depends on factors, such as in what kind of period and how intensively monetary policy influences economic variables, like interest rates or economic activity.

The second point is that the analysis of this paper focuses on the demand and supply mechanism of the current account balances at the Bank and cash, so it addresses only one aspect of various factors which comprise the economy. In order to analyze the influence of movements in monetary base on the whole economy, it is necessary to comprehensively examine various transmission channels.

However, even considering this point, if the argument is restricted to the relationship between monetary base and money stock, this paper's basic conclusion that the money multiplier, which is the ratio between these two variables, shows highly uncertain movements under nearly zero interest rates, remains unchanged. During nearly zero interest rates, the analysis of this paper will provide one viewpoint to examine the economic implication of the increase in monetary base.

[BOX]

Further Information about Monetary Base

Statistical data: The statistical data of 'Monetary Base' and 'Monetary Base and the Bank of Japan's Transactions' can be obtained through internet.

Monthly published statistics

http://www.boj.or.jp/en/siryo/siryo.htm#0100

Time-series data

http://www2.boj.or.jp/en/dlong/stat/stat1.htm

Explanations of Statistics: The explanations on the statistics of 'Monetary Base and the Bank of Japan's transactions' can be obtained through internet.

'Monetary Base no kaisetsu' (Explanation of Monetary Base, available in Japanese only)

http://www.boj.or.jp/siryo/exp/exbase.htm

'Monetary Base toukei no FAQ'(FAQ of Monetary Base statistics, available in Japanese only)

http://www.boj.or.jp/siryo/exp/faqbase.htm

'A Guide to "Monetary Base and the Bank of Japan's Transactions"'

http://www.boj.or.jp/en/faq/data/exmbt.pdf

Related Papers: The following papers are useful to better understand the Bank's money market operations.

Atsushi Miyanoya [2000], "A Guide to Bank of Japan's Market Operations", *Bank of Japan Financial Markets Department Working Paper E-Series*, 00-E-3.

http://www.boj.or.jp/en/down/siryo/data/kwp00e03.pdf

Bank of Japan's Financial Markets Department (Open Market Operations Division) [2001], "Money Market Operations in FY2000", *Bank of Japan Financial Markets Department Market Review E-series*, 2001-E-4.

http://www.boj.or.jp/en/down/siryo/data/kmr01e04.pdf

——— [2002], "Money Market Operations in FY2001", *Bank of Japan Financial Markets Department Market Review E-series*, 2002-E-3.

http://www.boj.or.jp/en/down/siryo/data/kmr02e03.pdf

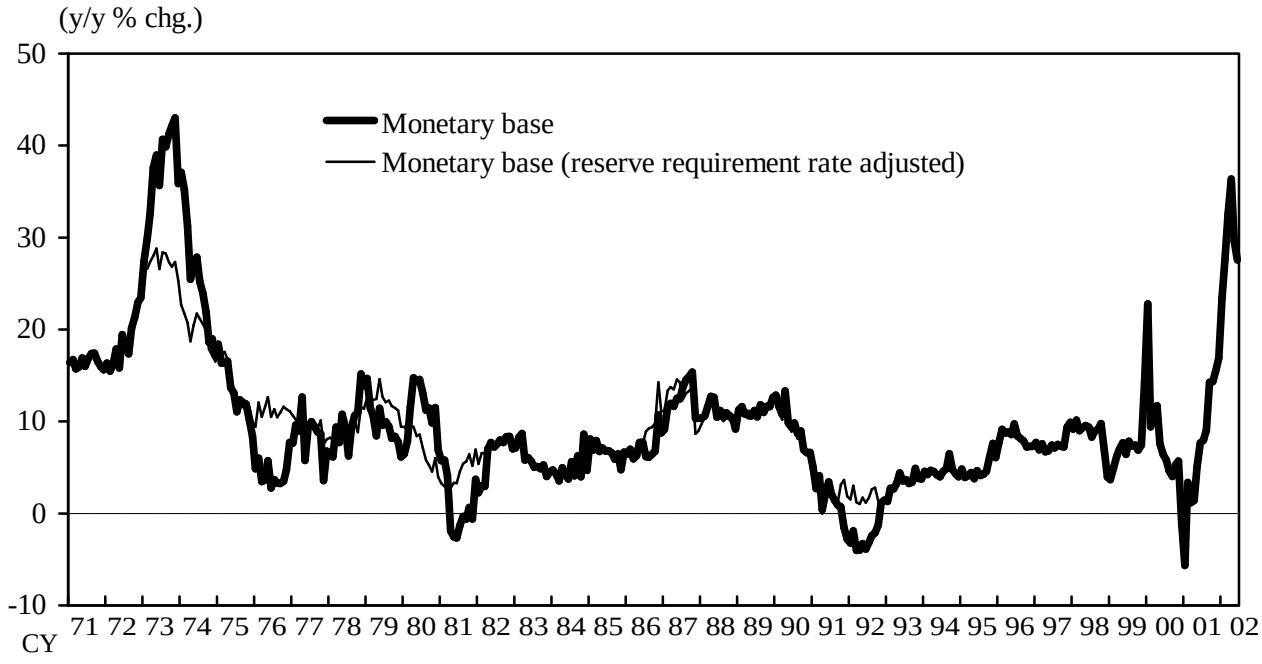
Bank of Japan's Policy Planning Office [2002], "Nihonginkou no seisaku, gyoumu to balance sheet" (Policy, Operations, and the Balance Sheet of the Bank of Japan, available in Japanese only), *Bank of Japan Monthly Bulletin*, Japanese version, July.

http://www.boj.or.jp/down/siryo/data/ron0207b.pdf

Chart 1

Monetary Base and Nominal Variables

(1) Monetary Base (Monthly)



Note : The index of reserves adjusted for the reserve requirement rate, which is calculated by the following equation, is published as a reference index. Monetary base adjusted for the reserve requirement rate is the sum of this index, cash in circulation, and current account balances at the Bank of Japan, which is held by institutions not subject to reserve requirements.

Reserve balances (reserve requirement rate adjusted)	=	Reserve balances of the month	×	Average effective reserve requirement rate of base period	÷	Average effective reserve requirement rate of the month

(2) Monetary Base and Nominal Variables (Quarterly)

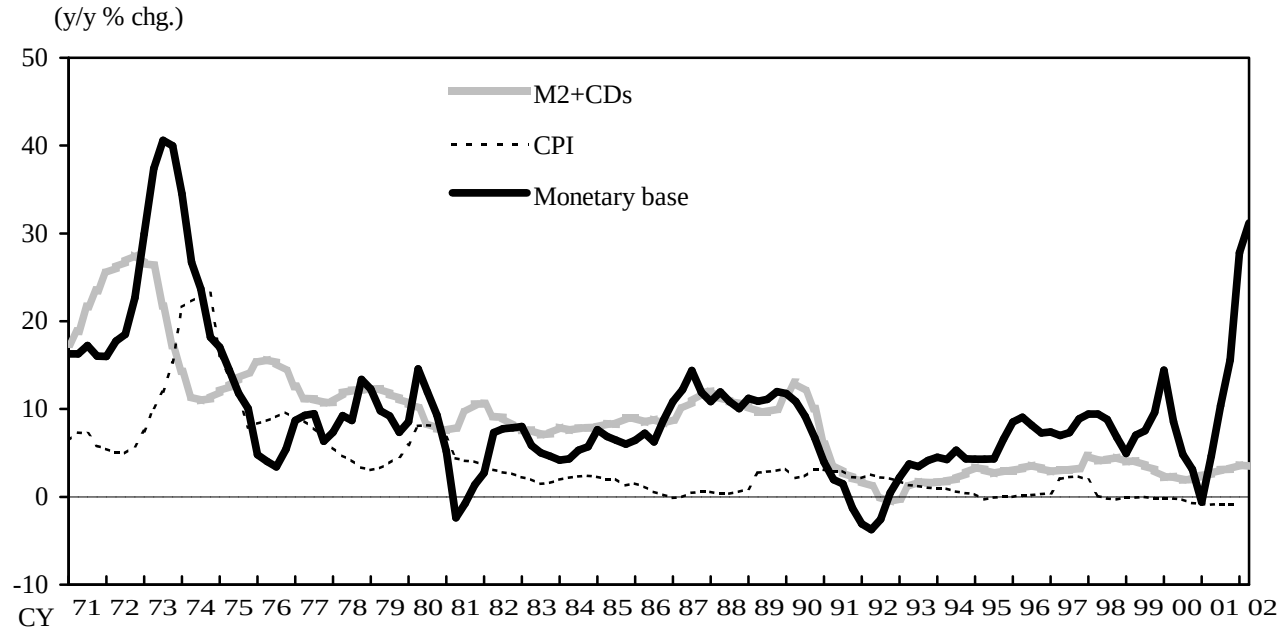
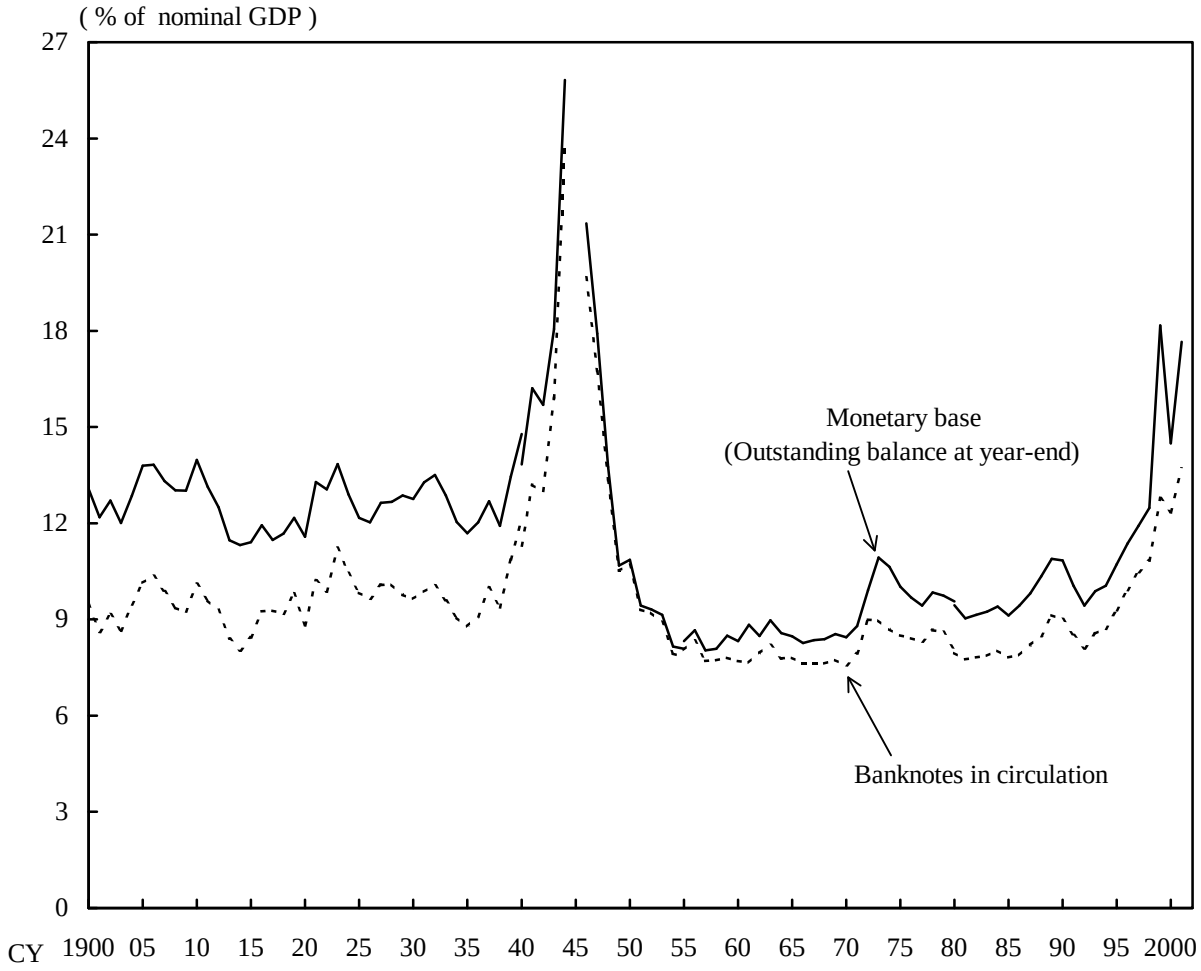


Chart 2

Ratio of Monetary Base to Nominal GDP : Long Time-Series

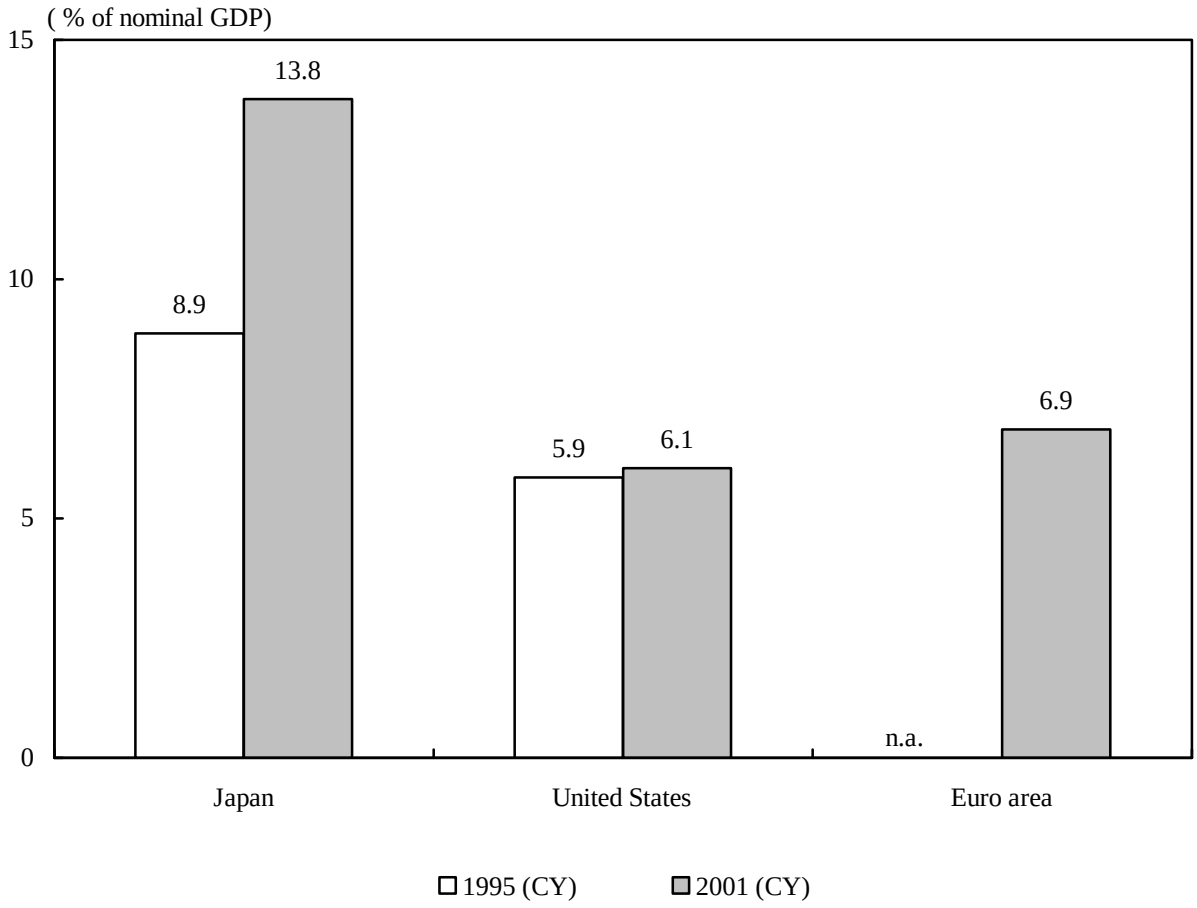


Notes : 1. The data of monetary base after 1970 are available, but figures before that are calculated from the end of years' outstanding balance-based data. These numbers differ from current data in the following respects: (i) before 1953, 'government paper money' is included; (ii) data of coins in circulation before 1922 are replaced by 'the net outstanding balance of coins issued and broken', which includes the Bank of Japan's holdings; (iii) the current account balances at the Bank in 1948 are the outstanding balances at fiscal year-end; and (iv) the current account balances at the Bank from 1949 to 1997 are replaced by 'deposits of financial institutions' (not including special current accounts), and, they do not include standard money.

2. With respect to nominal GDP, data before 1955 are from 'Gross National Expenditure at Market Prices' in Table 1-A of Ohkawa et al. [1974] "Estimates of Long-term Economic Statistics of Japan since 1868, vo. 1, National Income" (Toyo Keizai Shinposha, Tokyo), and data from 1955 to 1980 from total domestic expenditures in 68SNA, and data after 1980 from total domestic expenditures in 93SNA. Data from 1946 to 1951 are fiscal-year based.

Chart 3

Ratio of Monetary Base to Nominal GDP: International Comparison

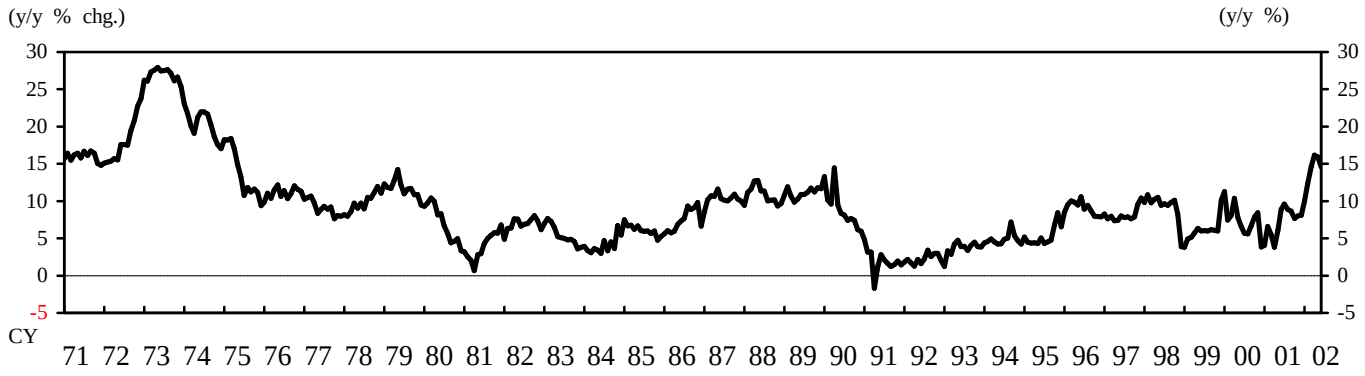


Note : Monetary base for the Euro area is the index of base money, published in the ECB's "Monthly Bulletin".

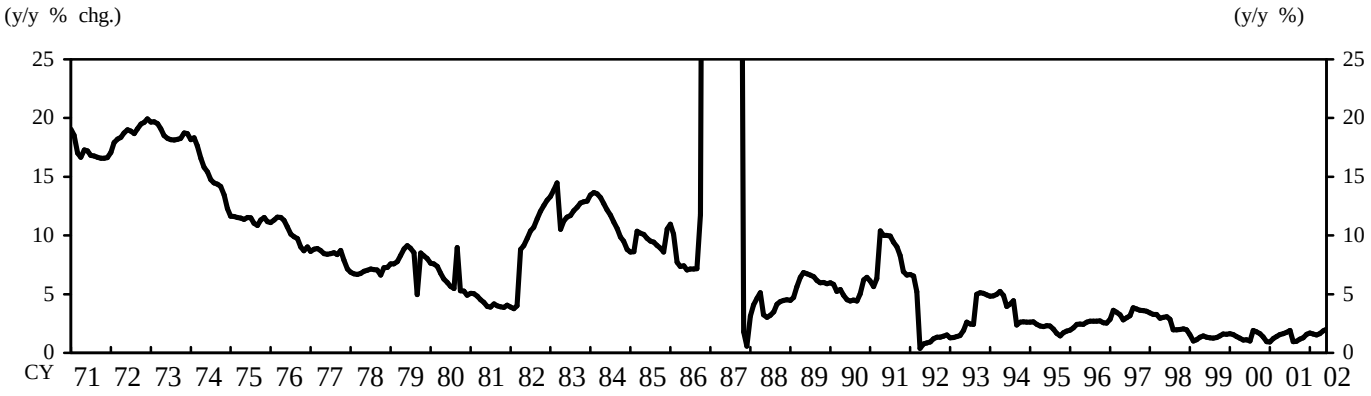
Chart 4

Monetary Base Components

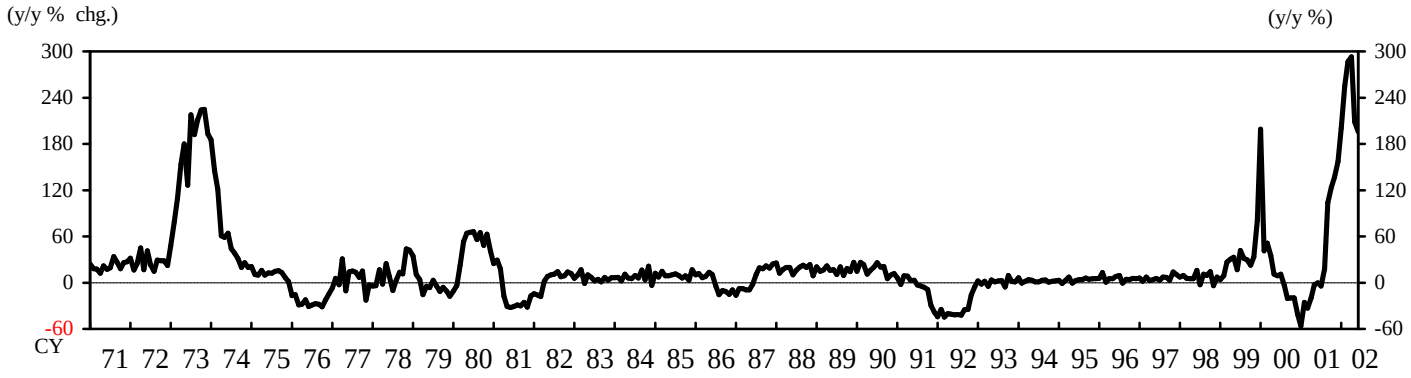
(1) Banknotes in Circulation



(2) Coins in Circulation



(3) The Current Account Balances at the Bank of Japan



(4) Share

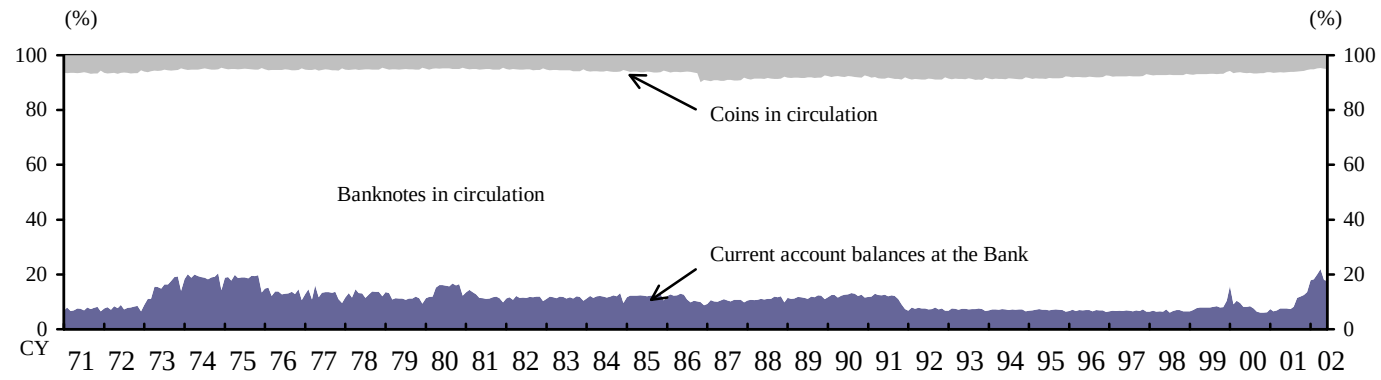


Chart 5

Concept of Monetary Base

Debtors	**Components**	**Holders**			
		The Bank	Central government	Financial institutions	Other private agents
The Bank of Japan (The Bank)	The current account balances at the Bank	——	The current account balance of government		
	Banknotes (Paper money)	——			
Central government	Coins	Coins held by the Bank			

Range of monetary base

Chart 6

Suppliers and Holders of Monetary Base and Money Stock

	Suppliers of money stock (Depository financial institutions)	Non-depository financial institutions, Central government	Holders of money stock
Supplier of monetary base	The Bank of Japan (The Bank)	——	——
Financial institutions subject to reserve requirements	Banks, *Shinkin* banks (with deposits of 160 billion yen), *Norinchukin* Bank	——	——
Account holders at the Bank	*Shinkin* banks (with deposits of 160 billion yen) [3], *Shinkin* Central Bank, *Shoko Chukin* Bank, *Shinkumi* Federation Bank [2], National Association of Labor Banks [2]	Development Bank of Japan [4], Japan Bank for International Cooperation [4], National Life Finance Coopertion [4]	Money market brokers , International Financial Futures Exchange, Deposit Insurance Corporation of Japan, Securities companies [3], Stock exchanges [3], Securities financing companies, Bankers associations [3]
Holders of monetary base	Credit cooperatives [2], Labor credit cooperatives [2], Credit federations of agricultural cooperatives [2], Credit federations of fishery cooperatives [2,4], Agricultural cooperatives [2,4], Fishery cooperatives [2,4], Post offices [2,4]	Insurance companies [4], Bank holding companies [4], Insurance holding companies [4], Government Housing Loan Corporation [4], Japan Finance Corporation for Small Business [4], Agriculture, Forestry and Fisheries Finance Corporation [4], Japan Finance Corporation for Municipal Enterprises [4], Okinawa Development Finance Corporation [4], Central government [4]	Individuals, Business firms [5], Local governments, Governments enterprises [5], Public corporations [5], Foundations, etc.

Notes : 1. Money stock in this table is M3+CDs, which is broader than M2+CDs.

2. M3+CDs includes deposits, etc. of these institutions, but M2+CDs does not include them.

3. Some *shinkin* banks, securities companies, stock exchanges, and bankers associations do not hold the current account balances at the Bank.

4. From a statistical viewpoint, cash held by these institutions should be excluded from money stock, but actually, it is not excluded because of some statistical constraints.

5. Institutions listed in other categories of this chart are excluded.

Chart 7

Holders of Monetary Base and Money Stock
(Conceptual Chart)

Categories of currency	Holders	
	Depository financial institutions, Non-depository financial institutions	Individuals, Business firms, Local governments, Local government enterprise /corporations
The current account balances at the Bank of Japan		
Cash	Cash held by financial institutions	Cash currency in circulation
Deposits	Deposits held by financial i nstitution s	Deposit money, Quasi-money + CDs

Money stock (647.1 trillion yen <M2 + CDs, average amount outstanding in 2001 (CY)>)

Monetary base (69.3 trillion yen <average amount outstanding in 2001 (CY)>)

Chart 8

Monetary Base and the Bank of Japan's Transactions

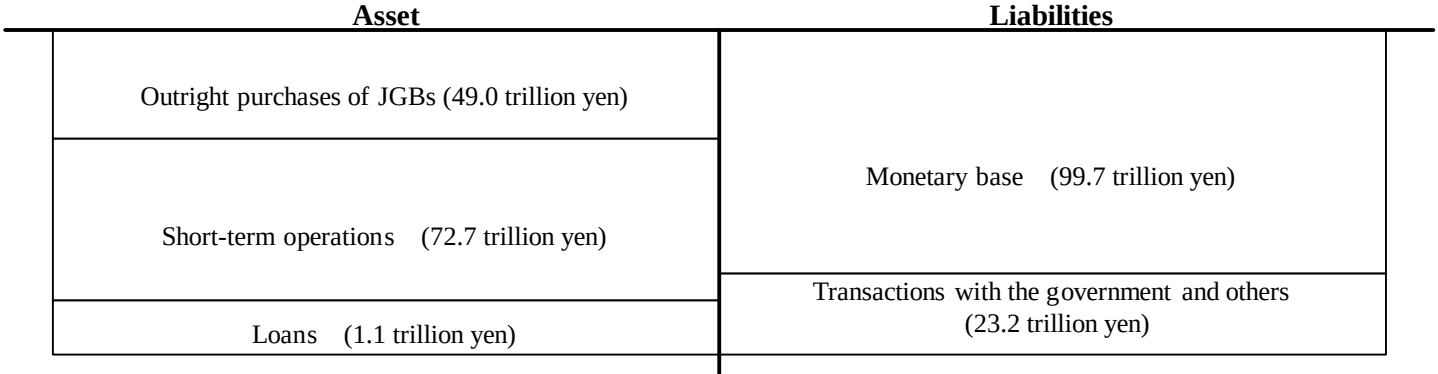
(1) Definitions of Transaction Categories

Transaction Categories		Items in "Monetary Base and the Bank of Japan's Transactions"
Outright purchases of JGBs		JGBs: Outright purchases
Short-term operations	TBs/FBs purchasing operations (under repurchase agreements)	Purchases of TBs and FBs under repurchase agreements
	TBs/FBs purchasing operations	TBs and FBs: Outright purchases
	Repo operations	Borrowing of JGBs against cash collateral (JGB repos) + Purchases of JGBs under repurchase agreements
	Bill purchasing operations	Outright purchases of bills + Outright purchases of bills utilizing corporate debt obligations
	CP purchasing operations (under repurchase agreements)	Purchases of CP under repurchase agreements
	Fund absorbing operations	Sales of TBs and FBs under repurchase agreements (-) + Outright sales of bills drawn by the Bank (-) + TBs and FBs: Outright sales (-)
Loans		Loans and discounts
Transactions with the government and others	Receipts of excessive government funds	Deposits of the government (-) + Sales of JGBs to the government under repurchase agreements (-) + TBs and FBs: Net outright sales to the government (-)
	Credit to the government	TBs and FBs: Underwriting + Purchases of JGBs from the government under repurchase agreements
	Others	JGBs: Other JGB transactions + TBs and FBs: Net outright sales to foreign central banks and others (-) + Others

Notes: 1. For details of these items, see footnotes to "Financial and Economic Statist ics Monthly" (each monthly issue, Research and Statistics Department, the Bank of Japan).

2. Items with (-) are on the liability side of the balance sheet, and their increase indicates a decrease in monetary base.

(2) Conceptual Chart of the Bank of Japan's Balance Sheet

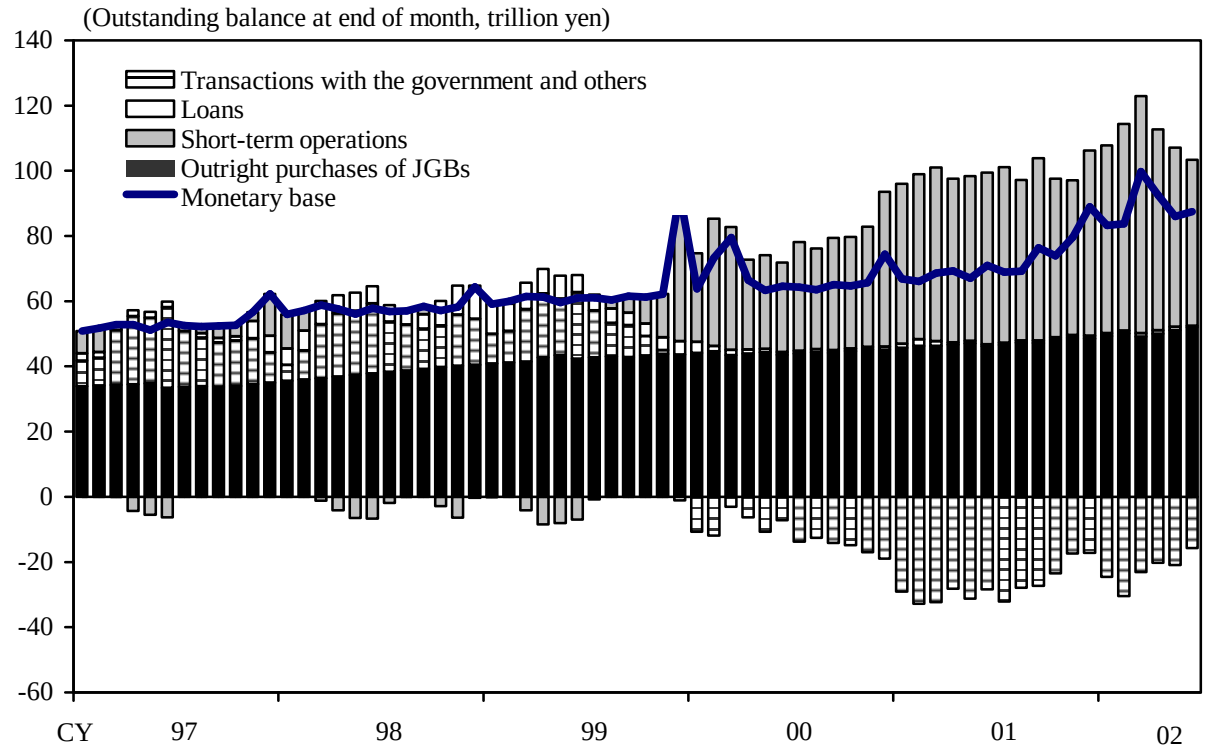


Notes: 1. Amounts are outstanding balances at the end of-fiscal 2001.

2. Short-term operations and transactions with the government and others are after netting assets and liabilities.

Transition of Monetary Base and the Bank of Japan's Transactions

(1) Components of the Bank's Transactions



(2) Components of Short-term Operations

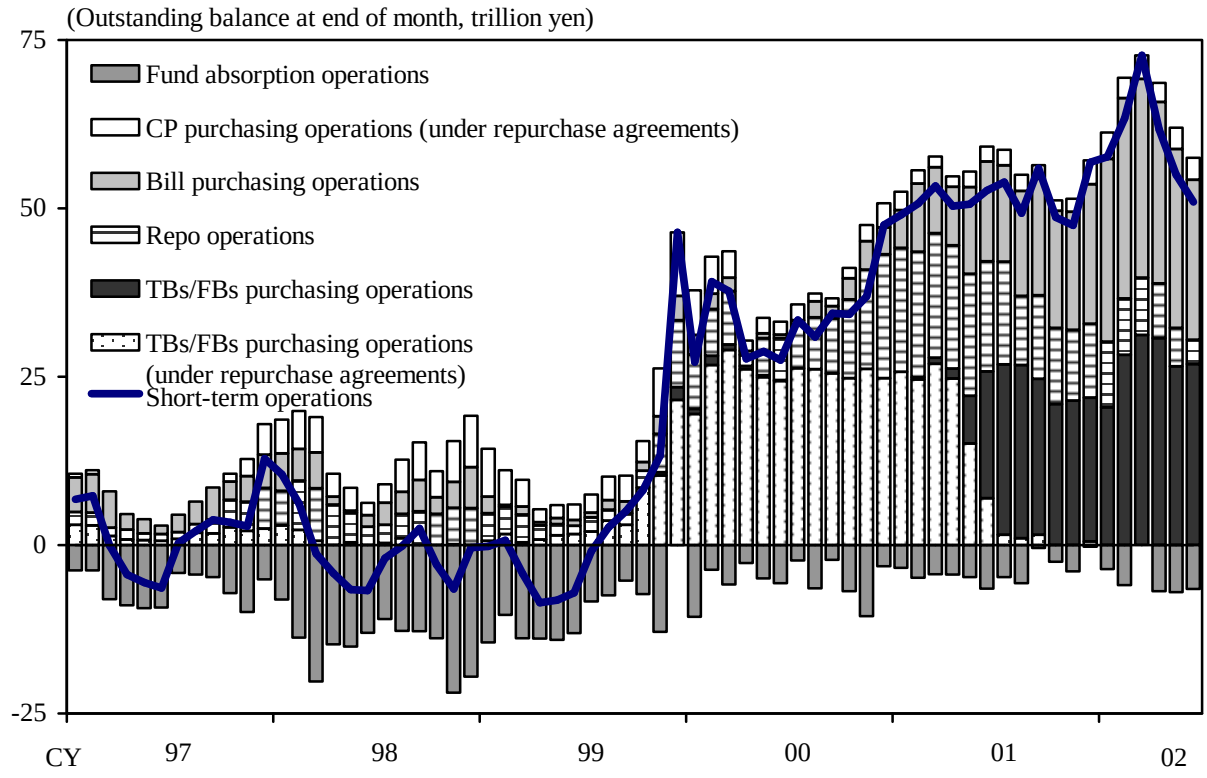


Chart 10

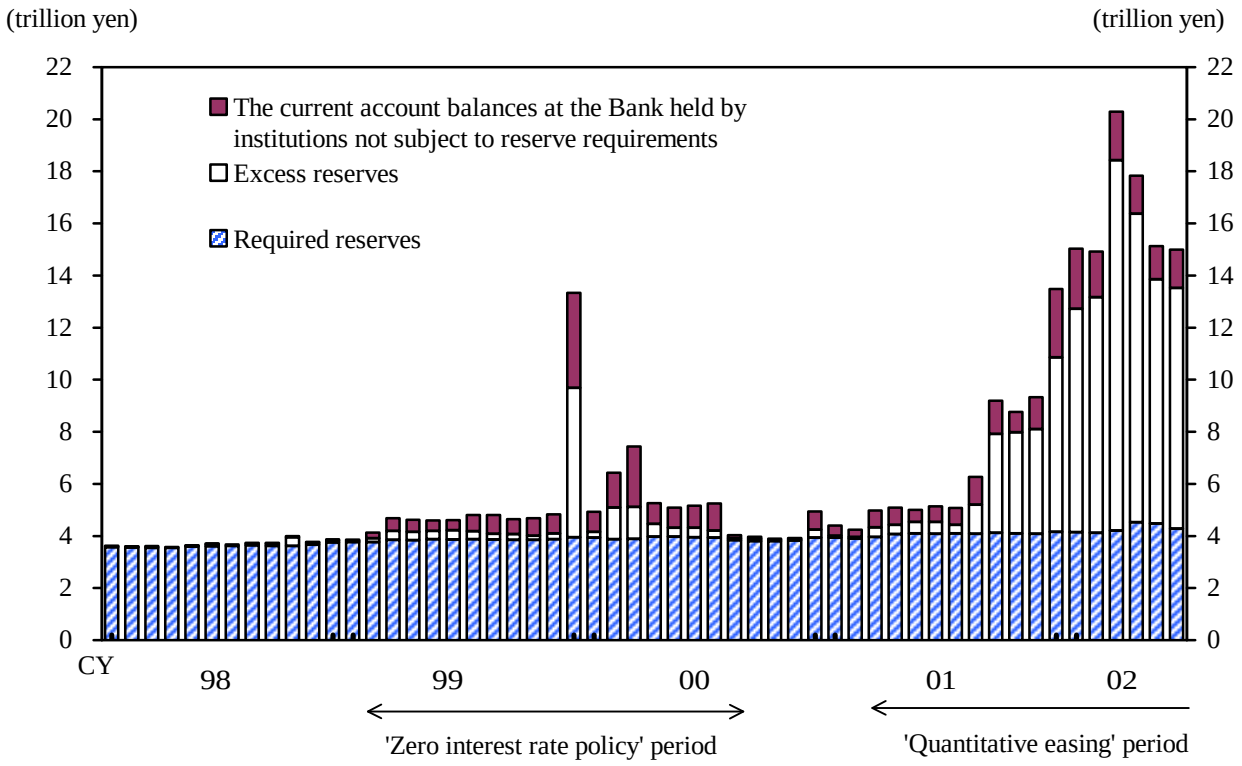
Main Extensions of Money Market Operation Methods
(Since FY1998)

Timing of decision	Contents
Nov, 1998	· Extension of remaining period of CP as instrument of the purchase of CP under repurchase agreements (within 3 months → within 1 year). · Introduction of extraordinary lending system for helping corporate finance . · Introduction of operations with bills collateralized by corporate debt .
Feb, 1999	· Active utilization of JGB repos.
Mar, 1999	· Integration of the purchase/sale of TBs/FBs under repurchase agreements. · Accepting FBs as eligible collateral for a wider range of credit instruments by the Bank.
Sep, 1999	· Accepting asset-backed securities as eligible collateral for outright purchases of utilizing corporate debt obligations. · Discontinuing of debt of account holders at the Bank as eligible collateral.
Oct, 1999	· Introduction of outright purchase/sale of TBs/FBs. · Addition of 2 - year JGBs to instruments of JGB repos. · Expansion of the number of eligible counterparties for JGB repos and the purchase of CP under repurchase agreements (temporary measure until the end of the year) . · Accepting US Treasuries as eligible collateral for loans on bills (temporary measure to counter Y2K problems).
Apr, 2000	· Introduction of ' direct method' (not through money market brokers) of the purchase/sale of bills. · Introduction of the purchase of bills at the head office and the purchase of bills at all offices. · Integration of the purchase of bills utilizing corporate debt obligations on deeds into the purchase of bills. · Pooling collateral for the purchase of bills and collateral for intraday overdrafts, etc.
Oct, 2000	· Integration of ' guidelines on eligible collateral'. Unification of official discount rates.
Feb, 2001	· Introduction of 'Lombard-type' lending (complementary lending facility). · Active utilization of the outright purchase of TBs/FBs.
May, 2001	· Extension of the maturity date for bills purchased (within 3 months → within 6 months) · Increasing the number of eligible counterparties in the purchase of bills at bank's head office (30 → 40). · Introduction of smaller units for bid rates in auctions (0.01 % → 0.001%) · Expansion of the range of JGBs for the outright purchase of JGBs (adding 2-,4-,5-,6- year bonds)
June, 2001	· Reform of 'Lombard-type' lending (electronic loans, pooling of collateral, etc.)
Aug, 2001	· Increasing the outright purchase of JGBs (400 billion yen per month → 600 billion yen per month) .
Sep, 2001	· Temporary increase in the number of business days for use of 'Lombard-type' lending where the official discount rate is applied (in the reserve maintenance period of September)
Dec, 2001	· Active utilization of the purchase of CP under repurchase agreements. · Addition of ABCP as instrument and eligible collateral for the purchase of CP under repurchase agreements.. · Enlargement of the range of eligible collateral adding asset-backed securities. · Increasing the frequency of the purchase of bills at all offices. · Increasing the number of participants due to the abandonment of offering in rotation. · Increasing the outright purchase of JGBs (600 billions yen → 800 billions yen).
Jan, 2002	· Enlargement of objective range of the purchase of JGBs (partly adding JGBs within 1 year after issue). · Occasional selection of the counterparties of the outright purchase of bills (once per month to all year), etc.
Feb, 2002	· Accepting loan credits to the Deposit Insurance Corporation and to the special account of local allocation taxes as eligible collateral. · Temporary increase in the number of periods to apply 'Lombard-type' lending and official discount rate (3/1-4/15). · Increasing the outright purchase of JGBs (800 billion yen → 1 trillion yen)

Note: This table is based on the timing of decisions, and may differ from operating periods.

Chart 11

Components of the Current Account Balances at the Bank of Japan

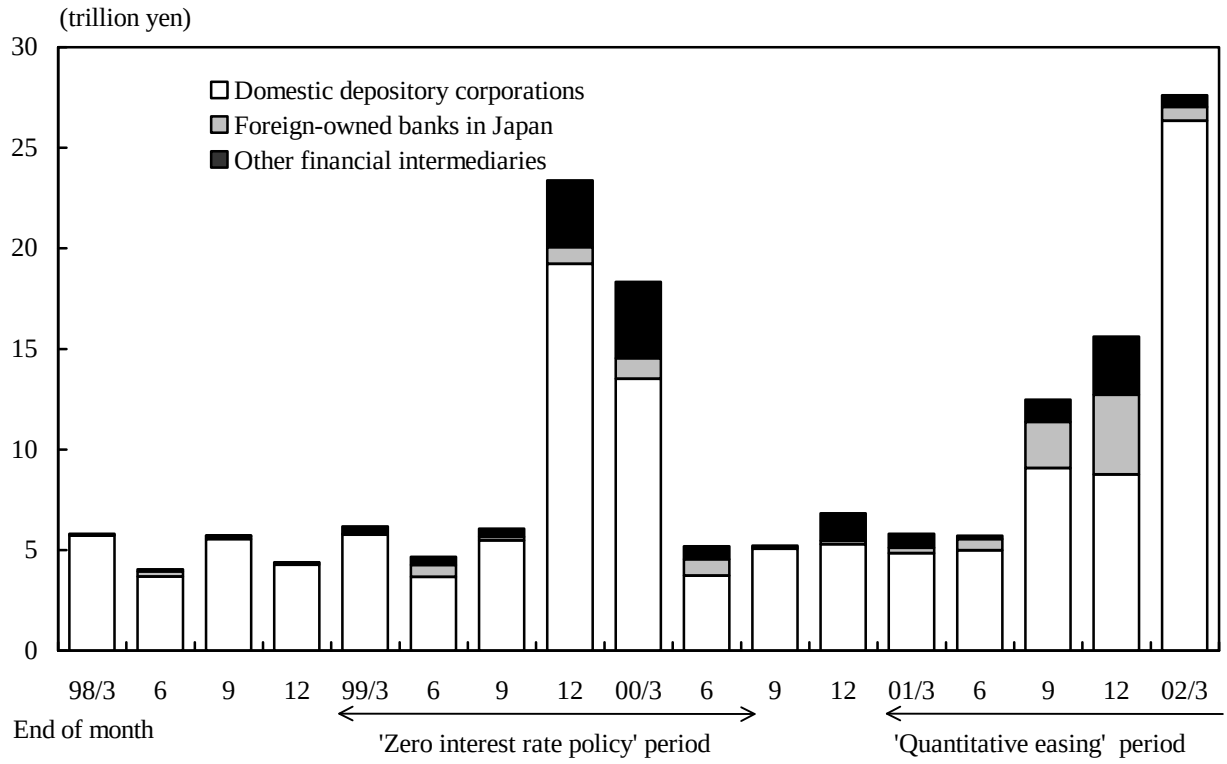


Note: Each month indicates a reserve maintenance period (from 16th of one month to the 15th of the following month).

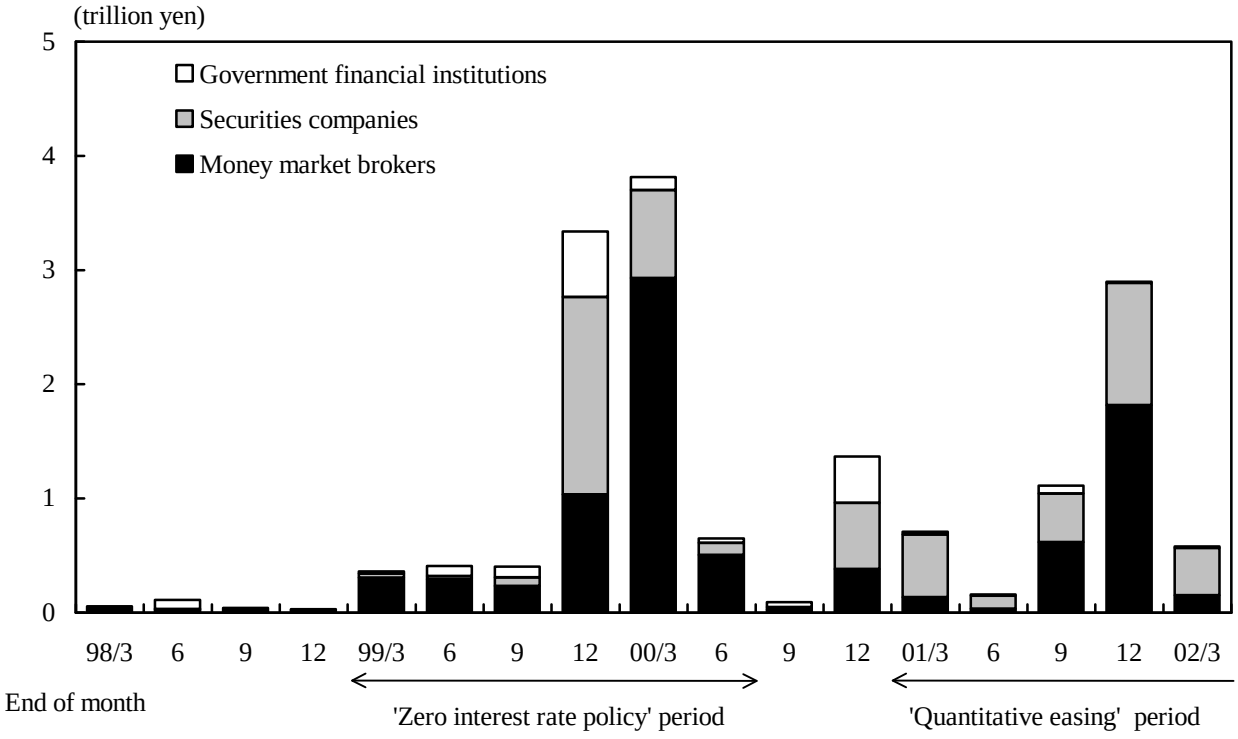
Components of the Current Account Balances at the Bank of Japan

—— Decomposition by holders ——

(1) Components of Total Current Account Balances



(2) Components of the Current Account Balances held by Other Financial Intermediaries

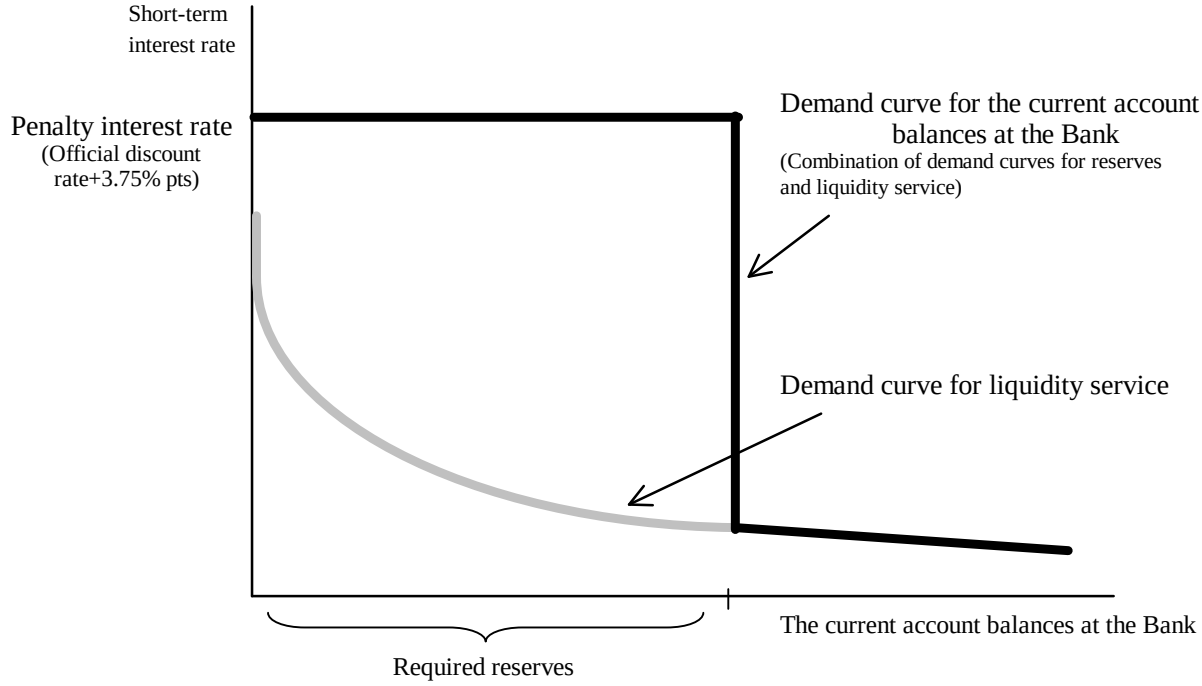


Source: Bank of Japan, "Flow of Funds Accounts".

Chart 13

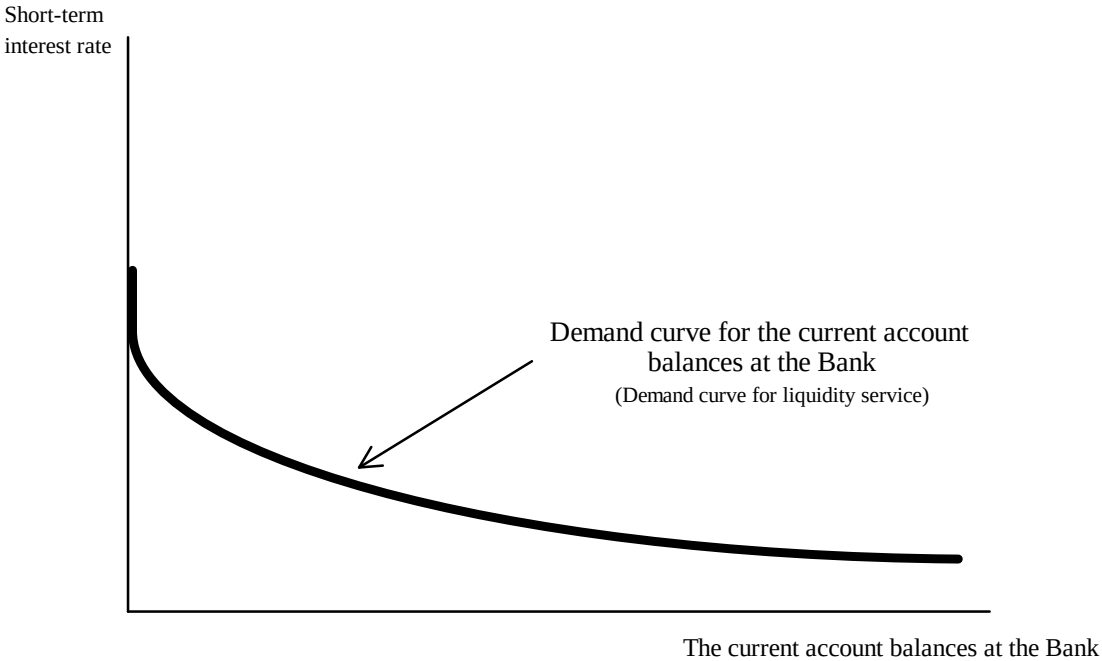
Demand Curve for the Current Account Balances at the Bank of Japan

(1) Case of Financial Institutions subject to Reserve Requirements

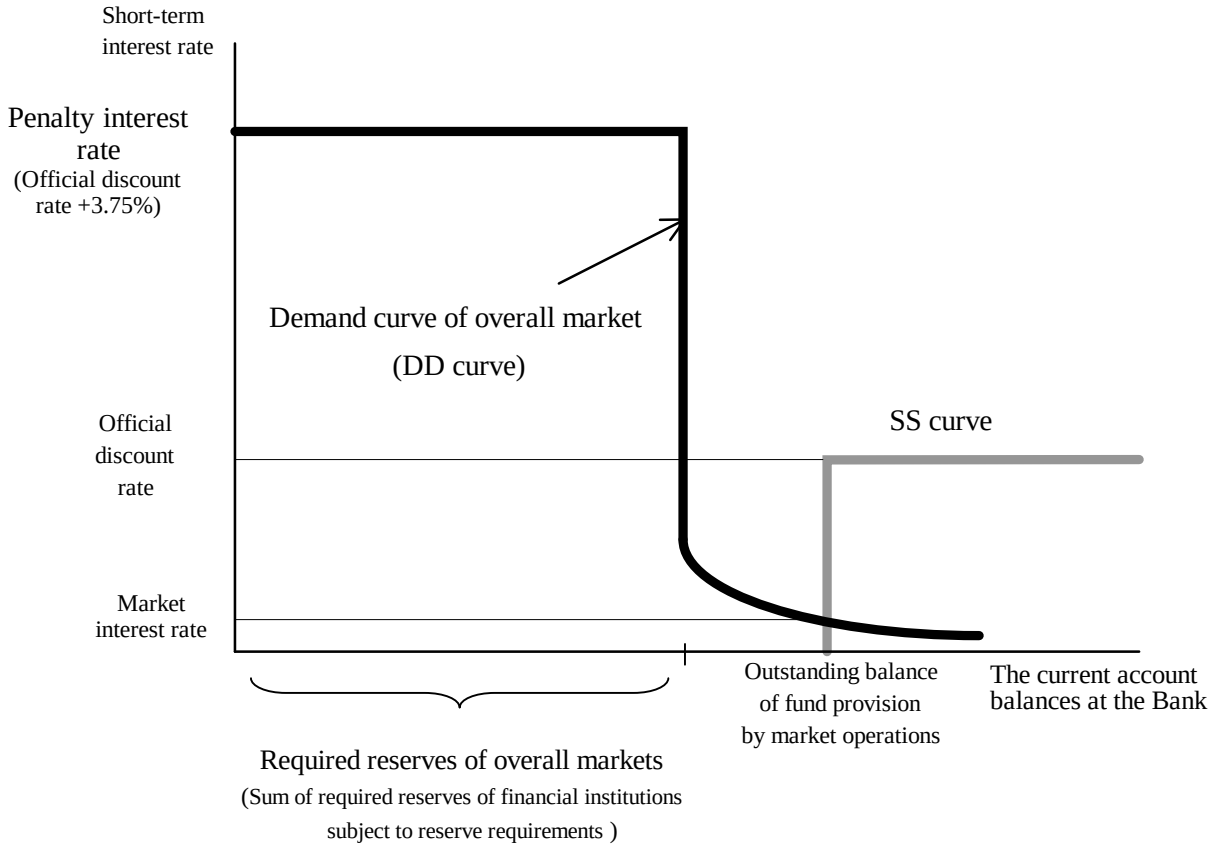


Note: If an institution fails to meet the reserve requirement, the shortfall is subject to a penalty interest rate (3.75 percentage points per annum above the official discount rate).

(2) Case of Financial Institutions Not subject to Reserve Requirements



(3) Overall Market



(4) The Case of Increase of Fund Demand (cf. End Day of Fiscal Year)

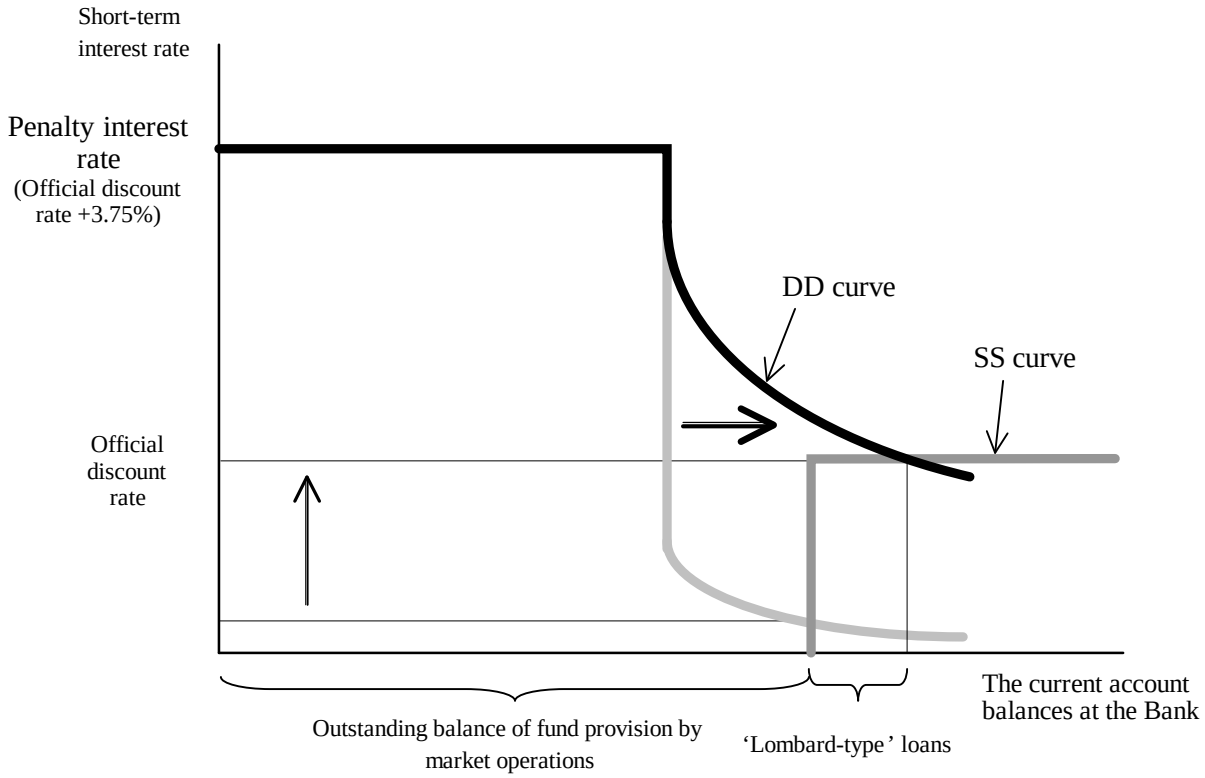
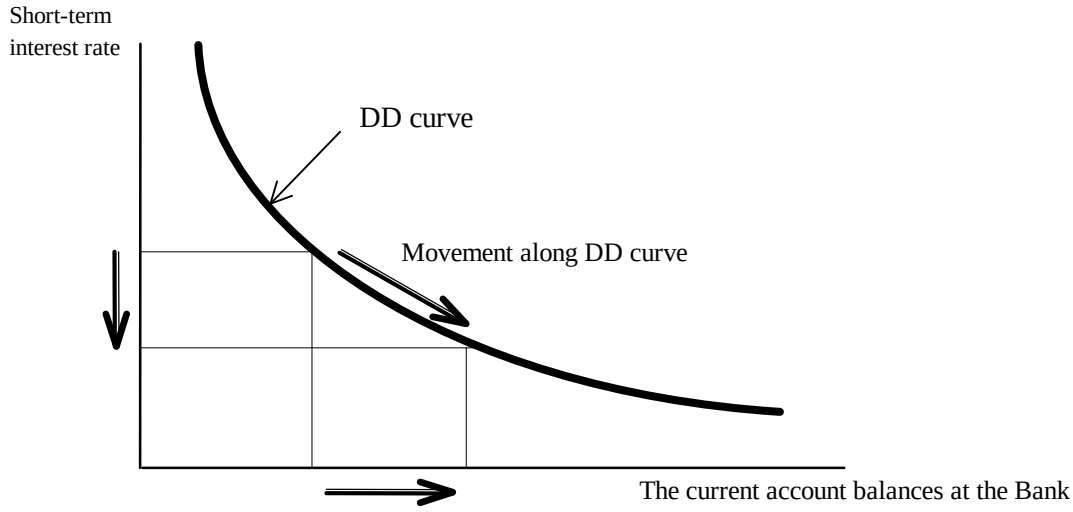


Chart 14

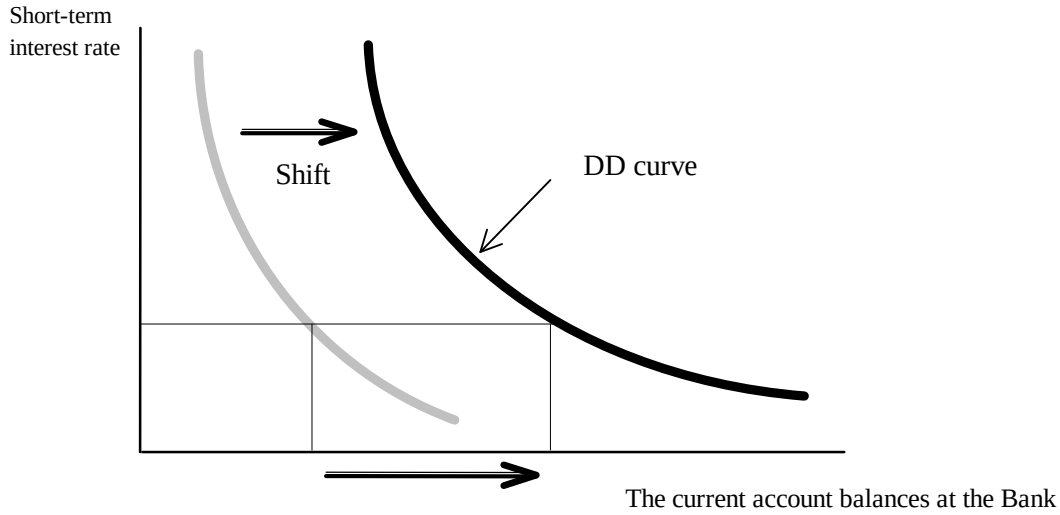
Determinants of Demand for the Current Account Balances at the Bank of Japan

(The range where demand is over reserve requirements)

(1) Levels of Short-term Interest Rates



(2) Levels of Transaction Amounts·Anxiety about Liquidity



(3) Inactive Market Transactions

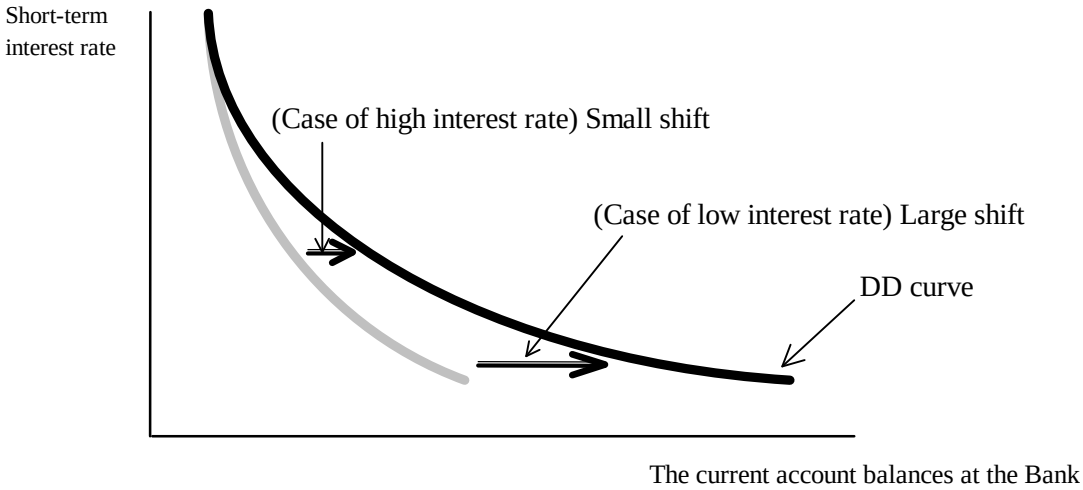
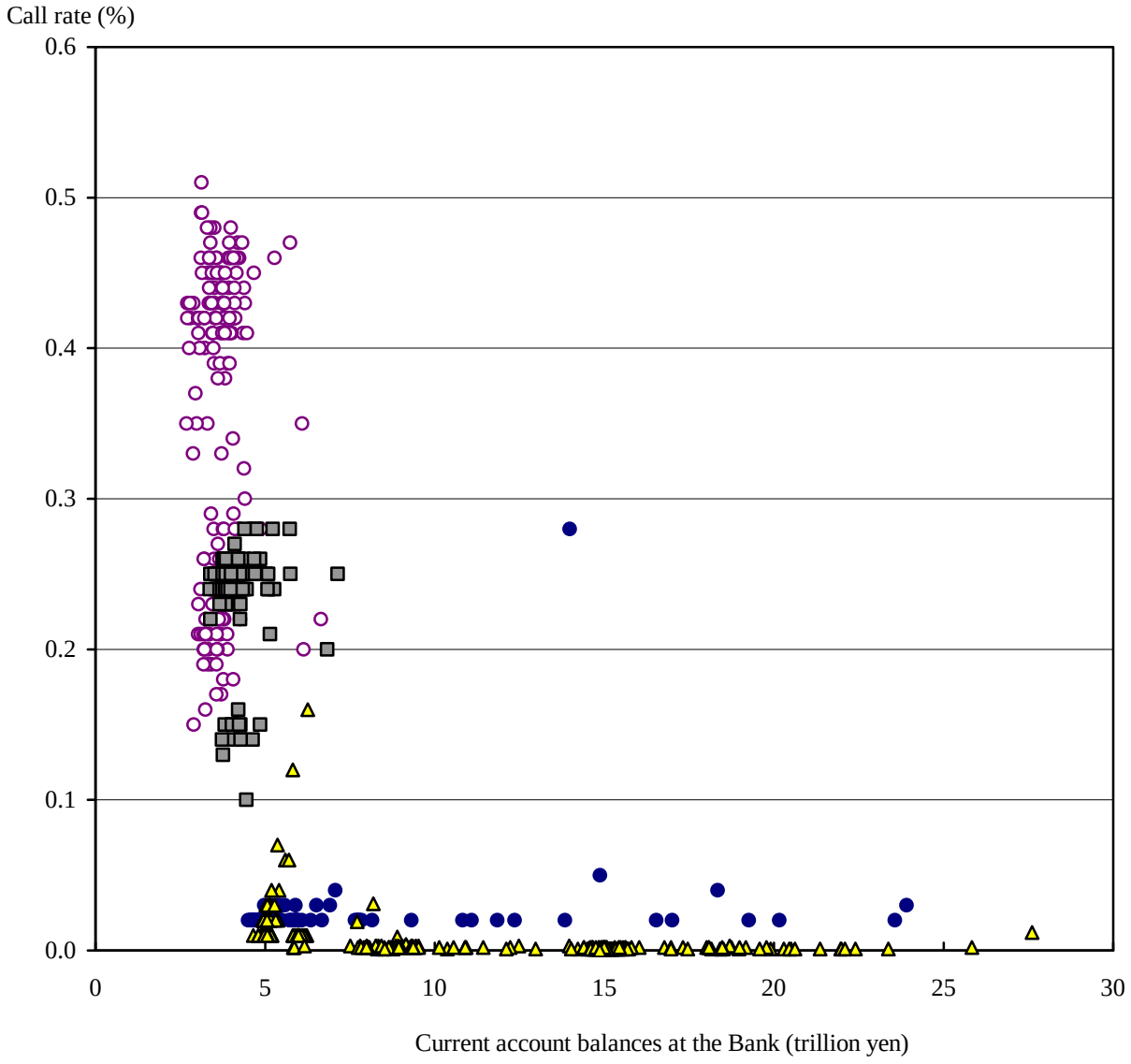


Chart 15

Relationship between Call Rate and the Current Account Balances at the Bank of Japan (since April 1998, Daily)



- ○ Before 'Zero interest rate policy' : 1 Apr 98 - 10 Feb 99 (Required reserve 3.6 trillion yen)
- ● 'Zero interest rate policy' period :12 Feb 99-11 Aug 00 (Required reserve 3.9 trillion yen)
- ■ After ending 'Zero interest rate policy' :14 Aug 00-19 Mar 01 (Required reserve 3.9 trillion yen)
- △ 'Quantitative easing' period :21 Mar 01-15 Jul 02 (Required reserve 4.1 trillion yen)

Chart 16

Outstanding Balance of the Call Market

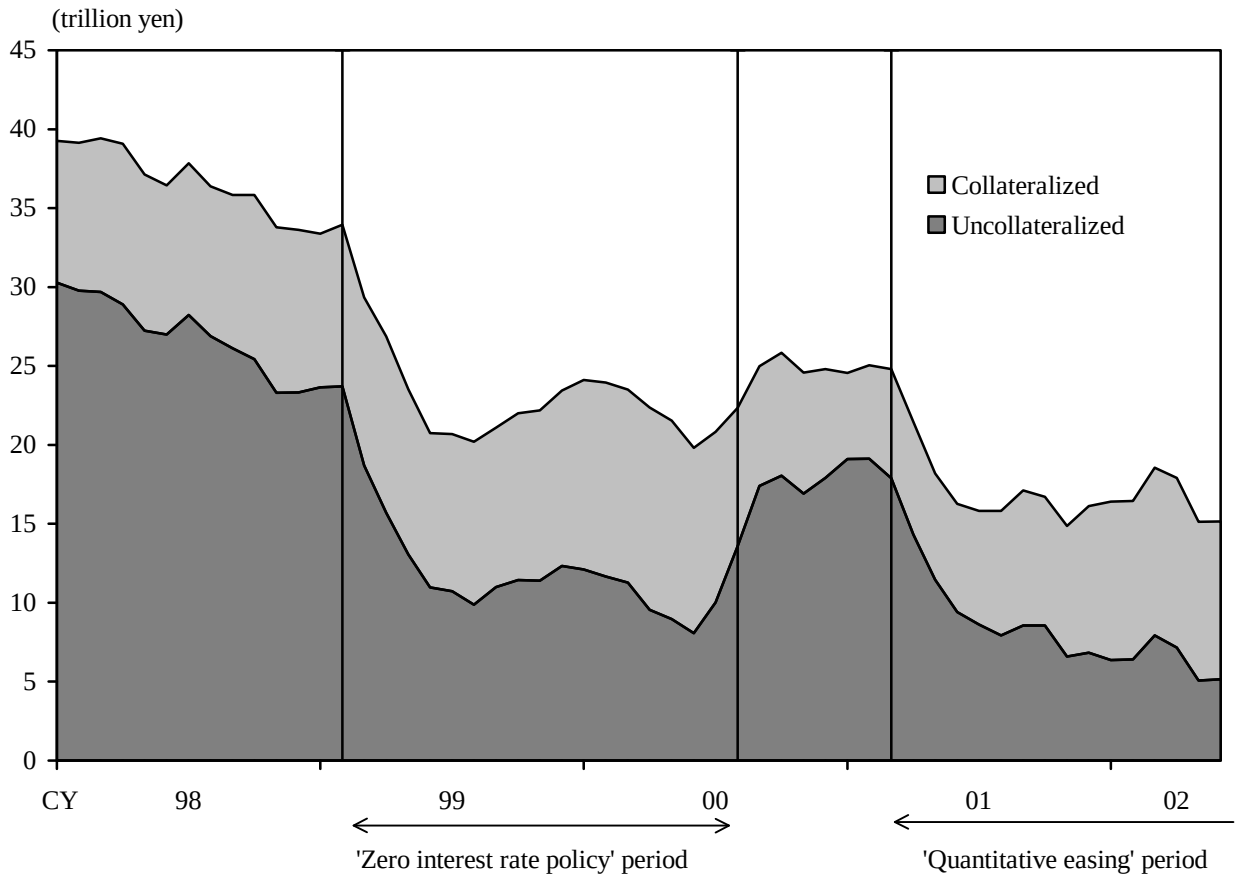
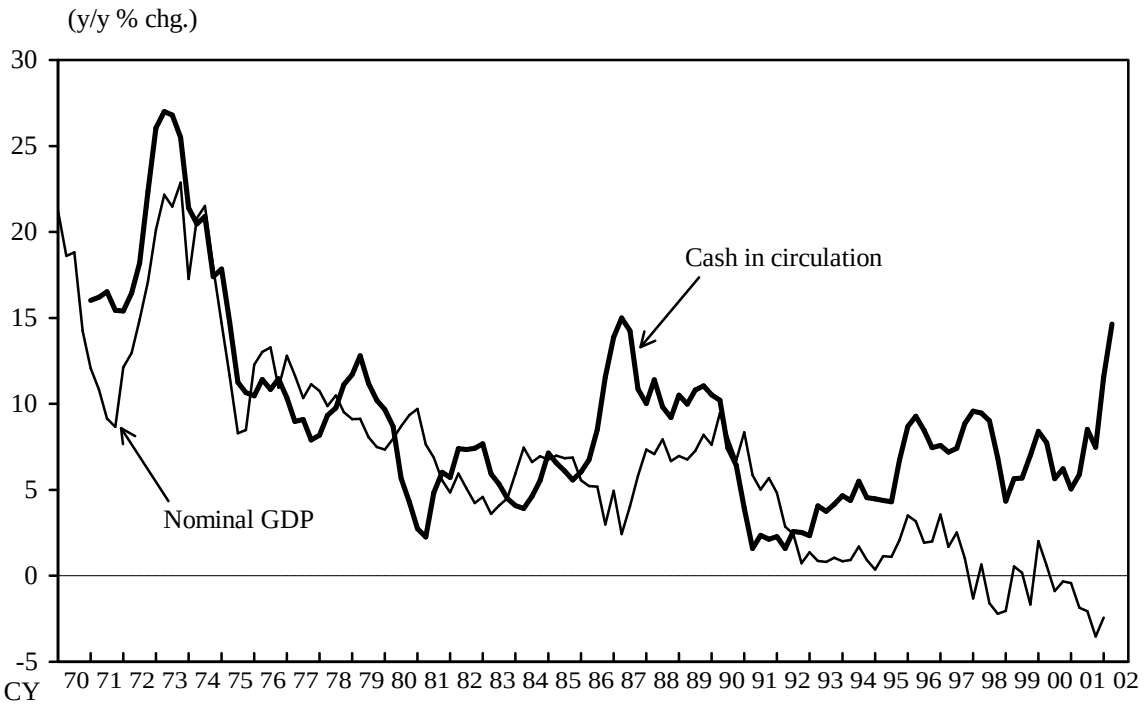


Chart 17

Nominal GDP, Cash in Circulation, Deposit Rate

(1) Nominal GDP and Cash in Circulation



(2) Ratio of Cash in Circulation to Nominal GDP, Deposit Rate

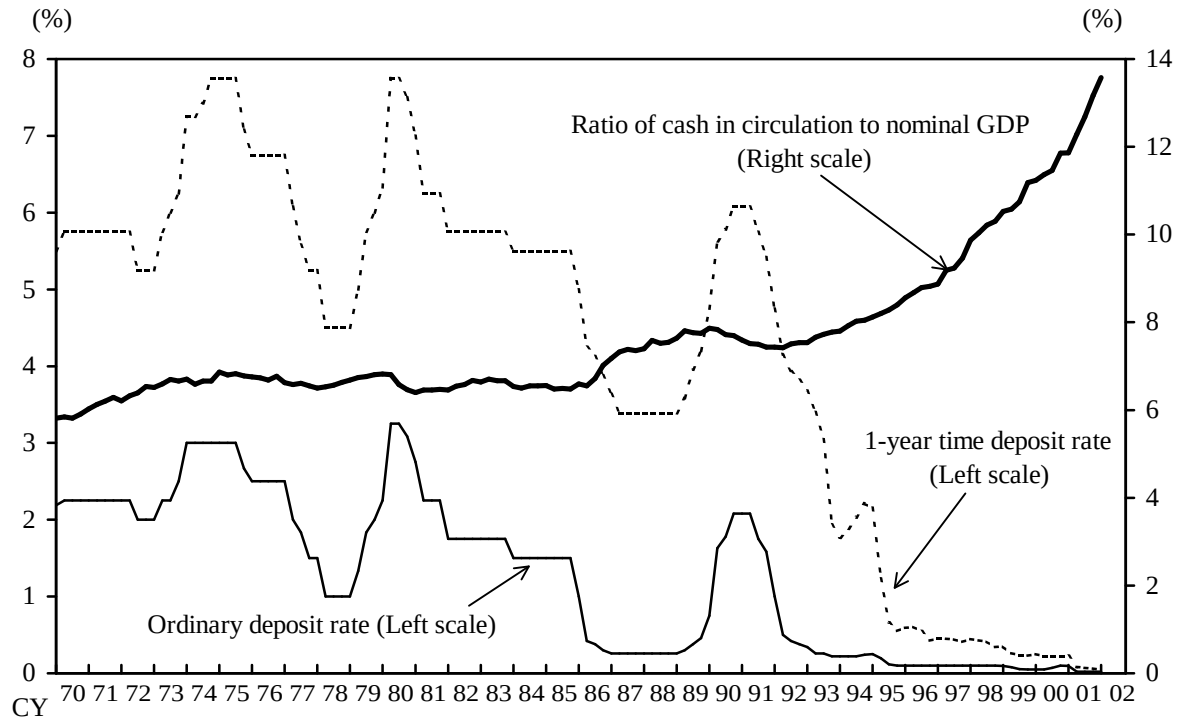
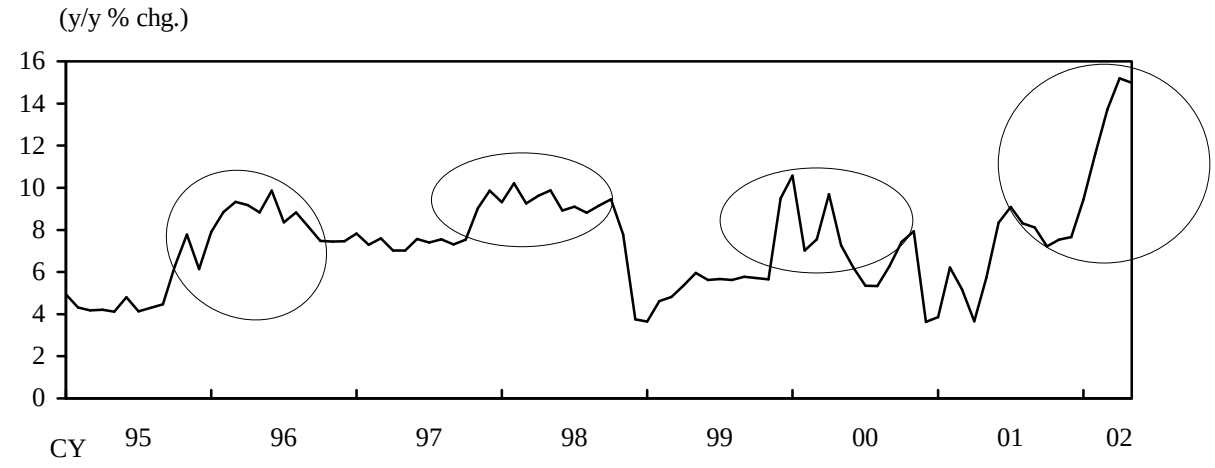


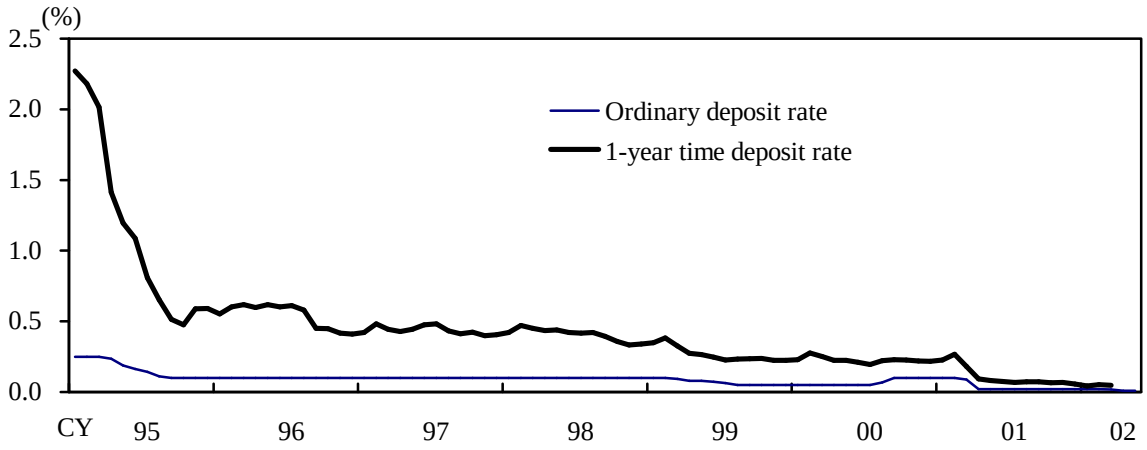
Chart 18

Increase Rate of Cash in Circulation

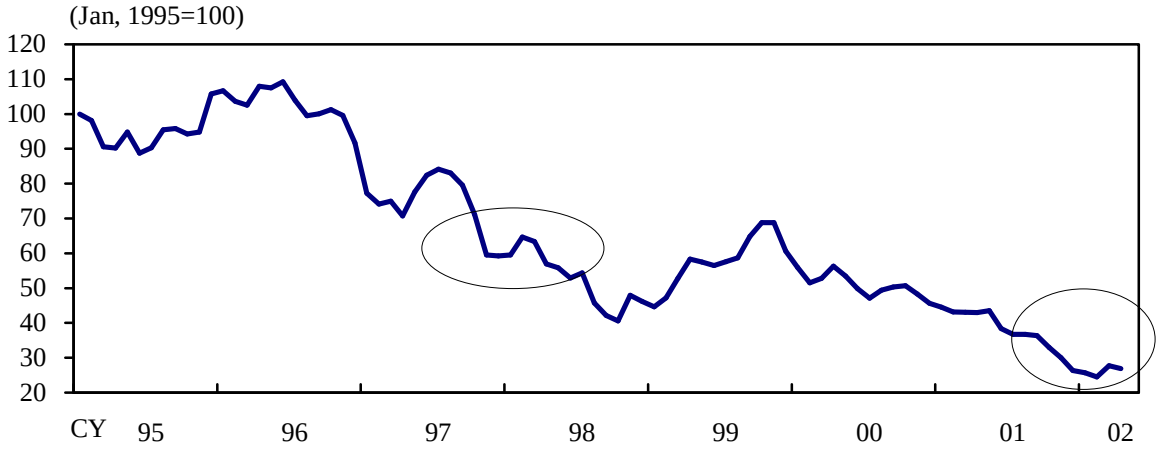
(1) Cash in Circulation



(2) Deposit Rate

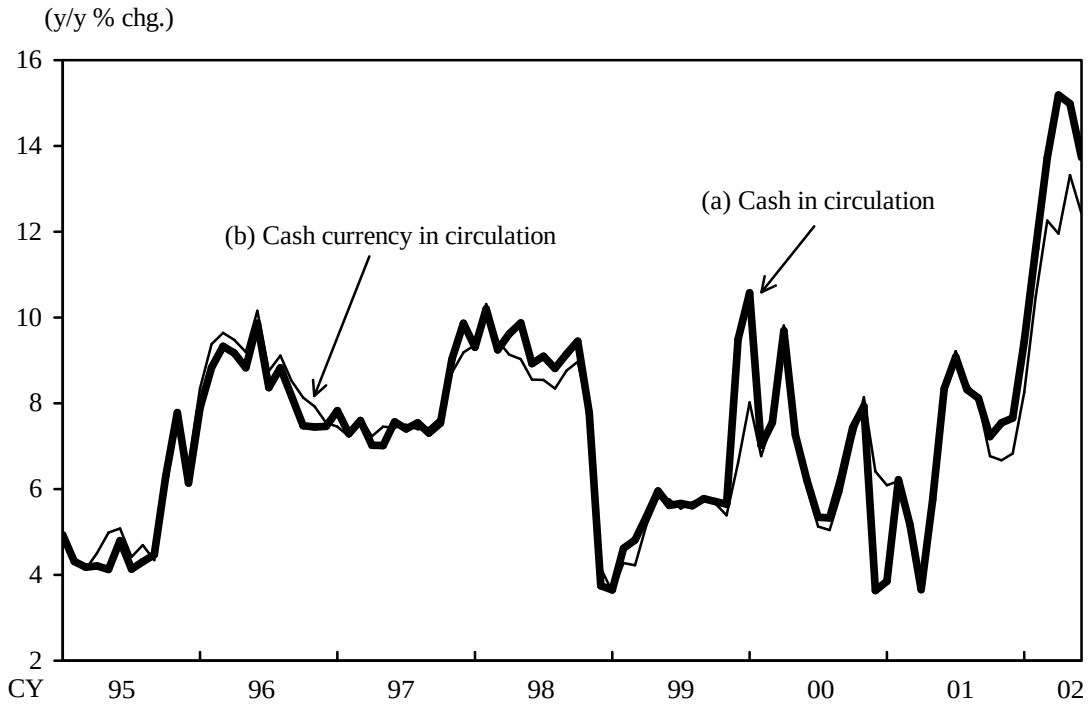


(3) Stock Prices of Banks (TSE, 1st Section)



Comparison of Increase Rates of Cash in Circulation and Cash Currency in Circulation

(1) Cash in Circulation and Cash Currency in Circulation



Note: Cash in circulation is a component of monetary base (including cash held by depository financial institutions).
Cash currency in circulation is a component of money stock (excluding cash held by depository financial institutions).

(2) Comparison of Year-on-Year Percentage Changes of Cash in Circulation and Cash Currency in Circulation.

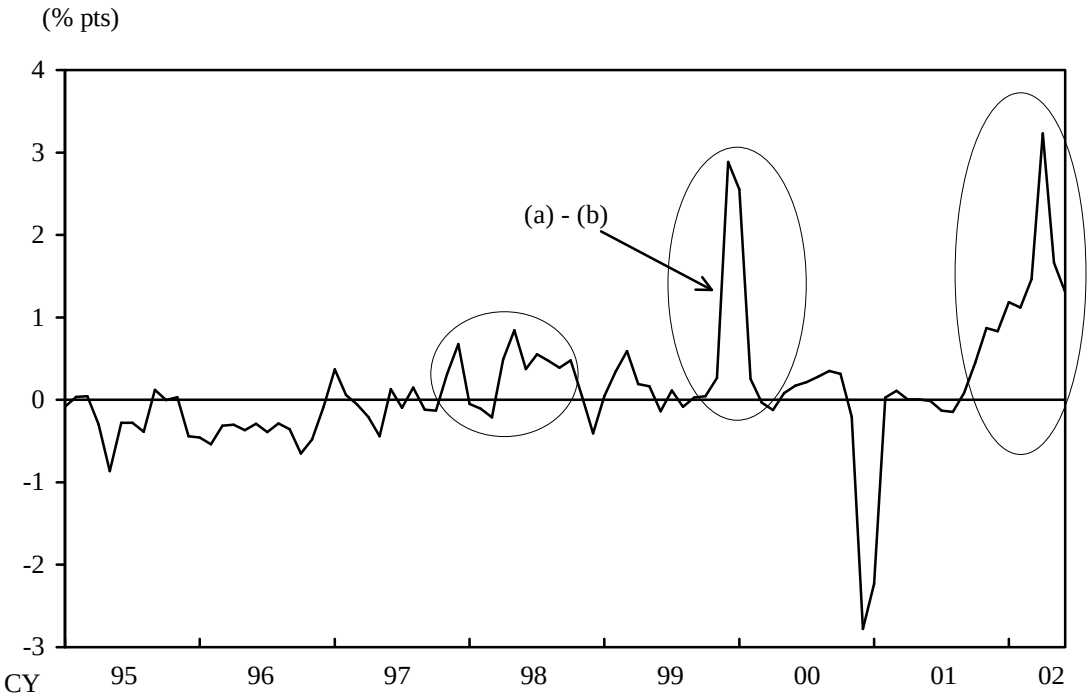


Chart 20

Development of Each Type of Currency

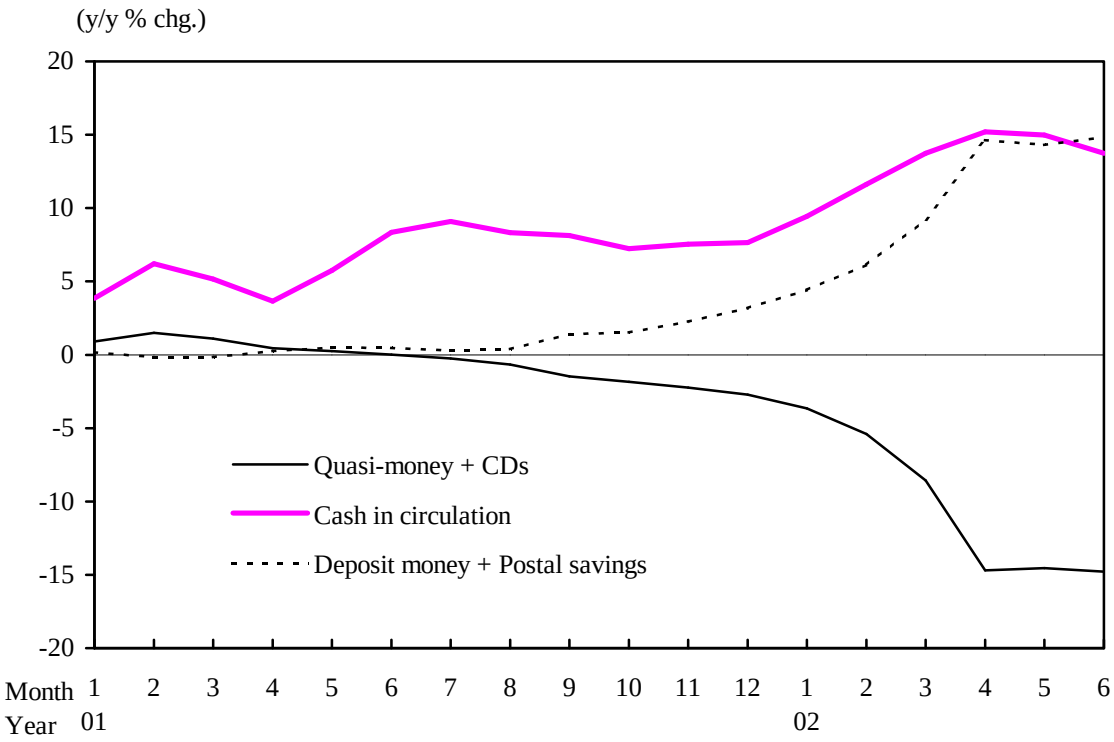
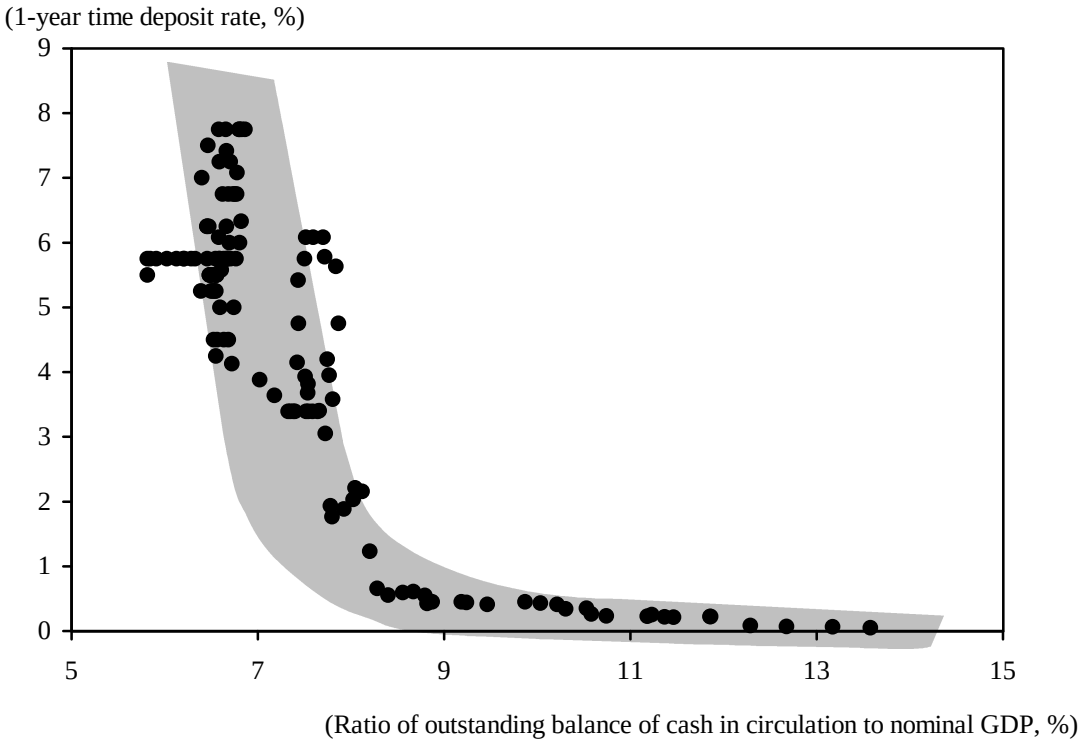


Chart 21

Relationship of Deposit Rate and Outstanding Balance of Cash



Note: Sample period is from 1970/1Q to 2002/1Q.

(Under 1% of Time Deposit Rate)

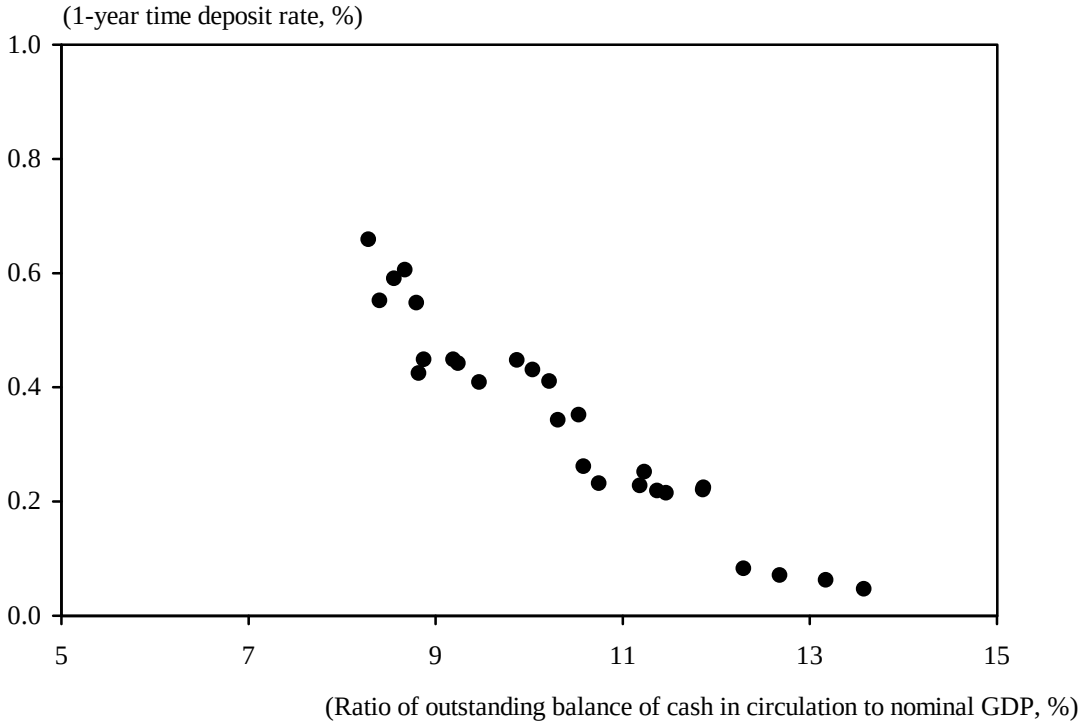
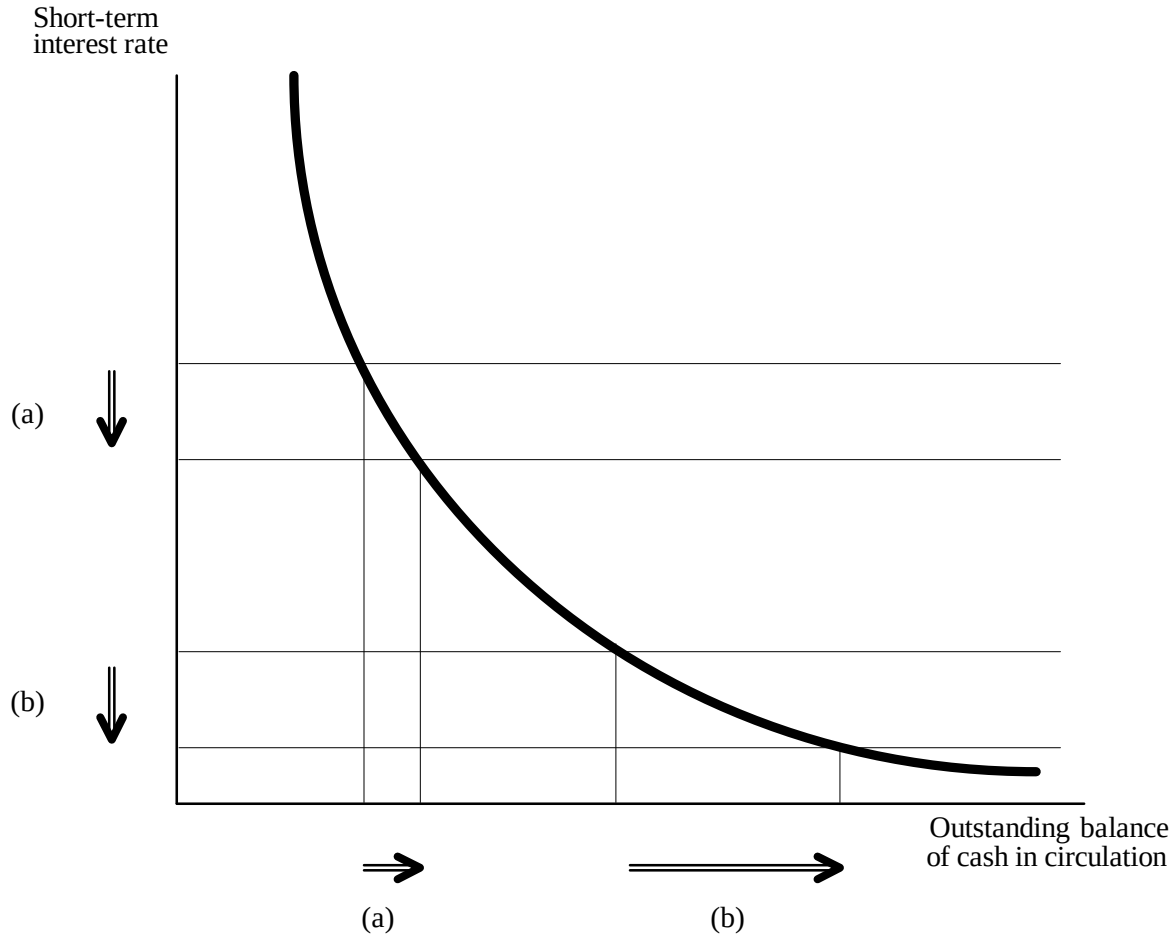


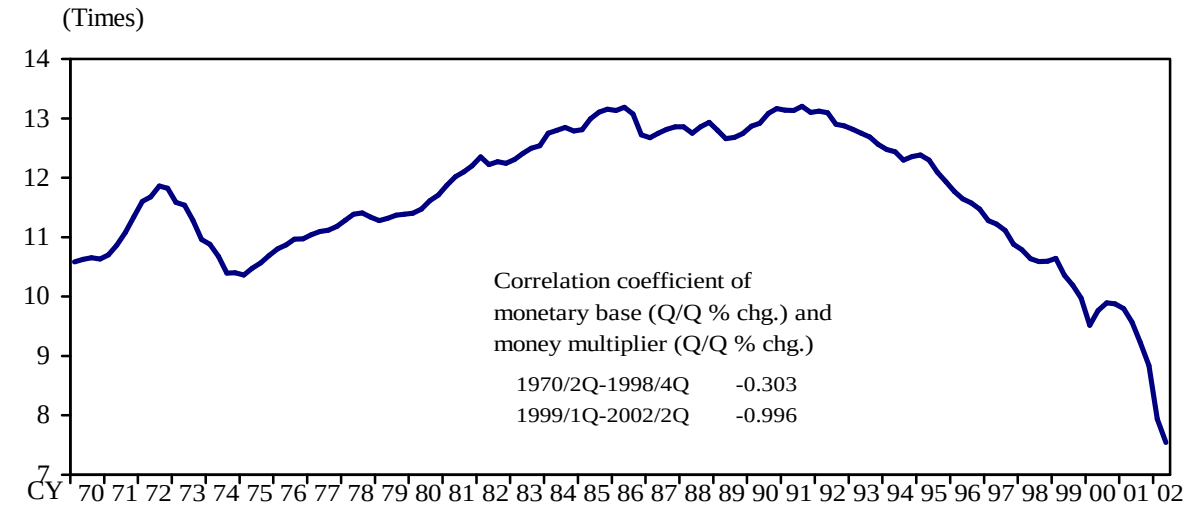
Chart 22

Demand Curve for Cash in Circulation

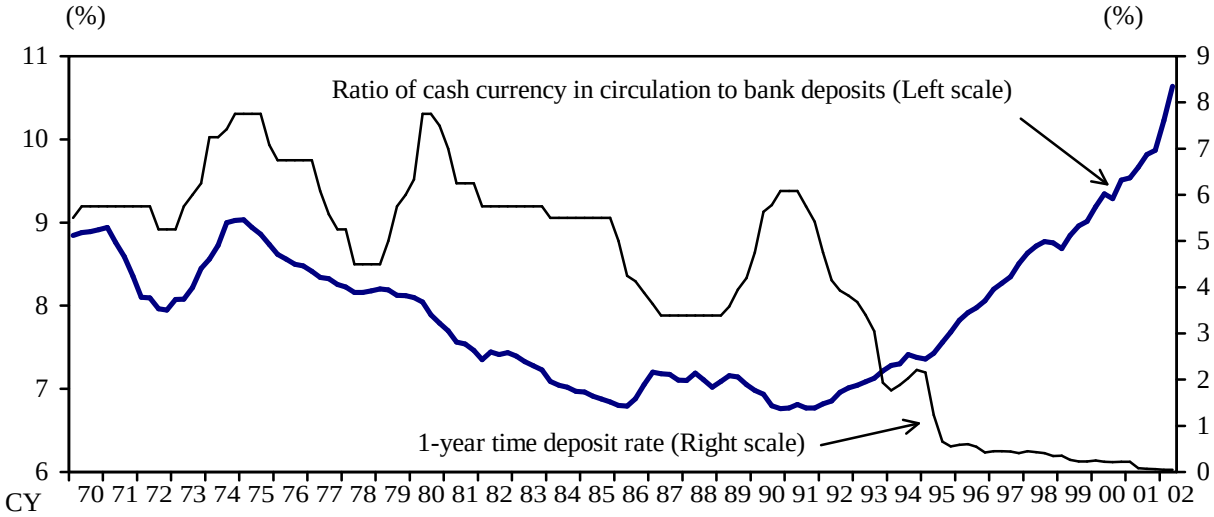


Money Multiplier

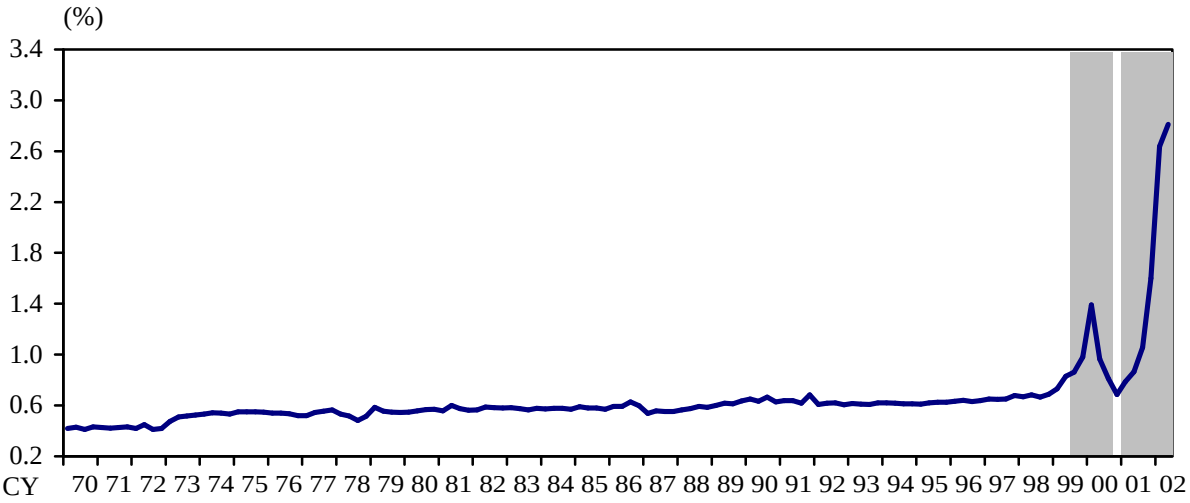
(1) Money Multiplier (M2+CD/Monetary base)



(2) Ratio of Cash Currency in Circulation to Bank Deposits



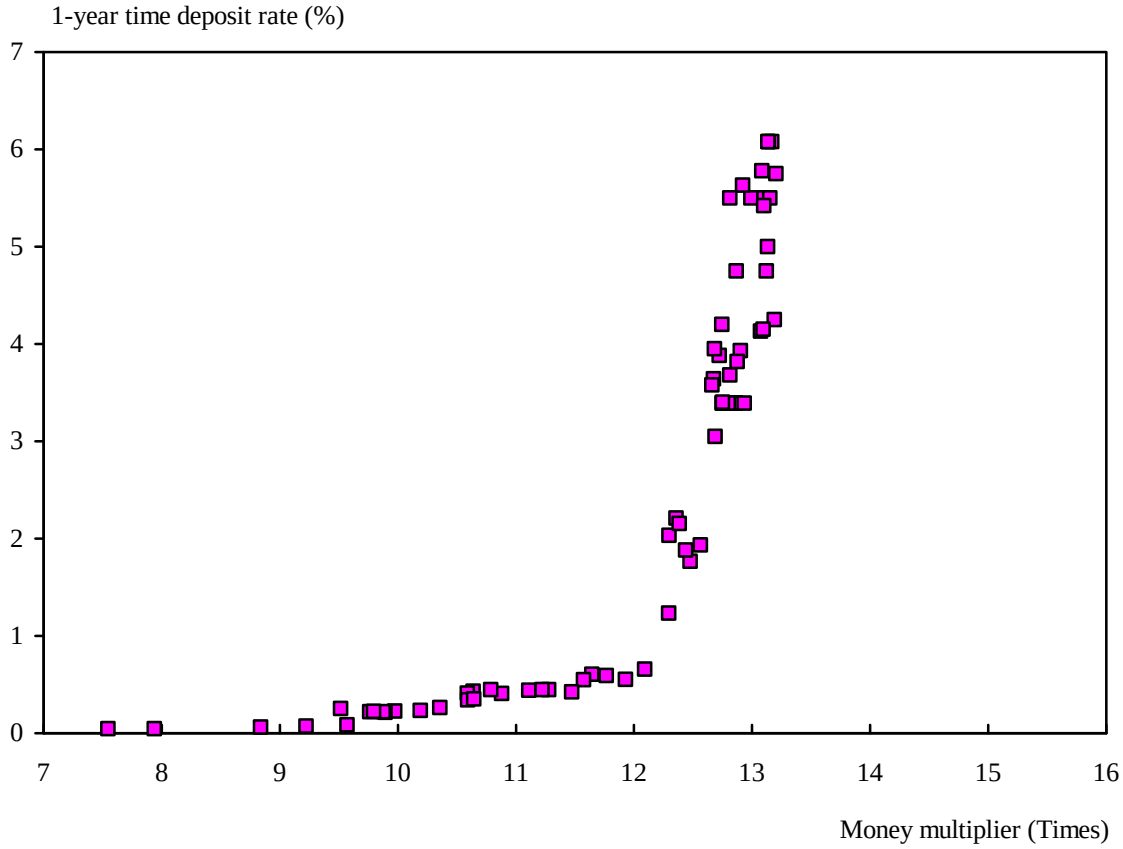
(3) Ratio of the Current Account Balances at the Bank of Japan to Bank Deposits



Notes: Monetary base is adjusted for reserve requirement rate.
Shaded areas represent 'zero interest rate policy' period and 'quantitative easing' period.

Chart 24

Relationship of Money Multiplier and Deposit Rate (since 1985/1Q)



Note: Monetary base is adjusted for reserve requirement rate.