Japanese Monetary Policy and Deflation

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J apan is experiencing deflation. Its price level (measured by the GDP deflator) fell about 10 percent from the end of 1997 to the end of 2002. The Bank of Japan (BoJ) possesses the power to end deflation and restore price stability by creating money. To do so, the BoJ needs to adopt a policy of active reserves creation where reserves creation depends upon misses of a target either for money growth or for the price level. With its present policy of demand-driven reserves creation, the BoJ limits reserves creation to the amount of reserves demanded by banks. The high level of reserves held by banks does not indicate an aggressive BoJ policy of reserves provision. The BoJ has only accommodated the increased demand for excess reserves by banks produced by a zero short-term interest rate.

The sole focus of political pressures on the composition of the BoJ's asset portfolio, in particular, on the purchase of nontraditional assets such as stocks and long-term government bonds (JGBs), is misplaced. In the absence of a strategy that makes the amount of bank reserves vary to control money and prices—for example, to eliminate misses in a target for the price level—the acquisition of such assets is comparable to sterilized foreign exchange intervention. Their purchase affects the composition of the public's asset portfolio without increasing bank reserves and money in a way that forces the portfolio rebalancing that stimulates expenditure.

According to popular commentary, monetary policy is impotent to stop deflation. One argument made is that the transmission mechanism linking central bank reserves creation to money and credit creation has been severed. Lacking opportunities to lend, banks hold whatever liquidity the central bank provides as excess reserves. Another argument is that at a zero interest rate a

limitless demand for money (a liquidity trap) causes the public to absorb any increase in money rather than spend it.[1]

I dispute these arguments below. Even with zero short-term interest rates, the BoJ can control money creation. Money creation combined with the considerable stability of money demand in Japan will stimulate expenditure. However, to do so, the BoJ must abandon its current policy of market-determined reserves creation that limits reserves to amounts demanded by banks.

In discussing Japanese monetary policy, newspapers make statements like the BoJ's "arsenal of traditional tools [has been] rendered largely ineffective" (*New York Times,* 9 April 2003). Such misperceptions arise from a lack of understanding of basic principles of central banking. For this reason, I review these principles.

In "The Nature of a Central Bank" (Section 1), I explain that a central bank is a creator of money, not a financial intermediary. In "How a Central Bank Controls the Money Stock" (Section 1), I explain money stock determination when the central bank uses an interest rate instrument. Even with an interest rate instrument, central bank control over expenditure derives from its control over reserves creation. When short-term interest rates become zero, the central bank should shift to a strategy of explicit reserves targeting to retain control over expenditure. The BoJ has not made that transition.

Section 1 continues with an explanation of money stock determination with a reserves instrument. With a zero short-term interest rate, the aggregate the central bank must control becomes the monetary base plus government securities yielding zero interest. Section 2 reviews the current BoJ operating strategy. Sections 3 and 4 examine the behavior of money demand. Sections 5 and 6 discuss strategies for ending deflation. Section 7 deals with issues of political economy, and Section 8 argues that current monetary policy procedures leave the Japanese economy unable to adjust to adverse shocks.

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[1] The current debate over Japanese monetary policy replays the old debate over whether the Federal Reserve System had the power to end deflation in the Great Depression. Milton Friedman (1956, 17) stated the quantity theory view challenging arguments of central bank impotence:

> The quantity theorist...holds that there are important factors affecting the supply of money that do not affect the demand for money....The classical version of the objection under this head to the quantity theory is the so-called real-bills doctrine: that changes in the demand for money call forth corresponding changes in supply and that supply cannot change otherwise....

> The attack on the quantity theory associated with the Keynesian underemployment analysis is based primarily on an assertion about the [demand for money]. The demand for money, it is said, is infinitely elastic at a "small" positive interest rate. At this interest rate...changes in the real supply of money...have no effect on anything. This is the famous "liquidity trap."

1. HOW THE BOJ CAN CONTROL MONEY CREATION AND YEN EXPENDITURE

An understanding of how a central bank controls money begins with an understanding of the nature of a central bank.

The Nature of a Central Bank

A central bank is not a commercial bank. It creates money rather than intermediates between savers and investors. This distinction is critical because popular commentary dwells on the supposed responsibility of the BoJ to control financial intermediation rather than money creation. Such commentary leads to the misplaced conclusion that the BoJ should concentrate on the structural reform of the financial system. For example, Koll (*Asian Wall Street Journal,* 26 February 2003) turns monetary theory on its head:

> By giving bankers a free ride, the BoJ's zero-rate policy is a root cause of Japan's fundamental problems—excess capacity, excess debt and excess employment. And by preventing a market-based destruction of excess capacity, the BoJ's zero-rate policy has significantly contributed to Japan's deflationary problem.... The key task is to raise interest rates.... Excess capacity would quickly be cut back.

Commercial banks are financial intermediaries. They acquire the debt of businesses, consumers, and government by issuing their own debt (deposits). Banks make loans and issue deposits up to the point where the marginal return from lending equals the marginal cost of borrowing. They create a broad market for their own debt (deposits) by making it liquid through a guarantee of the par (dollar, yen) value of their deposits. They also provide payment services through the transfer of ownership of deposits.[2] Although banks bundle their intermediation and payment services, they are conceptually distinct.[3]

Because a commercial bank acquires assets until the marginal return of lending equals the marginal cost of issuing liabilities, the marketplace limits the amount of liabilities an individual commercial bank creates. Extension of this logic to a central bank is the essence of the real bills fallacy that the market

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[2] As Goodfriend (1990) explains, banks bundle both financial intermediation and payment services because both involve the assessment of credit risk. Because the transfer of ownership of deposits does not occur in real time, but rather involves float or temporary credit extension between institutions, the provision of payments services involves credit evaluation.

[3] During the Depression, several economists (Henry Simons, Lauchlin Currie, and Irving Fisher) advocated 100 percent reserves requirements. That is, the only assets that banks could hold were currency. Banks would provide only payment services. Other financial institutions would issue debt to provide for financial intermediation.

limits central bank asset acquisition and base money creation. However, no such market mechanism exists to limit the issuance of central bank liabilities.

The liabilities of a central bank constitute base money (currency and deposits held with it by commercial banks). The central bank controls base money through its asset acquisition. It can then control money creation and the money price of goods—the price level. The failure to understand this responsibility leads to the belief that the central bank is not responsible for deflation. For example, Miller (*Asian Wall Street Journal,* 28 February 2003) writes, "Deflation . . . is not a monetary problem. It's a problem of the fundamental structure of Japanese industry. . . . The problem of deflation . . . is structural overcapacity."

Another fallacy due to the confusion of a central bank with commercial banks is that a central bank must worry about solvency. Otsuma and Chiba (2003) report that "limits on the central bank's capital make it 'impossible' to expand purchases [of equities]." However, central bank insolvency does not entail the same consequences as for a private corporation. The holders of central bank liabilities cannot run it by turning in currency to the central bank and demanding payment. Commercial banks can ask for currency in place of their deposits with the central bank, but the central bank can simply create additional currency. A change in the market value of a central bank's assets produces no change in the dollar (yen) value of its liabilities. A central bank balance sheet is important not as a measure of solvency but rather as a bookkeeping procedure for keeping track of monetary base creation.

With a positive short-term interest rate, a central bank exerts its control over the money stock through its influence over base money creation. Individuals and banks hold base money to arrange for the finality of payment. The public holds currency to make small transactions. Banks hold reserves to accommodate the public's demand for currency and to clear payments with other banks.

The amount of reserves banks demand to clear deposits varies with the amount of those deposits. Although central banks share money creation with commercial banks, their control over base money creation provides them with control over bank deposits and the money stock. Control over money creation endows central banks with control over the dollar (yen) expenditure of the public. The reason is that money creation induces the public to rebalance its portfolio.

Portfolio Balance

Money is one asset in individuals' portfolios. In order for them to be satisfied with the allocation of their assets, all assets must yield the same return adjusted for risk and liquidity. Equation (1), taken from Friedman (1969b), equates the return between money, government bonds, and capital (a proxy for any

illiquid real asset).[4]   The return to money includes the marginal liquidity (nonpecuniary) services yield of money ($MNPS_M$) minus the cost imposed by expected inflation $\left(\frac{1}{P}\frac{dP}{dt}\right)^*$ (or plus the return due to expected deflation). The return to bonds is the marginal liquidity services yield of bonds ($MNPS_B$) plus the explicit interest yield (r_B) and the negative of expected inflation. The marginal real yield on capital is MRY.

$$MNPS_M - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MNPS_B + r_B - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MRY. \quad (1)$$

Purposeful money creation by the central bank not offset by a commensurate price increase causes individuals to rebalance their portfolios. The increase in money lowers the marginal return on money relative to nonmonetary assets by lowering the marginal liquidity services yield on money. When the public attempts to move out of money into nonmonetary assets, it bids up the prices of those assets and lowers their yield. The reduction in yield spurs expenditure.[5]

The fall in yields on nonmonetary assets and the increase in expenditure induce the public to hold a larger real money stock. This equilibrium is temporary because it occurs without a change in the real resources and productive opportunities available to society. Portfolio balance returns only when the price level rises to restore the real money stock to its original value. The limitless ability of a central bank to create money through base money creation allows it to force portfolio rebalancing by the public.[6]

How a Central Bank Controls the Money Stock

Unfortunately, the standard central bank practice of setting a target for the short-term interest rate obscures the fact that central banks control the public's

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[4] "[E]ach dollar is…regarded as rendering a variety of services, and the holder of money as altering his money holdings until the value to him of the addition to the total flow of services produced by adding a dollar to his money stock is equal to the reduction in the flow of services produced by subtracting a dollar from each of the other forms in which he holds assets" (Friedman 1956, 14).

[5] "The key feature of this process is that it tends to raise the prices of sources of both producer and consumer services relative to the prices of the services themselves; for example, to raise the prices of houses relative to the rents of dwelling units, or the cost of purchasing a car relative to the cost of renting one. It therefore encourages the production of such sources (this is the stimulus to 'investment'…) and, at the same time, the direct acquisition of services rather than of the source (this is the stimulus to 'consumption' relative to 'savings')" Friedman (1969a, 255–56).

[6] A central bank is not just one among many institutions in the money market influencing credit flows. The way a central bank controls inflation does not depend upon the myriad, ever-changing institutional arrangements that circumscribe financial intermediation. The credit channel emphasized by Bernanke and Gertler (1995) constitutes part of the transmission mechanism of monetary policy; however, it *propagates* monetary shocks.

nominal expenditure through their control of money creation. I will explain this fact through a discussion of money stock determination relevant to interest-rate-targeting procedures. I will also explain how central banks retain control over expenditure with zero short-term interest rates by moving from interest-rate-targeting to reserves-targeting procedures. The discussion will distinguish between indirect control of the monetary base, which occurs with interest rate targeting, and direct control, which occurs with reserves aggregate targeting.

One can understand how a central bank achieves monetary control when it sets an interest rate target by understanding the discipline imposed by such procedures. This discipline is twofold, corresponding to the nominal and real components of an interest rate. A nominal interest rate measures the intertemporal price of a dollar in terms of dollars. A nominal interest rate of 10 percent represents a promise to pay $1.10 in the future for $1.00 today. Its real kernel is the real interest rate, which measures the intertemporal price of goods in terms of goods.

The nominal interest rate measures the real interest rate using the monetary (dollar) standard, whose value changes with changes in the price level. The nominal interest rate therefore incorporates an expectation of the change in the price level. Two facts are central: Because the central bank determines the inflation rate, it controls the behavior of this expectation. In contrast, the central bank cannot control the level of the real interest rate in a sustained way.

The real interest rate reflects the pattern of relative scarcity produced by the intertemporal distribution of consumption. A higher value of expected consumption in the future relative to current consumption requires a higher real interest rate. The natural rate of interest, MRY_N, is the real rate of interest in the absence of monetary disturbances. Alternatively, it is the real interest rate yielded by the real business cycle core of an economy with perfectly flexible prices. To control inflation, the central bank must respect the working of the price system by moving its interest rate target, $\bar{r}_B$, in a way that tracks the natural rate.

Consider again formula (1) with MRY set equal to MRY_N and r_B equal to the central bank's interest rate target, $\bar{r}_B$:

$$MNPS_M - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MNPS_B + \bar{r}_B - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MRY_N. \quad (2)$$

The central bank must move its interest rate peg, $\bar{r}_B$, in line with movements in the natural rate, MRY_N. For example, if it fails to raise its rate peg $\bar{r}_B$ in line with a rise in the natural rate, it creates base money and money. This money creation makes the marginal nonpecuniary services of money, $MNPS_M$, fall and the first two terms of (1) become less than the last. The public will rebalance its portfolio by moving out of money into illiquid assets.

The resulting rise in the price of illiquid assets stimulates current consumption, and a rise in current consumption relative to expected future consumption restrains the rise in the real rate relative to the rise in the natural rate.[7] However, a central bank does not stockpile the resources necessary to run a commodity stabilization scheme for the real interest rate. If not subsequently offset, the monetary emissions created by transitory divergences between the real rate and the natural rate force changes in the price level.

Central banks perform the ongoing task of tracking the natural rate by raising their rate peg relative to its prevailing value when economic growth strengthens relative to trend, and conversely. A prerequisite for performing this task is to stabilize expected inflation at a value equal to the central bank's inflation target. If the central bank does not tie down the public's expectation of inflation, the behavior of its rate peg becomes a loose cannon.

To summarize, with an interest rate target, to control the nominal money stock in a way that achieves predictable control of the price level, the central bank must fulfill two conditions. Monetary policy must be credible: the public's expectation of inflation must correspond to the central bank's inflation target, $\left[\left(\frac{1}{P} \frac{dP}{dt} \right)^* = \pi^T \right]$. Also, the central bank must vary its rate peg, $\bar{r}_B$, to track changes in the natural rate, that is, to maintain the following equality: $\left[MNPS_B + \bar{r}_B - \left(\frac{1}{P} \frac{dP}{dt} \right)^* = MRY_N \right]$. Given these conditions, the public's trend nominal expenditure growth equals trend real output growth plus trend inflation (equal to the central bank's target).[8]

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[7] See Goodfriend and King (1997) for a review of optimizing, sticky-price models that deliver this result.

[8] Economists say that with an interest-rate instrument, money is demand determined (at the price set by the central bank). In interpreting this statement, one must remember that the price of money is the price level, not the interest rate. (The goods price of money is the inverse of the price level.) The interest rate is the opportunity cost of holding real money balances. Money is demand determined because the central bank ties down the public's expectation of the future price level.

Current models in the literature with endogenous determination of the price level often omit money as a variable (for example, McCallum 2001). At first pass, this omission seems analogous to a model of the price of pencils that omits the quantity of pencils. However, the central bank's inflation target determines the public's expectation of inflation. That expectation determines the behavior of nominal variables.

With credibility and procedures that provide for tracking changes in the natural rate, the central bank's inflation target controls both money growth and inflation. The central bank's inflation target is the exogenous variable, while money is endogenous. Nevertheless, money remains critical. It is the ability to produce monetary shocks that endows the central bank with control over the public's expectations of inflation.

By assumption in these models, the central bank knows that it controls inflation, sets an inflation target, and pursues a policy consistent with its inflation target. Also, the public knows the target and the policy rule. The behavior of money then offers no independent information about the behavior of prices. That latter assumption becomes questionable in periods when monetary policy changes and the public is slow to learn of the change. For example, for much of the 1960s in the United States, the public formed its expectation of inflation based on prior experience with a commodity standard rather than the actual, inflationary monetary policy. In such a period, the behavior of money predicts inflation.

For the United States in the last two decades, the problem has been in-flationary expectations in excess of the Fed's implicit target. On several occasions, as economic growth quickened, these expectations jumped, as measured by the behavior of bond rates. As Goodfriend (1993) documents, the Fed dealt with these "inflation scares" through sharp increases in the funds rate. The ability to contract the monetary base gave the Fed the ability to engineer these funds rate increases.

For Japan, the problem is a "deflation scare." Because short-term interest rates are zero, the BoJ cannot lower interest rates.[9] Instead, it must increase the monetary base directly. The public announcement of a commitment to stabilize the price level accompanied by an expansion of the monetary base could reverse expectations of deflation. However, even if the public continues to expect deflation, monetary base expansion will stimulate expenditure through portfolio rebalancing. A revival of expenditure will eventually make credible a commitment to price stability.

When the central bank controls the monetary base directly by setting a target for a reserves aggregate, the reserves-money multiplier formula highlights the relevant behavioral relationships.[10] Given a reserves target, the money stock becomes a function of the currency-deposits ratio desired by the public and the reserves-deposits ratio desired by the banking system. Banks demand reserves for clearing purposes. With reserves-targeting procedures, the central bank uses the reserves-deposits ratio desired by banks as a lever for controlling the money stock.[11]

With a zero short-term interest rate, the monetary base and short-term Treasury securities become perfect substitutes. In (1), if expected deflation equals the real yield on capital, the short-term interest rate r_B is zero ($MNPS_M = MNSP_B = 0$). Because the marginal liquidity services yield on money then equals zero, the public is sated with liquidity and is indifferent between Treasury securities and money. In this case, the relevant aggregate that the central bank uses to force portfolio rebalancing is the sum of the

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[9] Goodfriend (2000) argues that the central bank can make the cost of carry for money positive instead of zero by taxing bank reserves and currency. A negative rather than a zero interest rate then becomes the relevant lower bound.

[10] With interest rate targeting, fluctuations in the reserves-deposits ratio do not affect the money stock because the central bank automatically offsets such fluctuations as a consequence of maintaining its interest rate peg.

The multiple expansion of deposits in response to a reserves injection by the central bank is a textbook construction. With reserves targeting and an interbank market for reserves, a reserves injection by the central bank would produce a reduction in the funds rate relative to the returns that banks earn on assets. Banks would respond by buying assets. The resulting increase in deposits would raise the reserves-deposits ratio. Reserves do not pass sequentially from bank to bank. However, if the interbank rate is zero, a reserves injection could produce the sequence of deposit expansion produced by reserves passing from bank to bank.

[11] If this ratio is unpredictable, the central bank must use a feedback procedure that offsets random changes.

monetary base and short-term Treasury securities. Through open market purchases that increase this total, the central bank increases expenditure by giving the public an excess of liquid assets relative to illiquid assets. Even with a zero short-term interest rate, open market purchases endow the central bank with the power to create money and control expenditure.

When short-term interest rates are zero, interest-rate-targeting procedures are problematic. The zero floor on market interest rates can prevent the central bank from countering expectations of deflation and from responding to a fall in the natural rate. This zero-bound problem is especially acute when expected deflation turns the zero short-term interest rate into a positive real rate. In this situation, predictable control of money and prices requires that the central bank abandon interest-rate-targeting procedures for reserves-targeting procedures. A reserves target continues to allow the central bank to create money to stimulate portfolio rebalancing and expenditure.

2. BOJ OPERATING PROCEDURES

On 19 March 2001, the BoJ began to announce "targets" for reserves balances (current account balances, CABs) held with it by banks. Nevertheless, the BoJ continued to use interest-rate procedures by setting a "target" for reserves equal to estimated reserves demand at a zero overnight call market rate.[12] (The Appendix documents statements in this and the following paragraph.) During the period of the original zero rate policy, February 1999 to August 2000, CABs had averaged 5 trillion yen. With the procedures announced on 19 March 2001, the BoJ adopted this 5 trillion yen figure as a way of reestablishing a zero overnight rate (see Figure 1).

Bank reserves remained demand-determined by the market rather than supply-determined by the BoJ. After 19 March 2001, the BoJ increased its "target" for CABs only in line with increased demand by banks. Demand increased in part because of heightened financial market uncertainty. After 9/11 and after withdrawals from mutual funds following Enron's difficulties, uncertainty increased.[13] On 19 December 2001, the BoJ set a range for CABs of 10 to 15 trillion yen. It used a range because of uncertainty over reserves demand at a zero interest rate. The BoJ commented, "It was a challenge for the Bank of Japan to maintain a high level of current account balances throughout FY2001" (2002, 5). There is no "challenge" if the BoJ determines the amount

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[12] The Japanese overnight call money market is comparable to the funds market in the United States. It is, however, open to financial institutions other than banks.

[13] See discussion in *BoJ Quarterly Bulletin* (November 2001 [Minutes, 18 September 2001], 68); *BoJ Quarterly Bulletin* (February 2002 [Minutes, 18–19 December 2001], 94); and Yamaguchi (2002, 36).

Figure 1 Currency and the Monetary Base
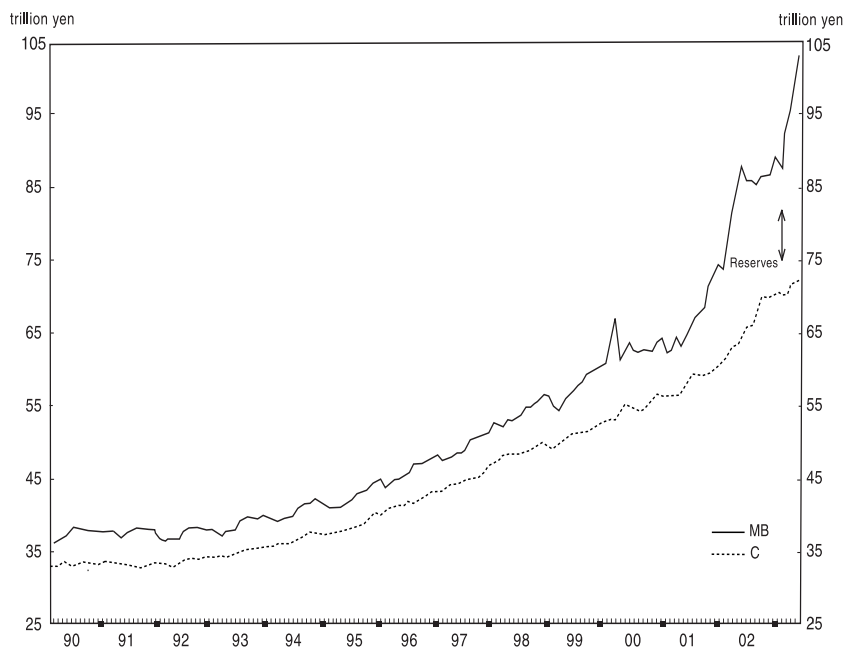
Notes: Monthly observations of currency notes in circulation and the monetary base. Heavy tick marks indicate twelfth month of year. Source: BoJ/Haver Analytics.

of assets to acquire with a reserves strategy instead of limiting itself to the amount of assets necessary to supply the reserves demanded by banks.

The demand for bank reserves has increased because, with a zero short-term interest rate, holding excess reserves becomes an attractive substitute for active reserves management through the use of the call money market. (The call money market provides liquidity by making available overnight loans to meet reserves deficiencies.) On the one hand, excess reserves offer a return equal to the (negative of the) deflation rate. On the other hand, they allow banks to save on the personnel cost of reserves management associated with the use of the call money market (Nakahara 2001, 13). Most important, the use of the call money market began to entail credit risk starting in fall 2001.[14] From 1992 through 1997, total loans in the call money market averaged in

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[14] For example, an article in the *Nikkei Weekly* (17 March 2003) states: "The market remains unable to dispel concerns about the risk of a chain of failures of life insurers and banks that could be triggered by the slumping stock market."

Figure 2 Total Average Outstanding Loans in the Call Money Market
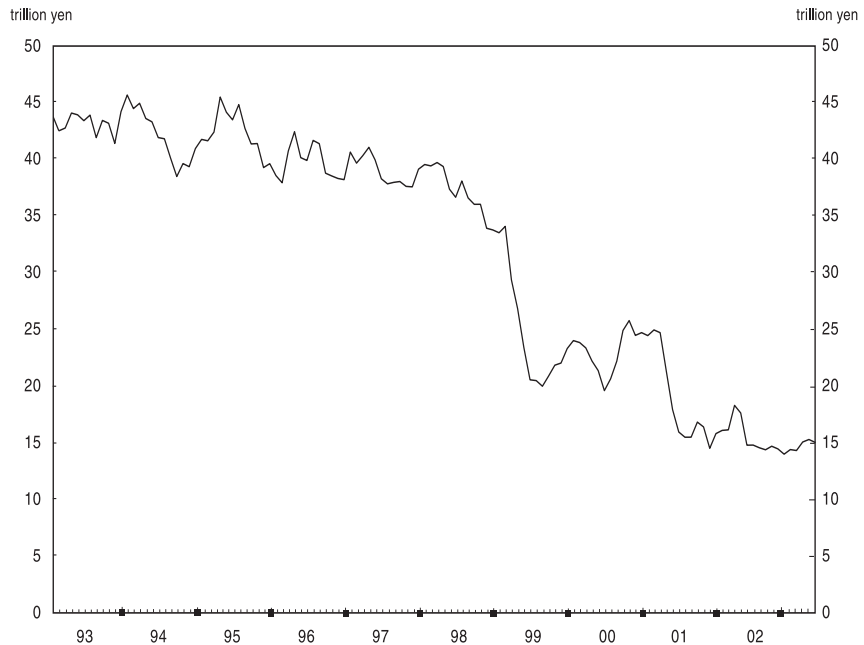
Notes: Monthly observations of average outstanding loans in the call money market. Heavy tick marks indicate twelfth month of year. Source: BoJ.

excess of 40 trillion yen. This figure fell dramatically when the BoJ went to its zero interest rate policy in February 1999 (see Figure 2). By mid-2002, it was only 15 trillion yen.

The high level of bank reserves associated with near-zero interest rates creates the misimpression that the BoJ has tried but failed to make banks expand their asset portfolios and deposits. For example, newspapers state that the Japanese banking system is "awash in liquidity." However, individual financial institutions have only substituted the liquidity of excess reserves for the liquidity formerly offered by the overnight call money market (Kodama 2002). The resulting belief that banks have simply impounded reserves supplied by the BoJ generates the mistaken assumption that altering the composition of its asset portfolio, say, by purchasing long-term government bonds (JGBs) is one of the few policy options open to the BoJ. For example, Otsuma (2003a) states, "Buying bonds from commercial banks is one of the few policy tools left to the central bank."

Under the current BoJ demand-driven procedures for reserves provision, the effect of purchases of JGBs and other illiquid assets such as equities are sterilized and thus do not augment total bank reserves. Regardless of whether the interest rate target is positive or zero, bank reserves continue to be demand-determined. A purchase of a JGB, therefore, requires the sale of a short-term security and leaves bank reserves unchanged.[15] To date, the BoJ has limited reserves creation to the amounts demanded by banks. It has not created the additional liquidity that would force an expansion of money.

3. THERE IS NO LIQUIDITY TRAP

With a liquidity trap, the public simply hoards the money the BoJ creates rather than attempting to run down additions with increased expenditure. However, limitless accumulation of money by the public is not a real world phenomenon. The public will not forever accumulate money, which it can use to satisfy real needs.[16]

In Japan there is no evidence for a liquidity trap.[17] Figure 3 shows actual percentage changes in real money (M2+CDs) and the fitted values from the regression in Table 1. Recent real money growth is somewhat stronger than predicted by the regression, but there is no mushrooming demand indicative of a liquidity trap.[18]

In contrast to M2+CDs, M1 growth has risen sharply. M1 growth, which had been around 5 percent, rose in 1995 and then fluctuated around 10 percent until early 2002. At that time, rapid growth in demand deposits (see Figure 4) raised M1 growth to 30 percent. Table 2 shows an M1 demand regression comparable in form to the regression in Table 1. The regression predicts

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[15] The BoJ open market desk supplies reserves with two sorts of operations: outright purchases and offers (tenders) to sell a specified amount of reserves at the interest rate target, say, zero. If the desk purchases outright a JGB without reducing the offered amount in the latter tender operation, the offer will be undersubscribed. That is, the bid-to-cover ratio will be less than one. Total reserves will remain at the amount demanded at the zero rate of interest. "[W]hether the Bank provides reserves from its right pocket (short-term operations) or from its left pocket (long-term government bond operations), the amount individual financial institutions intend to hold will not change" (Shirakawa 2002, 13).

Purchases of JGBs are comparable to Operation Twist, begun by the Fed in 1961. The Fed purchased long-term government bonds while selling Treasury bills. The idea was to lower bond yields without having to lower short-term interest rates and exacerbate the balance-of-payments problems. Similarly, under current procedures, purchases of JGBs are like central bank purchases of foreign currency in a sterilized foreign exchange intervention. The idea of such intervention is to limit appreciation of the country's currency by altering investors' portfolios to increase the share of domestically denominated assets. However, with no change in the central bank's interest rate target, the monetary base and money remain unchanged (see Broaddus and Goodfriend 1995).

[16] Bernanke (2000, 158) argues: "The monetary authorities can issue as much money as they like. Hence, if the price level were truly independent of money issuance, then the monetary authorities could use the money they create to acquire indefinite quantities of goods and assets. This is manifestly impossible."

[17] Wolman (1997) finds no evidence of a liquidity trap in the U.S. Depression.

[18] The estimates go through 2001, which is the last year for which SNA wealth data are available. (SNA is the System of National Accounts, which in the United States is referred to as the National Income and Product Accounts, or NIPA.)

Table 1 Real Money (M2+CDs) Demand Regression, 1959–2001

$$\Delta \ln M_t = \underset{(2.8)}{.21} \Delta \ln M_{t-1} + \underset{(4.2)}{.58} \Delta \ln GDP_t - \underset{(5.4)}{.08} \Delta \ln(R_t - RM_t)$$

$$+ \underset{(4.0)}{.31} \Delta \ln W_t - \underset{(3.8)}{.47} E_{t-1} + \hat{\mu}$$

$$CRSQ = .86 \qquad SEE = 1.8 \qquad DW = 1.8 \qquad DF = 38$$

Notes: The regression is in error-correction form. Observations are annual averages, except for wealth, which is a year-end observation. M is M2+CDs divided by the GDP price deflator; R is a rival interest rate paid on nonmonetary assets; RM is a weighted average of the own rates of return paid on the components of M2; W is wealth. E is the estimated residual from a money demand regression in level form using as independent variables GDP, $(R - RM)$, and W; ln is the natural logarithm; Δ is the first-difference operator. $CRSQ$ is the corrected R squared; SEE is the standard error of estimate; DW is the Durbin-Watson; and DF is degrees of freedom. Absolute value of t-statistics is in parentheses.

The dates for the regression are determined by the availability of data on the components of M2. Wealth data are available with a one-year lag. The Cabinet Office puts together wealth and GDP data.

From 1957 through 1965, the rival rate (R) is the interest rate on discounts of government securities by banks with the BoJ (boj.or.jp/en/siryo/siryo_f.htm). Thereafter, it is the series used by Toshitaka Sekine (1998) and kindly updated by him. R is the highest interest rate from among the following instruments: three-month (Gensaki) RPs; five-year money trusts; five-year loan trusts; five-year bank debentures (subscription and secondary market); five-year postal savings; and three-year postal savings. The own rate on money (RM) is a weighted average of the own rates on the components of money (demand deposits, time deposits, savings deposits, and CDs).

changes in real M1 until 2001. If there has been an M1 liquidity trap, it is in 2002.

However, the rapid growth in demand deposits in early 2002 reflects a switch from time deposits made in response to a change in government deposit insurance guarantees. In 1996, the government abandoned insurance guarantees limited to 10 million yen on individual deposits for complete coverage. It did so to protect small banks threatened with withdrawals after failure of housing loan corporations (*New York Times,* 23 January 2002). In April 2002, it reimposed the earlier limits by insuring time deposits only up to 10 million yen, while demand deposits remained fully covered. With no interest paid on either type of deposit, depositors could receive unlimited free insurance by switching from time deposits to demand deposits.

Figure 3 Actual and Predicted Real Money Growth
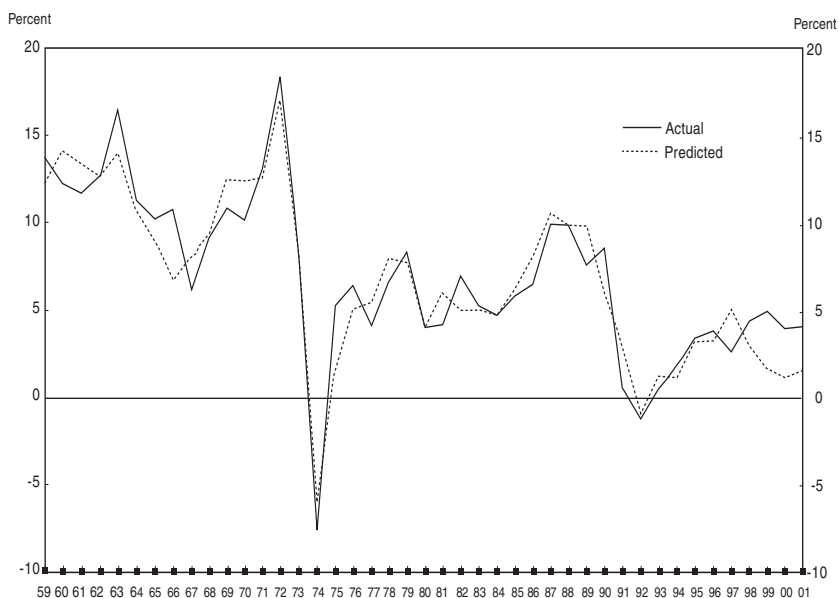
Notes: Predicted values are the within-sample simulated values from the regression shown in Table 1.

4.   CAN THE QUANTITY THEORY EXPLAIN JAPANESE DEFLATION?

After 1990Q3, money growth fell by 12 percentage points (see Figure 5).[19] This decline contrasts with the secular rise in real purchasing power demanded. Figure 6 expresses purchasing power as the fraction of nominal output the public holds in money balances. At present, the Japanese hold an amount of money sufficient to fund $1\frac{1}{3}$ times (133 percent of) a year's expenditure on national output. As shown by the trend line, on average, real purchasing power grows by 1.9 percent a year.

What variable has reconciled this fall in the growth of nominal money with the persistent secular rise in the public's demand for purchasing power? A fall in yen output growth in line with money growth maintained desired purchasing power. Over the period 1980Q1 through 1987Q1, money growth averaged

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[19] References to money are to M2+CDs. (CDs comprised 2.8 percent of M2 in the ten years after 1992.) I concentrate on M2+CDs rather than M1 because of the more stable demand function for the former than the latter. Note the smaller standard error of estimate of the real M2+CDs demand regression in Table 1 than in the real M1 demand regression in Table 2.

Table 2 Real M1 Demand Regression, 1959–2000

$$\Delta \ln M_t = \underset{(4.5)}{.37} \Delta \ln M_{t-1} + \underset{(1.7)}{.29} \Delta \ln GDP_t - \underset{(4.9)}{.08} \Delta \ln(R_t - RM_t)$$

$$+ \underset{(3.0)}{.31} \Delta \ln W_t - \underset{(2.3)}{.14} E_{t-1} + \hat{\mu}$$

$$CRSQ = .73 \quad SEE = 2.7 \quad DW = 2.1 \quad DF = 37$$

Notes: See Table 1. M is real M1 (M1 divided by the GDP price deflator). R is a rival interest rate paid on the non-M1 components of M2. It is a weighted average of the own rates paid on time deposits and CDs. RM is a weighted average of the own rates of return paid on the components of M1. The data are from Toshitaka Sekine (1998) and have been kindly updated by him.

8.3 percent, while nominal GDP growth averaged 5.9 percent. (This period serves as a natural benchmark because the money growth during it produced the near price stability of the mid-1980s.) Over the period 1990Q3 to 2002Q3, money growth averaged 2.8 percent, while nominal GDP growth averaged 0.9 percent. Between the two periods, money growth fell 5.5 percentage points and nominal output growth fell almost the same amount, 5 percentage points.

Nominal output is real output measured in yen. Nominal output can change because either real output or the price level changes. In the 1990s, initially, real output growth fell and then prices. Disinflation turned into deflation.

5. A QUANTITATIVE STRATEGY TO STABILIZE THE PRICE LEVEL

Even with a zero interest rate, a central bank can still create money.[20] A strategy based on the price level as the target and bank reserves as the instrument would stimulate yen expenditure by inducing portfolio rebalancing.[21] In this section

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[20] Economists arguing that the BoJ should undertake aggressive open market purchases to end deflation include Bernanke (2000), Friedman (1997), Goodfriend (1997), Krugman (1998), and Meltzer (1998). McCallum (1992) argues that the BoJ should use the monetary base as an instrument to control growth of nominal output.

[21] A monetary policy strategy involving reserves-aggregate targeting would require Japan to move to a system of contemporaneous reserves accounting when excess reserves have fallen to normal minimal amounts. At present, Japan has partially lagged reserves accounting. Banks calculate their required reserves based on the daily average of their deposits over a month. The reserves settlement period runs from the 16th of a particular month to the 15th of the following month. Instead of adopting contemporaneous reserves accounting, the BoJ could set required reserves ratios

Figure 4 Currency, Demand Deposits, Time Deposits Plus CDs, and M2

trillion yen   trillion yen
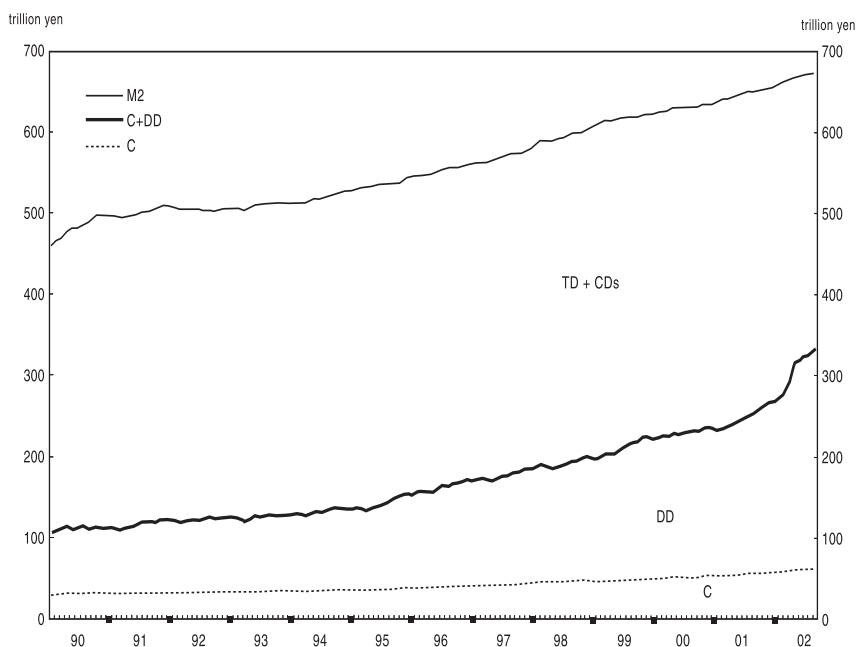
Notes: Monthly observations. C = currency; DD + C = demand deposits + currency; M2 = DD + C + (time deposits + CDs). Seasonally adjusted using RATS esmooth command. Heavy tick marks indicate twelfth month of year. Source: BoJ/Haver Analytics.

I explain this power for two such strategies under the assumption of zero short-term interest rates. The first is a pure transfer of money. The second involves an open market purchase of an asset.[22]

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at zero. The need to hold reserves to clear payments would then determine reserves demand. A 1957 law establishing reserves requirements makes this latter option unlikely.

[22] As a third alternative, the BoJ could "target" the term structure of interest rates. Bending the term structure down would be stimulative, and conversely. The BoJ cannot actually peg a long-term interest rate because it cannot credibly commit to maintaining the implied pattern of future short-term interest rates. For example, on 4 March 2003, the implied one-year-forward rate four years into the future was about 0.5 percent (BoJ 2003). Targeting a reduced interest rate on a four-year bond would in principle require committing to making short-term interest rates four years into the future less than 0.5 percent.

Aiming for a less steeply sloped yield curve would force monetary base creation through the tension created between the implied pattern of forward yields and the pattern expected by the public. However, the amount of base money created would be highly unpredictable. To avoid this "shotgun" approach, the BoJ could simply decide on the amount of base money to create based on the extent of the price level target miss.

Outright Money Transfers

With the first strategy, the central bank increases base money by crediting the deposit account the Treasury holds with it.[23] The Treasury delivers such increases to individuals as outright transfers (in a way unrelated to their existing money holdings). After the increase in money, the public still holds no additional liquidity because, at a zero interest rate, the marginal value of the liquidity that economizes on transactions is zero. However, the public now holds purchasing power in excess of what it desires. Because wants are unlimited and the additional money serves no useful purpose, individuals will spend it either on consumption or on acquiring nonmonetary (illiquid) assets. Only a rise in the price level can restore equilibrium.[24]

A real balance effect stimulates expenditure. Increases in base money increase the public's wealth. Increases in this monetary wealth are savings. Because the public saves more in monetary form, it saves less in a nonmonetary form. Consequently, its expenditure rises (Friedman 1976, 320).

Open Market Operations to Increase Money

In practice, central banks create base money through open market purchases in which the public gives up a financial asset in return for a bank deposit. With a zero short-term interest rate, the purchase by the central bank of a Treasury bill does not increase liquidity because Treasury bills are perfectly substitutable for money. No incentive for portfolio rebalancing arises. If the central bank purchases an asset imperfectly substitutable for money, it can force portfolio rebalancing just as in the outright transfer example.[25]

Two related issues arise with zero short-term interest rates. Which assets are imperfect substitutes for money and what magnitude of open market purchases must the central bank undertake to induce portfolio rebalancing? The magnitude of the open market purchases required to produce portfolio

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[23] A variation would be for the central bank to purchase JGBs through open market operations in amounts sufficient to provide for increases in currency. Beyond those amounts, it could credit the Treasury's demand deposit to increase the monetary base.

[24] Imagine a government budget constraint in real terms relating the deficit to the issue of government bonds and seigniorage (the increase in nominal money divided by the initial price level). As long as government commits to maintaining a given fiscal policy, the only variable left to adjust to the increase in nominal money is the price level.

[25] Milton Friedman wrote the author (15 April 2003):

In the preceding case [Outright Money Transfers], the transfer of money raises total nominal wealth. It is windfall income and recipients are inclined to spend at least part of it. In addition, they have been made temporarily to hold a distribution of assets that is not their equilibrium distribution. In the second case in which the central bank operates by purchasing assets by open market operations, the effect is limited to the rebalancing of an improperly structured portfolio.

Figure 5 Money Growth
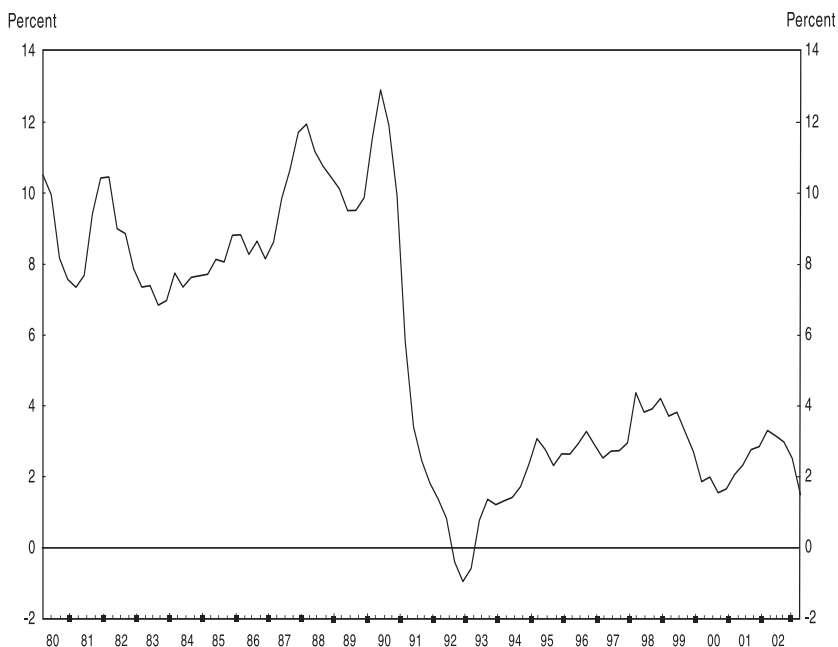
Notes: Quarterly observations of four-quarter percentage changes of money (M2+CDs). Heavy tick marks indicate fourth quarter of year. Source: BoJ/Haver Analytics.

rebalancing depends upon whether assets like JGBs, corporate bonds, and equities are good substitutes for money. Although in theory these assets could be perfect substitutes, the possibility is highly implausible.[26]

What can one say about the likely magnitude of the asset acquisition required of the BoJ to stimulate the public's yen expenditure? Goodfriend (2000, 2001) argues that to spur expenditure with a zero short-term interest rate, the central bank needs to expand "broad money." He distinguishes between the liquidity services offered by narrow money and broad money. With a zero

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[26] At a zero interest rate, money is a perfect substitute for a short-term bill. A short-term bill *could* be a perfect substitute for a JGB. By the expectations hypothesis, a long-term interest rate is just an average of short-term rates. An individual could be indifferent between holding a succession of three-month bills and a JGB. The higher interest rate on the JGB could simply reflect the market's expectation that short-term interest rates will rise in the future.

Furthermore, JGBs can be a perfect substitute for equity. Imagine that the government issues debt and uses the proceeds to purchase equities. If individuals understand that the government is simply holding the equity for them, their behavior is unchanged. It follows that if money is a perfect substitute for JGBs, it is a perfect substitute for equity.

This complicated chain of reasoning pushes the logical limits of what one can assume about investor preferences. Brunner and Meltzer (1968) and Meltzer (1999) question the idea that all financial assets become perfect substitutes at a zero interest rate.

Figure 6 The Demand for Real Purchasing Power
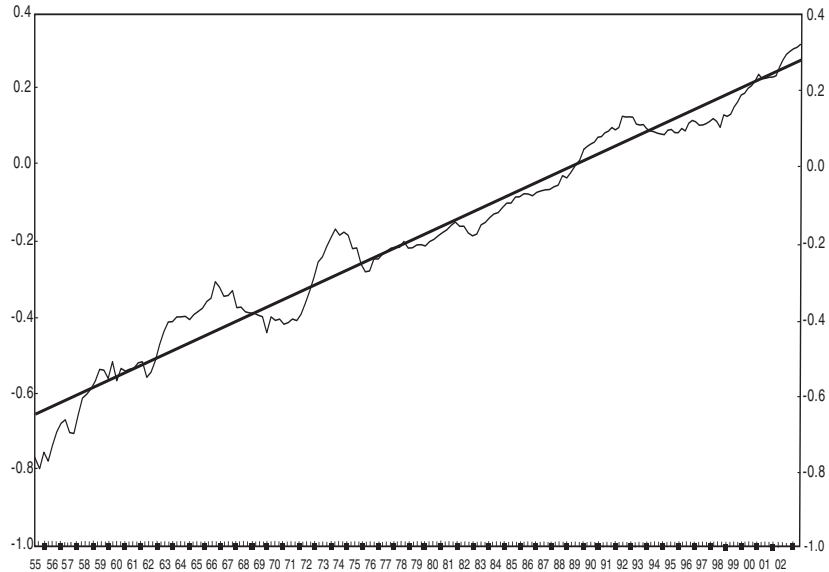
Notes: Quarterly observations of the natural logarithm of M2/GDP with trend. The solid line is the trend line derived from the fitted regression $\ln(M2/GDP)*400 = -263 + 1.9T + \hat{\mu}$. T is a time trend. Heavy tick marks indicate fourth quarter of year. GDP is SNA68 through 1979, SNA93 thereafter. Source: Cabinet Office/Haver Analytics.

interest rate, the public is sated with the transactions services offered by narrow money, but not with the liquidity services offered by broad money that facilitate financial intermediation in a world of agency problems and asymmetric information between borrowers and lenders. For example, because the assets included in broad money are useful as collateral, they lower the cost of credit to a borrower by lowering the finance premium required for external finance. A central bank can increase broad money and spur expenditure by increasing broad money through open market purchases.

For Japan, M2+CDs constitutes a measure of broad money. In 2002Q4, it comprised 134 percent of GDP.[27] A 6 percent rate of increase in M2+CDs,

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[27] For the United States, M2 was 55 percent of GDP in 2003Q4. The Japanese save more in the form of money than Americans do. At the end of March 2002, Japanese households held 54.1 percent of their assets in the form of currency and bank deposits. The corresponding figure

a rate consistent with price stability, would not require vast increases in the BoJ's asset portfolio.[28]

The explicitness of a reserves-aggregate strategy for controlling prices would shape expectations of inflation in a way that reinforces the effects of money creation. Such a strategy entails not only a procedure for altering reserves in response to misses in the target for prices, but also an explicit numerical target for the price level.[29] If the price level falls below the targeted price level and policy is credible, the public will expect the price level to rise to eliminate the target shortfall. Expected inflation will raise market rates of interest and reduce money demand. Money demand falls at the same time that the central bank increases money. The public will rebalance its portfolio to eliminate the resulting excess of actual over desired money.

Monetary Indicators

Friedman (1960) argued that lags between central bank actions and changes in the price level make targeting the price level directly destabilizing. He suggested targeting steady money growth to avoid the problem of "long and variable lags."[30] As a supplement to a price level target, the BoJ could use

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for U.S. households was 11.6 percent (BoJ, *Flow of Funds Accounts;* Board of Governors, *Flow of Funds Accounts of the United States*).

[28] The low value of the reserves-money multiplier limits the required magnitude of the increase in base money. In February 2003, the monetary base equaled 14 percent of M2 and CABs 3 percent. To take an illustrative example, with a constant monetary base/money ratio, a 20 percent increase in money (M2+CDs) would require a 20 percent increase in the monetary base. (In the following, T¥ indicates trillion yen. All figures are for February 2003.) With a monetary base of 93 T¥ and money of 672 T¥, a 20 percent increase in each would amount to 18.6 T¥ and 134.4 T¥, respectively. This increase in the monetary base amounts to 3.4 percent of 2002Q4 GDP.

The required increase in the monetary base would be less if the public held the proceeds from its asset sales to the central bank only in deposits rather than adding to currency (the ratio of currency to total commercial bank deposits is 12 percent). However, the increase in the base would rise if the public held all of the increase in deposits in demand deposits rather than time deposits and banks held reserves primarily against demand deposits. (The ratio of demand deposits to total bank deposits is 0.45. The ratio of reserves to demand deposits is 0.074.)

[29] An inflation target set at a positive rate is a promise to make the currency lose some of its purchasing power each year. A target for the price level is a promise to maintain the purchasing power of the currency. Price indices are biased measures of inflation because they do not account for change in quality. Shiratsuka (1999) places the bias for Japan at 0.9 percent per year. A target path for the CPI price level consistent with genuine price stability would then rise at about 1 percent a year.

Summers (1991) argues that central banks should maintain a positive inflation rate to avoid the zero-bound problem. However, a credible target for the price level would work better. Wolman (1998, 16) points out that when the price level falls below target, such a target ensures a reduction in real rates through transitory increases in expected inflation.

[30] Goodfriend and King (1997, 273–74) argue that a central bank can stabilize the price level with a reaction function that makes its policy instrument vary directly with the discrepancy between the actual price level and the targeted price level. They argue that with credibility price setters will be "forgiving" of policy mistakes. However, this credibility, along with the staggered price setting assumed by Goodfriend and King, implies that a central bank can run, say, an expansionary monetary policy for a very long time before the price level rises.

money and nominal expenditure growth as indicator variables to aid in setting its reserves-aggregate instrument.

Because of the considerable stability in the public's money demand function, money (M2+CDs) has been a better indicator of the thrust of monetary policy than interest rates.[31] The BoJ set the overnight rate at 0.5 percent in September 1995 and at almost zero in February 1999. Low money growth has been a better predictor of deflation than "low" interest rates.

If money demand did become unstable with a reserves-aggregate strategy, the BoJ could use the yen expenditure of the public as an intermediate target. Price stability requires yen expenditure growth equal to sustainable real growth. The BoJ could set a target for yen expenditure growth equal to its estimate of trend real output growth.[32]

6.   DEPRECIATION OF THE EXCHANGE RATE

Twentieth-century experiments with fiat money have validated the central implication of the quantity theory that the central bank determines the behavior of the price level. A corollary is that when the central bank pegs the exchange rate, the domestic price level varies to equilibrate the balance of payments. With the exchange rate fixed and foreign prices given, domestic prices must vary to price domestic goods in a way that achieves balance on the external account. Proposals for ending Japanese deflation through a depreciation of the yen build on this fact.[33]

Consider hypothetical yen depreciation achieved by the abandonment of floating exchange rates. For example, the BoJ could peg the yen-dollar

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For example, monetary policy was expansionary in the United States after 1964 and in Japan after 1997 for two years before inflation rose. From its experience, the BoJ drew the conclusion that a central bank should look at asset prices rather than at the price level (Hetzel 1999). However, the relationship between asset prices and the price level is nebulous. In both the U.S. and Japanese cases, the central banks would not have allowed inflation if they had looked at money.

[31] For time-series studies demonstrating stability, see Sekine (1998) and Bank of Japan (1997). For cross-sectional data indicating stability of money demand, see Fujiki (2002) and Fujiki et al. (2002).

[32] Economic recovery (elimination of a negative output gap) would require an initial target higher than the long-run trend growth of real output. Also, deflation may have reduced output growth over the last decade. In that case, the 1974–1991 average for productivity growth of 2.7 percent is likely to be a better estimate of trend output growth than the 1992–2002 figure of 1.1 percent. (Productivity is calculated as real GDP per worker.) From 1999 through 2001, the population aged 20 to 59 declined 0.4 percent per year. This secular decline in the labor force lowers trend output growth.

[33] Several economists have advocated the use of an exchange rate target to escape the zero-bound problem. Svensson (2001) advocates an initial yen devaluation to end Japanese deflation followed by price level targeting. This policy would raise the Japanese price level while still tying down the public's expectation of the future price level. McCallum (2000, 2003) argues that the BoJ should use the exchange rate as an instrument to control prices.

The BoJ's current interest-rate procedures result in the sterilization of its purchases of dollars. For example, following instructions from the Ministry of Finance, the BoJ purchased 4 trillion yen ($33 billion) in May and June 2002. The BoJ sterilized the resulting reserves creation. That is, it did not allow bank reserves and the money stock to rise.

exchange rate at 150, a 25 percent depreciation from the end-2002 value of 120. In itself, this action will induce a 25 percent rise in the price of traded goods in Japan. The public's decisions determining foreign trade depend upon the relative price of Japanese goods in terms of foreign goods, that is, the terms of trade. A 25 percent depreciation of the yen requires a 25 percent rise in Japanese prices to reestablish the former terms of trade.[34]

Because the Ministry of Finance possesses legal responsibility for the foreign exchange value of the yen, a policy of yen depreciation to control inflation would endanger BoJ independence. Given the large and increasing amount of government debt, financial markets could become concerned that an end to independence might lead to pressure to monetize government debt regardless of the consequences for inflation. Furthermore, Japan must always deal with the protectionist proclivities of its trading partners. A policy of yen depreciation would poison its relations with other countries.[35]

7. INSTITUTIONAL CONSTRAINTS ON THE BOJ

Under the 1998 law establishing central bank independence, Policy Board members are responsible for the "solvency" of the BoJ. Specifically, the BoJ retains 5 percent of its earnings for capital and pays the remainder to the government. At present, the BoJ's capital amounts to 7.6 percent of its assets. The BoJ is concerned that increasing money sufficiently to stop inflation will require not only a large increase in its asset portfolio, but also an increase in nontraditional risky assets.[36] Governor Toshihiko Fukui said, "The institution

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[34] After the depreciation, Japanese goods are 25 percent less expensive to foreigners. The BoJ finances the additional demand for Japanese exports by placing newly created yen in the hands of foreigners in return for dollars. Foreigners exchange those yen for Japanese goods, while the Japanese exporters use their newly acquired yen to purchase Japanese securities or deposit the funds in banks. Either way, the Japanese money stock rises. Japanese producers will not forever surrender real resources for low-yielding financial assets. Instead, they will attempt to reduce their money balances through increased spending. Only a rise in the Japanese price level sufficient to restore the former terms of trade can eliminate this imbalance.

As a byproduct of the depreciation, the trade deficit increases transitorily while the price level rises to restore the equilibrium terms of trade. A "large" rise in the price level does not require a "large" trade deficit. Using a model simulation for Japan, McCallum (2003) shows that a devaluation of the Japanese yen need not entail a large trade deficit. The reason is that the stimulative effect of the devaluation also increases imports. It is wrong to argue that "for depreciation to have any real impact on price levels...the yen would have to fall by a huge amount...because trade accounts for a relatively small proportion of the Japanese economy" (Fidler and Guha, *Financial Times,* 23 November 2001). (In 2002, Japan's exports amounted to about 10 percent of GDP.)

[35] Twice the United States pursued a policy of dollar devaluation. The first time was in March 1933, when it devalued the dollar in terms of gold—a policy termed "beggar thy neighbor." The second time was in August 1971, when President Nixon imposed an import surcharge as a club to force countries to revalue their currencies (devalue the dollar). See Hetzel (1999, 2002). Each instance engendered resentment among U.S. trading partners.

[36] Ideally, from an economic perspective, the BoJ would have to increase the size of its asset portfolio significantly to expand the money stock sufficiently to end deflation. In that way, the

that can take indefinite risks is the government alone. Central banks can't go ahead limitlessly—we should never, ever forget this point."[37]

The BoJ is concerned that a fall in the market value of its assets could erase its capital account. The solution to these institutional concerns is political. The government could promise to simply transfer (deliver without monetization) to the BoJ the amount of government securities required to maintain the value of its capital account. The BoJ could then expand its asset portfolio by acquiring assets whose prices fluctuate.

While these concerns may well be determining for BoJ policymakers, it is still important to put them into an economic context. The terminology of "solvency" can possess legal implications for a central bank, but it is not a meaningful economic concept. The economic issue is how the central bank uses the seigniorage from money creation.[38]

It is important for central banks not to attempt to allocate credit by purchasing private securities, especially of insolvent institutions (Hetzel 1997). For the central bank of a less developed country that cannot restrict borrowing by insolvent banks, the problem is real. The central bank may have to monetize so much debt that it creates inflation. However, Japan is not in this situation.

If the BoJ did decide to expand its asset portfolio by purchasing assets other than short-term government debt, it could start with JGBs. In principle, it is possible that ending deflation would require massive open market purchases, which could at a later date require offsetting sales to prevent inflation. The BoJ might then be in the situation of buying JGBs at a high price and selling them later at a low price.[39] The practical import of this situation is that when

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BoJ could take a large amount of JGBs off the books of banks. When the BoJ does end deflation, interest rates will rise and bond prices will fall. A panic could result if banks collectively attempt to sell bonds. The fall in bond prices could create uncertainty about the solvency of banks. The more long-term bonds that the BoJ has removed from the books of banks, the stronger the financial system will be. The BoJ would then need a transfer of short-term securities from the government to maintain a positive value of its capital account.

[37] The material in this paragraph is from Otsuma (2003b).

[38] Consider the specific example of a central bank lending to an insolvent bank (with no deposit insurance). If the bank fails, the central bank is left with worthless debt, which it writes off. The central bank has purchased private market debt rather than government debt. As a consequence, more government debt ends up in the hands of the public. The real burden of government debt is correspondingly higher. The reason is that interest payments on government debt to the public affect the size of the government deficit. Interest payments to the central bank do not because they are simply recycled. To the extent that the central bank owns government debt, there is no meaningful national debt burden.

[39] If the BoJ is concerned about commercial bank insolvency, it should purchase JGBs from banks to protect them from a future rise in interest rates. Major banks own more than 50 trillion yen in government bonds (*Nikkei Weekly*, 17 March 2003). If the BoJ were concerned about maintaining the market value of its portfolio following economic recovery, it could diversify by buying mutual fund shares holding a diversified selection of stocks.

it comes time to contract the monetary base, it might not have sufficient assets and might have to issue its own debt.[40]

In evaluating BoJ concerns over capital adequacy, one should recognize that the current policy already leads down the path the BoJ wants to avoid. As discussed earlier, the zero short-term interest rates produced by deflation have increased bank holdings of excess reserves by limiting the scope of the call money market. Since March 2001, the value of CABs has risen by about 25 trillion yen. Furthermore, the BoJ is under political pressure to acquire a variety of risky assets such as stocks, to maintain their market value, and securitized business loans, to make funds available to small business. A policy of monetary expansion to end deflation would hold open the prospect of an ultimate solution to the BoJ's capital problems.

For Japanese society, the issue is far more important than the legal and technical one of capital adequacy and the use of seigniorage revenues. First, in the 1990s, disinflation in Japan likely lowered real growth.[41] The fall in asset prices in Japan reflects the reduction in wealth from lower real growth. Second, as I explain in the next section, the zero short-term interest rates produced by expected deflation impede the proper functioning of the price system.

8. ECONOMIC FRAGILITY

To understand why the Japanese economy is now susceptible to adverse shocks, recall the distinction made earlier (in "How a Central Bank Controls the Money Stock") between the real rate and the natural rate. The real rate is the nominal interest rate adjusted for expected inflation (deflation). The natural rate is the real rate that would occur in the absence of monetary disturbances.

The Japanese economy is in a fragile equilibrium because an adverse real shock would simultaneously raise the real interest rate and lower the natural rate. An adverse shock would raise the real rate by increasing expected

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[40] The BoJ possesses legal authority to issue debt.

[41] There is evidence to support the contention that the difficulty of adjusting nominal wages to disinflation has lowered real growth. First, during the disinflation in the early 1990s, labor's share of income rose from 65 to 75 percent. The persistence of that elevated share through 2002, despite rising unemployment, indicates incomplete adjustment of nominal wages to lower prices. Second, real wages are not procyclical. Third, adjustment of bonuses has exercised only a limited impact on real wages. Fourth, nominal wages of full-time and part-time workers have remained practically unchanged since the early 1990s (see Fujiki et al. 2001 and Kodama 2001–02). Corporations have adjusted the overall nominal wage by replacing full-time workers with part-time workers, a practice that likely lowers productivity.

deflation. It would lower the natural rate by making the public more pessimistic about the future (Goodfriend 2002). With nominal short-term interest rates equal to zero, the nominal interest rate cannot fall to bring the real rate into equality with a lower natural rate.

Events in October 2002 have already produced this dilemma. In early October 2002, Heizo Takenaka replaced Financial Services Minister Hakuo Yanagisawa. Takenaka desires to prevent banks from lending to insolvent firms. Pessimism about the economy increased from fears that his policy would increase bankruptcies and consequently exacerbate unemployment. Increased pessimism about the future lowered the natural rate.

At the same time, the real rate rose as a result of heightened fears of deflation. Both the Daiwa Institute of Research and the Deutsche Bank economics-forecasting groups predict changes in prices. As of end 2002, both groups forecast a fall of 1.4 percent for the GDP deflator in 2003.[42] Monetary deceleration accompanied this tension in movements in the natural rate and the real rate. In October 2002, year over year money growth was 3.5 percent. By April 2003, it had fallen to 1.4 percent.

At the current deflation rate, this growth in nominal money allows for only minimal growth in real output. Since 2000, inflation (GDP deflator) has averaged -1 percent. Nominal money growth of 1.4 percent then implies 2.4 percent real money growth. The trend growth in real purchasing power is 1.9 percent (see Figure 6), which leaves less than 1 percent real money growth to accommodate real output growth.

9.   CONCLUDING COMMENTS

Inflation and deflation are monetary phenomena. They depend upon the way the central bank creates money. The BoJ can end deflation by raising money growth. To do so, it would need to abandon its current policy of limiting base money creation to the amount demanded by the public. Instead, it should adopt an explicit target for the price level and a policy of monetary base creation to achieve that target.

APPENDIX: DEMAND-DETERMINED RESERVES PROVISION

In February 1999, the BoJ adopted a target for the uncollateralized overnight call rate of interest of near zero. In August 2000, it raised its target to 25 basis points. However, the economic recovery that had prompted that rise

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[42] Deutsche Bank Group (2002) and Daiwa Institute of Research (2002).

ended that fall. The BoJ then adopted reserves-targeting language allowing it to return to its former zero rate policy without an explicit reversal.

The 19 March 2001 "Minutes of the Monetary Policy Meeting" (*BoJ Quarterly Bulletin,* May 2001, 82) state:

> [T]he effects previously brought about by the zero interest rate policy could be achieved and at the same time the market mechanism could be maintained to some extent, if the operating target was changed to the outstanding balance of current accounts at the bank and the amount was increased to a level that would reduce the interest rate to virtually zero (the level was estimated to be around 5 trillion yen given the experience of the zero interest rate policy). [Expected inflation would not rise] if the quantitative easing was *limited* to the level necessary to achieve a fall in the overnight call rate to virtually zero. (*italics added*)

At the 13 August 2001 Monetary Policy Meeting, the BoJ raised the CAB target to 6 trillion yen, "the *maximum* amount possible" (*italics added*) (*BoJ Quarterly Bulletin,* November 2001 [Minutes, 13 August 2001], 45). There is no "maximum" amount to a reserves target set by the central bank.

After March 2001, the BoJ increased reserves provision only in line with increases in demand by banks. Masaaki Shirakawa (2002, 9), adviser to the governor, explained the increase in reserves that occurred after March 2001 as reflecting factors affecting bank demand for reserves: "an increase in domestic financial institutions' precautionary demand for liquidity against the background of uncertainty with respect to liquidity conditions" and an increase in demand from foreign banks arising from yen-dollar swap transactions. Yutaka Yamaguchi (2001, 6), BoJ deputy governor, explained:

> [T]he Bank did not simply raise the target [for CABs] regardless of demand. The Bank decided the level of the target... based on a judgment that it was maximum demand for the current account balance at the time. In September [2001], the Bank swiftly responded to the surge in demand for liquidity.... [T]he Bank can increase the current account balance flexibly as long as demand for liquidity increases.... The current account balance can be increased when a certain stress gives incentives for financial institutions to hold a larger amount of liquidity.

Policy Board member Nobuyuki Nakahara (2001, 11–12) argued that "[t]he Bank is simply providing funds to accommodate funds demand." He detailed examples of funds absorption by the open market desk to show that the BoJ does not force unwanted reserves on financial institutions. Board member Shin Nakahara (2002, 3) commented, "[T]he outstanding balance of current accounts at the Bank cannot be increased 'without limit' since it cannot exceed the actual demand for funds by financial institutions."

The BoJ has set its "target" for CABs as a range to allow for reductions in bank demand for reserves:

> These members raised the question of whether, if liquidity demand decreased for some reason, the Bank could continue its provision of funds to maintain the outstanding balance of current accounts at a high level. . . . The staff pointed out that. . . depending on liquidity demand, there was a possibility that the total amount of bids in market operations would often fall short of the amount the Bank offered, i.e., a possibility of undersubscription. . . . The Bank should be capable of dealing with the situation where demand for funds decreased as the demand did not seem to have become stable yet. (*BoJ Quarterly Bulletin*, February 2002 [Minutes, 18–19 December 2001], 101)

The fact of "undersubscription" shows that the BoJ limits reserves creation to the amount demanded by banks. "[In FY2001] undersubscription for fund providing operations was not uncommon" (BoJ 2002, 1). "Many members said that the undersubscription was proof that the Bank was providing liquidity to its utmost" (*BoJ Quarterly Bulletin,* May 2002 [Minutes, 7–8 February 2002], 35). The bid-to-cover ratio measures undersubscription. For example, the BoJ's repurchase operations on 2 May and 9 May 2001 were undersubscribed with bid-to-cover ratios of 0.9 and 0.4, respectively (Chen 2001).

This ratio measures the supply of bills the market offers to the BoJ relative to the bills that the BoJ is willing to buy. (The latter figure, the amount that the BoJ is willing to buy, comes from estimates of purchases necessary to provide just enough reserves to maintain the overnight call rate at zero.) The BoJ purchases the former, the amount the market offers, not the latter amount. The bid-to-cover ratio would be irrelevant if the BoJ simply bought the amount of assets required to achieve a given target for bank reserves. "Undersubscription" can occur only if the BoJ allows market demand to determine reserves provision.

With demand-determined reserves provision, the BoJ limits reserves creation to the amount that banks demand at a zero interest rate. With active reserves provision, the BoJ would supply reserves beyond this amount. Bank reserves demand would then increase to match supply because of an increase in bank deposits.

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