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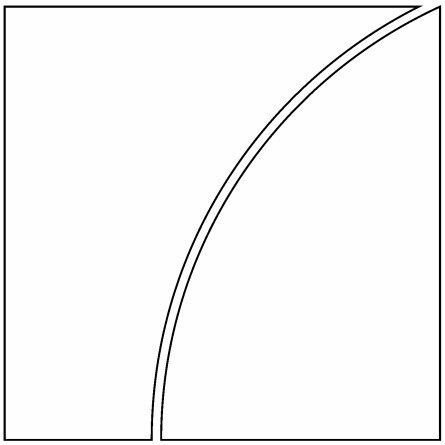

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The monetisation of Japan's government debt

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Abstract

Japan's government debt is extremely high, especially considering the fact that the data exclude likely future liabilities stemming from an ageing population and possible requirements of the financial system. Nevertheless, an offsetting factor is the degree to which the Bank of Japan has already monetised the debt. The monetary expansion up to the end of 2003 has increased the net worth of the Bank of Japan, properly measured, to more than 17% of GDP, directly reducing the debt position of the consolidated government and central bank - the most relevant measure of the government's fiscal position. Furthermore, the consolidated debt ratio could fall further depending both on the degree to which the monetary expansion is reversed to prevent inflation from rising too much and on the response of nominal interest rates to any temporary inflation that does occur. Under reasonable scenarios, the consolidated government/central bank debt position could be noticeably lower than indicated by commonly cited debt statistics.

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Introduction

Japan's prolonged economic slowdown from the early 1990s to 2003 has led the Bank of Japan to attempt to stimulate economic growth through a huge expansion of the monetary base. Moreover, the slowdown, along with an expansionary fiscal policy, has contributed to large fiscal deficits and a ballooning of public debt. This paper presents some simple calculations to quantify one source of interaction between these monetary and fiscal policies, namely the implications of the monetary expansion for government debt.

These fiscal effects can be divided into two components. First, by purchasing large quantities of government bonds, the Bank of Japan has monetised a notable portion of the debt: therefore, the net debt of the consolidated general government and central bank - the most appropriate measure for analysing the government's fiscal position - is smaller than is the debt of the general government alone, which is the figure most commonly cited. Second, the consolidated debt ratio could fall further depending on the degree to which the monetary expansion to date is reversed to prevent inflation from rising too much. It will also depend on the response of both the exchange rate and nominal interest rates to any temporary inflation that does occur. I conclude that, under reasonable scenarios, the consolidated government/central bank debt position could be noticeably lower than indicated by commonly cited debt statistics.

The intention of this paper is not to minimise Japan's fiscal difficulties, nor is it to argue that Japan should "inflate itself" out of its debt problem. Ongoing budget deficits are very high, and the ageing of the population, and possibly also the needs of the financial sector, are expected to add substantial budgetary strains in the future. As I shall discuss, one could even imagine a situation in which fiscal considerations stand in the way of the Bank of Japan carrying out its desired monetary policy. Rather, this paper is intended to help understand the fiscal implications of the Bank of Japan's monetary policies and to emphasise that such considerations will be an important part of the economic debate.

The paper proceeds as follows. Section 1 presents standard government budget identities to help illustrate that the consolidated net debt of the government and central bank is the most relevant debt concept for analysing fiscal conditions. Section 2 presents basic data on government debt and the BOJ's balance sheet, and notes that for purposes of this paper one must move away from conventional central bank accounting, which fundamentally obscures the central bank's true financial position by failing to recognise the special nature of its liabilities. Section 3 provides rough estimates of the implications of the monetary expansion for prices and discusses the likely reversal of policy aimed at preventing large price increases. Section 4 calculates the effect of higher prices on consolidated debt/GDP ratios under different assumptions about the accompanying rise in interest rates, and lays out a menu of ultimate debt/GDP ratios that take into account both the central bank net worth position and the price level consequences associated with different degrees of monetary reversal. Section 5 concludes.

1. The central bank and the government

Modern central banks are public institutions that make public policy. They are agents of the government that can be dissolved by the government. The trend towards operational independence for many central banks indicates that, for some purposes, it is useful to treat the central bank as being distinct from the rest of the government. But for purposes of analysing fiscal policy, the definition of the public sector ought to include the central bank. Central bank operations have the well recognised ability to finance government spending, and central banks have explicit rules for how their surpluses must be transferred to the government. Conversely, central bank transfers to the government are sometimes reduced to help support the central bank's finances (as has been done in Japan in recent years), and fiscal authorities at times are called upon to stand behind the finances of the central bank. The fact that some bookkeeping distinctions between the central bank and government - for example, which party holds foreign exchange assets and so bears exchange rate risk - vary across countries highlights the inherently arbitrary nature of the distinction. Indeed, Buiter (2003a) cited the consolidation of central bank and government accounts as one of his "ten commandments" for a fiscal

rule in the EMU. Nevertheless, central banks are treated in the international system of national accounts as being part of financial private business, separate from the rest of government.

These considerations rationalise the typical practice of combining the budget identities for the government and central bank to generate one overall public sector budget identity (eg Walsh 1998). Such a budget identity will help demonstrate that the consolidated net debt of the government and central bank is the debt variable of interest; it will also prove useful later in the paper.

The government budget identity can be written as:

$$G_t + i\,BG_{t-1} + \Delta AG_t \;=\; T_t + i\,AG_{t-1} + CBT_t \;+ \Delta BG_t \qquad (1)$$

Equation (1) says that all cash outlays - for non-interest government spending (*G*), interest payments on the total government debt (*i* times *BG*), and new purchases of financial assets (Δ*AG*) - must be funded by some combination of tax receipts (*T*), interest earnings on government assets (*i* times *AG*), transfers from the central bank (*CBT*), and new debt issuance (Δ*BG*). Note that I have assumed for simplicity that government assets earn the same rate of return as must be paid on government debt. Taking into account both gross debt and financial assets, the net debt of the government is:

$$NDG_t \;=\; BG_t \;- AG_t \qquad (2)$$

The central bank is assumed to hold as assets government debt (*BM*) plus an alternative asset (*AM*), and the monetary base (*M*) is the only central bank liability. The budget identity of this central bank is given by:

$$\Delta BM_t + \Delta AM_t \;+ CBT_t \;=\; i\,AM_{t-1} + i\,BM_{t-1} + \Delta M_t \qquad (3)$$

Equation (3) says that central bank purchases of new assets plus transfers to the government must be funded by interest earnings on the central bank's assets plus the expansion of the monetary base (Δ*M*). The net debt of the central bank - that is, the negative of its net worth - is equal to:

$$NDM_t \;=\; -\,BM_t \;- AM_t \qquad (4)$$

This notion that the net worth of the central bank is equal to the value of its assets (*BM* + *AM*), ignoring the value of its liability (*M*), will be discussed in more detail in the next section. For now, the main idea is that the monetary base pays no interest, so (*BM* + *AM*), rather than (*BM* + *AM* – *M*), represents the net interest-earning assets of the central bank.

Combining equations (1) and (3) generates the familiar budget identity for the overall public sector:

$$G_t - T_t \;+ i\,(BG_{t-1} - AG_{t-1} - BM_{t-1} - AM_{t-1}) \;=\; \Delta BG_t \;- \Delta AG_t - \Delta BM_t - \Delta AM_t \;+ \Delta M_t \text{ or}$$

$$G_t - T_t \;+ i\,(NDG_{t-1} + NDM_{t-1}) \;=\; \Delta(NDG_t \;+ NDM_t) + \Delta M_t \qquad (5)$$

Equation (5) states that government spending less tax receipts, plus net interest payments on the consolidated net debt of the government and central bank (*NDB* + *NDM*), must be funded either by increases in this consolidated net debt or by an increase in base money.[1] This equation highlights the two traditional channels through which central bank actions affect the government budget. First, a monetary expansion (Δ*M*) can itself fund a government deficit; typically this is done indirectly through an open market asset purchase that, combined with the additional *BG* sold by the government, leaves consolidated net debt unchanged. Second, a monetary expansion, which provides the public with a non-interest bearing asset in exchange for an interest bearing asset, raises the central bank's net worth properly measured and so reduces net interest payments on the consolidated net debt. Again, for present purposes, the key point is that the *consolidated government and central bank net debt* is the appropriate debt concept for the public sector (Buiter (2003a,b)).

To be sure, in Japan's present low interest rate environment, the equation's sharp distinction between interest-bearing and non-interest-bearing government liabilities is exaggerated. Nevertheless, the distinction will become more important when interest rates eventually increase. In particular, the calculations in the next section will emphasise that some central bank liabilities are irredeemable, or, in other words, they pay zero interest forever.

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[1] The equations assume that all debt and assets carry the same nominal interest rate. Relaxing this assumption complicates the algebra but not the economic meaning of the equations.

2. Japanese government and central bank balance sheets

With this as background, Table 1 presents the basic balance sheet information for the public sector in Japan at the end of 2003. Gross debt of the general government - that is, the consolidated central government, sub-national governments, and social security system, but *not* including the central bank - amounted to 157% of GDP according to OECD estimates, the highest in the industrial world. The Japanese government also holds substantial financial assets amounting to some 78% of GDP, mostly in the social security system. Thus, the general government net debt is 79% of GDP, below the levels of Italy or Belgium but still one of the highest in the industrial world. At present, these debt levels do not translate into unusually high debt service costs because of the very low levels of interest rates; the Japanese government's net interest payments as a share of GDP are well below those of Italy or Belgium, for example. But were interest rates eventually to increase substantially, then so would debt service costs.

Furthermore, several factors imply that Japan's debt situation is more serious than the net debt figure suggests. First, the effect of an ageing population on future social security and medical costs is more severe than in most countries. (However, see Broda and Weinstein (2004) for an argument that the very long-run demographic influences on the budget are more favourable than is commonly supposed.) Thus, as the financial assets held by the social security system are earmarked to an unusually high level of future obligations, some analysts view the gross debt figures as being more appropriate for international comparisons. Second, the figures omit what could be substantial contingent liabilities, including the possible need for public support of the banking system and implicitly guaranteed loans of quasi-governmental agencies (see Kashyap (2002) and IMF (2003a)). Third, the quality of some government assets is suspect; in particular, the government's substantial dollar-denominated assets are subject to exchange rate risk and could lose value were the yen to appreciate.[2] Finally, huge government deficits (8% of GDP in 2003) imply that the debts are increasing at a rapid rate.

An important limitation of these government debt figures, however, is that they ignore the wealth position of the Bank of Japan. As can be seen in the middle portion of Table 1, BOJ holdings of short-term and long-term government securities reached ¥93 trillion in total, or about 19% of GDP, at the end of 2003.[3] To be sure, consolidation of the central bank accounts with the rest of general government must combine liabilities as well as assets, implying that only the BOJ's overall net worth should be relevant. And as conventionally measured, the net worth (or "capital") of the BOJ, as with most central banks, is low - about 1% of GDP.

But this conventional accounting is misleading because it does not recognise the special nature of central bank liabilities. In particular, fiat currency is a "liability" that pays zero interest and never need be redeemed (Fry (1993), Buiter (2003a,b)); the true cost of this liability, abstracting from the small costs associated with manufacturing and distributing the notes, detecting forgeries, and so on, is zero. Alternatively stated, were the central bank to pay a private agent to take over these liabilities, the fair market price would be close to zero. The same is true for required bank reserves; these central bank liabilities often pay no interest and can also be viewed as only rarely having to be redeemed (such as when a bank ceases operation).

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[2] The data for general government gross debt, net debt, and total financial assets are OECD (2004) estimates. The data on foreign reserves, however, are from the Ministry of Finance (2004), and "other assets", which subtracts foreign reserves from total financial assets, therefore mixes the two data sources. Japan's purchases of foreign reserves, funded by additional gross debt issuance (financing bills), increased notably further in early 2004.

[3] In line with traditional accounting procedures, the assets of the Bank of Japan are valued at historical cost and are not marked to market. At present, this probably does not distort the asset valuation too severely, but, as will be discussed below, asset values are subject to adjustment in response to changes in interest rates.

Table 1

Japanese general government and central bank balance sheets, December 2003

¥ trillions (as a percentage of GDP)

Assets		Liabilities	
General government			
Foreign reserves	72 (14.4%)	Gross debt	785 (157.3%)
Other assets	317 (63.6%)		
Total financial assets	389 (78.0%)		
Net debt	**396 (79.3%)**		
Bank of Japan			
LT government debt	64 (12.9%)	Banknotes	77 (15.4%)
ST government debt	29 (5.8%)	Required reserves	4 (0.9%)
Foreign assets	4 (0.9%)	Other current deposits	26 (5.2%)
Other assets	34 (6.7%)	Other liabilities	19 (3.8%)
Total assets	131 (26.3%)	Capital[1]	5 (1.1%)
		True net worth	**86 (17.3%)**
Consolidated government/BOJ			
Foreign assets	76 (15.3%)	Government debt	691 (138.6%)
Domestic assets	351 (70.3%)	BOJ true liabilities	45 (9.0%)
Total assets	427 (85.6%)	Total liabilities	736 (147.6%)
Consolidated net debt	**309 (62.0%)**		

[1] Bank of Japan capital includes legal and special reserves.

Sources: OECD; Ministry of Finance; Bank of Japan.

Excess reserves - such as most of the BOJ's current deposits - are an intermediate case. As these are redeemable, they amount to a temporary interest-free loan to the central bank and so represent a liability whose true value is less than reported but is greater than zero. However, the fact that the BOJ is targeting this aggregate could be taken to imply that these deposits do not have to be redeemed unless and until the BOJ changes its targets. Nevertheless, to be conservative in my calculations, I will treat only required reserves - a small portion of overall current deposits - as being similar to currency and representing a zero true liability to the central bank. The remainder of current deposits will be taken to represent only a temporary interest-free loan to the central bank and will be measured, to a

first approximation, as representing a liability of full value. In all, I present a more meaningful definition of the BOJ's net worth that includes currency and required reserves as well as capital.[4] As shown in Table 1, the BOJ's "true" net worth according to this definition was 17.3% of GDP at the end of 2003.[5] Consolidating this BOJ capital position with the general government data would bring the net debt to only 62%, rather than 79%, of GDP in 2003.

Table 2 presents these calculations for each year since 2000, a period during which both debt accumulation and the monetisation of this debt were proceeding rapidly. General government debt rose by 20% of GDP during this three-year period, but the BOJ's true net worth also increased during this period. In all, the consolidated net debt of the general government and central bank increased from 45% of GDP in 2000 to 62% in 2003.

Table 2

Consolidated government/BOJ net debt

(as a percentage of GDP)

	2000	**2001**	**2002**	**2003**
General government net debt	59.9	65.2	71.4	79.3
BOJ true net worth	14.1	15.4	17.0	17.3
Consolidated government/BOJ net debt	45.0	49.7	54.4	62.0
Domestic net debt	53.8	60.8	66.5	77.3
less: foreign currency assets	8.8	11.1	12.1	15.3

As can be seen in Table 3, similar calculations show both the "true" net worth and the holdings of government securities for central banks of other industrial countries to be far lower than for Japan. For most countries, therefore, a consolidation of the central bank with the rest of government would not greatly affect the government's net liability position.

Parenthetically, this discussion helps shed light on the arguments about the importance of central banks maintaining positive capital (Stella (2002), Hawkins (2003)). The market value of the Bank of Japan's ¥64 trillion holdings of long-term government bonds could fall substantially if longer-term interest rates rise. Concerns about maintaining a positive capital position have led the BOJ to retain a larger share of its profits, rather than turn them over to the Ministry of Finance. More importantly, such concerns may have been a factor influencing the conduct of monetary policy itself (Bernanke (2003), Zhu (2004)).[6] The discussion above provides two insights into this issue. First, for some purposes the balance sheet of the consolidated government and central bank is of primary concern. (Government debt is a net liability in this consolidated balance sheet. Any reduction in the value of the BOJ's assets were interest rates to rise would be offset by a much larger reduction in the liability of the general

[4] As the discussion in the text indicates, this definition is a convenient simplification. A more complete calculation, which generates similar results, might value both assets and liabilities as the discounted present value of expected future interest receipts or payments. To take an example, suppose we hold the size of the balance sheet constant and assume that after two years short-term interest rates will rise to 2% and be expected to remain at that level indefinitely (implying that long-term rates settle near 2% as well and BOJ earnings gradually rise as the debt is rolled over). On the liability side, assume that excess reserves will need to be replaced with other liabilities costing 2%. Of course, currency will continue to cost the central bank zero. In this scenario, the discounted value of future interest earnings and payments, using a discount factor of 2%, generates net worth of ¥84 trillion, close to that of the simple calculation presented in the text.

[5] Taking into account not the *existing* central bank balance sheet items, as is done here, but the expected future expansion of central bank balance sheets enabled by inflation and a growing economy, Fry (1993) calculated that the "franchise value" of a central bank's right to issue domestic currency would be worth about 150% of GDP for a typical central bank attempting to maximise seigniorage revenue. Fry calculates that it would be worth about 38% of GDP if combined with the requirement that the central bank pursue zero inflation.

[6] Zhu (2004) cites minutes of the BOJ Monetary Policy Meeting in April 2003 to support the view that its capital position has been a constraint on monetary policy.

government.) This is not to say that one should never be concerned about central bank finances in isolation, for perceptions of financial strength may contribute to the viability of an independent central bank. However, the second insight is that, ideally, such perceptions ought not to depend on the measured capital position because this can provide a misleading view of the central bank's true net worth. This true net worth cannot decline as the result of the purchase of new assets through an expansion of irredeemable monetary liabilities; even if these new assets subsequently decline in value, the true net worth will still not be lower than if the monetary expansion and asset purchase had never occurred in the first place.

Table 3

Central bank assets and liabilities, 2003

(as a percentage of GDP)

	Date	Total assets	Of which: Gov't securities	Total liabilities	Of which: Irredeemable liabilities[1]	Capital	Capital plus irredeemable liabilities
Japan	Dec 03	26.3	18.7	25.3	21.4	1.1	17.3
United States	Dec 03	7.0	6.5	6.9	6.4	0.2	6.5
Canada	Dec 03	3.6	3.4	3.6	3.5	0.0	3.5
United Kingdom	Feb 03	4.7	1.3	4.5	3.1	0.1	3.3
Eurosystem	Dec 03	11.8	0.6	10.8	6.2	0.9	7.1
Australia	Dec 03	8.4	1.5	7.6	4.6	0.8	5.4

[1] "Irredeemable liabilities" comprises currency plus zero interest required reserves. For the Eurosystem and Australia, where bank reserves pay interest, it comprises currency only.

Source: Central banks.

3. Potential implications of monetary expansion for the price level

3.1 No policy reversal

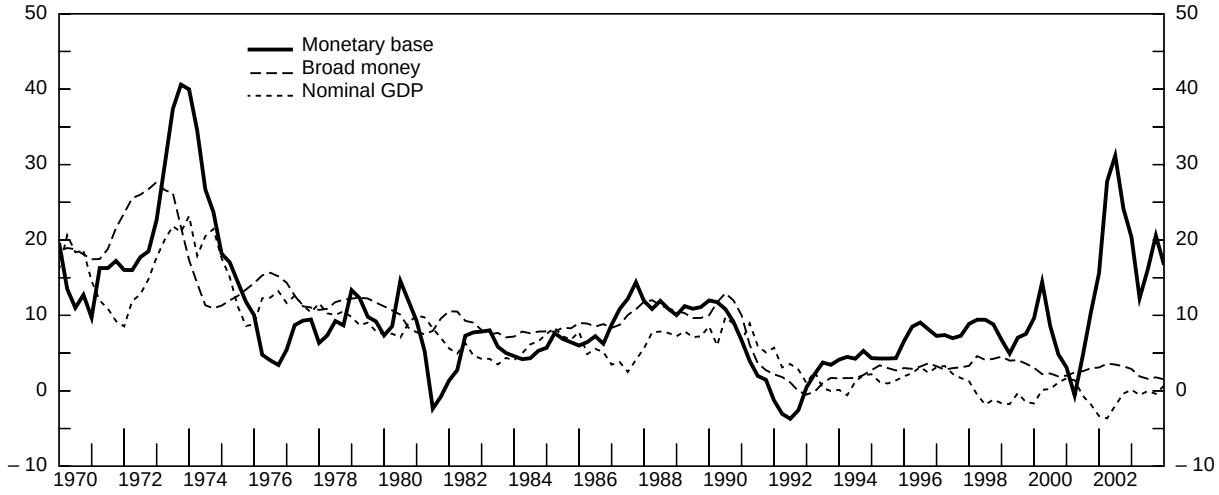
For a more complete analysis of the effects of the BOJ's monetisation on government debt ratios, I next consider the potential price implications of the BOJ's monetary expansion. I begin by examining the implications for prices under the extreme assumption that the monetary base remains at end-2003 levels, and then, more realistically, discuss the monetary reversal necessary to prevent a large increase in prices.

The top panel of Graph 1 shows how the growth rate of the monetary base has increased sharply over the past several years. Ordinarily, one would expect that such rapid money growth would fuel inflation and therefore raise growth of nominal GDP by a similar magnitude. But as the graph makes clear, this has not occurred. Instead, deflation combined with stagnant real GDP growth has left nominal GDP little changed. Therefore, as shown in the lower panel, the monetary base as a share of GDP has risen to more than 20% - far in excess of the ratios for the other countries shown.

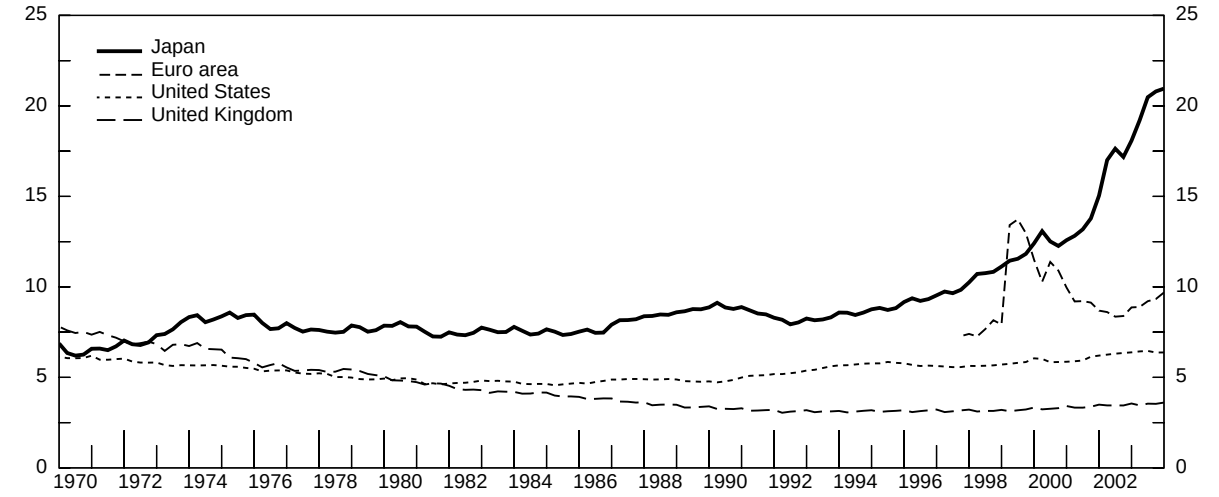
Graph 1

Monetary base, broad money and nominal GDP in Japan

Annual percentage changes



Monetary base as a percentage of nominal GDP



Sources: IMF; national data.

The most straightforward explanation for this sharp increase in the monetary base/GDP ratio (or, equivalently, decline in the velocity of the monetary base) is that Japan is experiencing a liquidity trap.[7] One legacy of the collapse in asset values after 1989 is low investment demand by companies burdened with high debt (Koo (2003)). As a result, even though the Bank of Japan has pushed short-term interest rates to their lower bound of zero, this has not translated into broader monetary aggregates nor provided enough stimulus to aggregate demand to eliminate the output gap or stem deflation. Further monetary expansion in such a situation - unless it can reduce real interest rates by generating higher expected inflation - has difficulty in stimulating aggregate demand, and as a result, the ratio of the monetary base to nominal GDP increases.[8] Structural problems in the Japanese

[7] Ahearne et al (2002) provide a useful overview of these issues.

[8] A slowdown in potential GDP growth, which by all accounts has been an important part of Japan's economic slowdown since the 1980s, can contribute to the likelihood of a liquidity trap by reducing the equilibrium rate of interest and so narrowing the scope for stimulative policy given the zero lower bound for the policy rate. See Hayashi and Prescott (2002) and Andolfatto (2003). But see Posen (2001) for an argument that Japanese productivity and potential GDP growth is higher than is commonly recognised.

financial system - another legacy of the drop in asset values - could be a contributing factor as well; indeed, in the view of some analysts, this may be the more important part of the explanation (Hutchison (2000), Morsink and Bayoumi (2000)). According to this explanation, banks are hampered with bad loans that may limit their ability to fund even potentially profitable further lending, resulting in a build-up of reserves that does not feed into broader monetary and credit aggregates or aggregate demand.

As economic conditions in Japan improve and the liquidity trap comes to an end, and as the condition of the financial system strengthens, nominal GDP would be expected to rise into more normal alignment with the monetary base. In other words, there is a monetary overhang in Japan that could eventually lead to very large price increases. An estimate of the magnitude of such a price increase can be obtained by assuming that the earlier relationship between the monetary base and nominal GDP will eventually be reasserted. (Such a monetarist approach must be viewed as extremely rough in the light of the well known instability of money velocity.) Graph 1 shows that the inverse of base velocity trended gradually higher from around 6% in 1970 to around 8-9% in the early 1990s; a ratio of around 10% today would be roughly in line with this earlier trend. Thus, I assume that the existing monetary base is consistent with about a doubling (111% increase) of nominal GDP; such an increase would bring the ratio to 10% from over 20% at present.[9]

The extent to which any such increase in nominal GDP would occur through a price increase versus an increase in real GDP depends on the magnitude of the output gap. Many analysts believe that the gap of GDP below potential GDP in Japan is only about 2-3% at present, and that potential GDP is rising only a little more than 1% per year (see OECD (2004) or IMF (2003b)). According to such estimates, if the reversal of velocity were to be achieved over a small number of years, at most several percentage points of the adjustment would occur through real output growth. Even if the output gap and potential output growth were substantially larger (as was argued to be the case by Krugman (1998), Kuttner and Posen (2001) and Posen (2001)), the lion's share of a large increase in nominal GDP in a short number of years would need to be achieved by price increases rather than through growth of real GDP. In the calculations in Section 4, I will assume that real GDP rises by 10% with prices accounting for the remainder; one such scenario would involve a five-year period during which potential GDP rises 1-1/2% per year and a 2-1/2% output gap closes to zero. The calculations will of course be insensitive to small changes in this assumption.

3.2 Future policy reversal

To be sure, the preceding situation is extreme. Such a price increase will not be acceptable to the Bank of Japan, and the monetary expansion will therefore be reversed to some degree. That is, when the economy eventually strengthens, the BOJ will sell some portion of its bond holdings to reverse the expansion of the monetary base. In terms of Graph 1, the larger is the reduction in the monetary base, the smaller is the increase in nominal GDP required to bring the ratio of the two back to 10%.

Although some degree of monetary reversal will surely be necessary, the extent of reversal will need to take into account the various arguments about the desirability of some price increases following a long period of deflation. Many analysts believe that some *temporary* burst of inflation to raise the price level would be highly beneficial. First, much of the academic literature on liquidity traps (Krugman (1998), Reifschneider and Williams (1999), Eggertsson and Woodford (2003), Svensson (2003)) suggests that an important channel through which monetary policy can remain effective in a liquidity trap is to reduce real interest rates by raising expected inflation; that is, the public must believe that the central bank will eventually be successful in raising the price level. Second, Bernanke (2003) argued that an increase in the price level would also be desirable to relieve the burden that deflation has imposed on debtors; this could relieve the pressures on banks as well. Finally, the desire to reduce the value of government debt may itself play a role in determining the desired increase in the price level. To be sure, one must not imagine that such a real debt reduction is painless, for the loss is borne by bondholders. But in evaluating the consequences of the various approaches to reducing the

[9] One caveat is that, in the new steady state, money demand might be higher than suggested by the earlier trend if nominal interest rates are lower than the levels that prevailed during the 1980s. In this situation, base money as a share of GDP may return to a level higher than 10%. Given reasonable elasticities of money demand, however, the difference is unlikely to be large, and for simplicity I retain the 10% assumption in my calculations.

government debt - inflation or outright repudiation on the one hand, and higher taxation or other fiscal policy adjustments on the other - some degree of price increases may well be justified on efficiency grounds, as this would reduce the costs of distortionary taxation (Auerbach and Obstfeld (2003)).[10]

On the other side, one obvious argument against allowing too large a price increase is the fear that a period of inflation would not be temporary but could lead to inflation that is higher than desired on an ongoing basis. Once the desired reflation is achieved, the BOJ, like other central banks, would like to maintain a low and stable inflation rate. But a period of higher inflation could kindle inflationary expectations that would be costly to reverse. Some analysts have suggested that the adoption of a price level target or exchange rate target would help prevent such a one-time price increase from engendering expectations of higher ongoing inflation (see Eggertsson and Woodford (2003), Bernanke (2003) or Svensson (2003)).

In all, the magnitude of price increase to be desired is far from clear. Krugman (1998) called for a sizable increase of 4% inflation for 15 years, or 60% in all from 1998 levels; given subsequent deflation, this is almost 70% above the current price level. Bernanke (2003) suggested that the price level be brought to where it would have been had prices increased by 1% per year from 1998; this would imply a 15% higher price level by 2003. Of course, many analysts believe that no temporary period of price level reflation is desirable at all. The calculations in the next section will therefore present a range of possibilities.

This discussion presumes that the Bank of Japan will be able to reverse its monetary expansion should it wish to do so. But there is at least a possibility that such a reversal may be difficult unless the government begins to make credible fiscal adjustments at the same time. The argument derives from the literature on fiscal dominance (eg Sargent and Wallace (1981)). If Japan's fiscal deficits were to remain large even after an economic expansion has taken hold, then the public could come to fear that the government will not be able to fulfil its obligations without engaging in continued monetisation, and interest rates could move sharply higher. The economic consequences of such high interest rates could generate pressure on the central bank to pursue a larger monetary expansion even at the expense of higher inflation.[11]

Although of some interest from a theoretical/analytical perspective, a situation in which fiscal dominance hampers monetary policy, fortunately, is not likely to occur in Japan. To be sure, the government knows that fiscal tightening would be premature until a recovery becomes self-sustained; in early 1997, a rise in the value added tax proved detrimental to an incipient recovery. Nevertheless, the government has on several occasions stated its intention of adopting a policy of fiscal consolidation - including pension reform - over the medium term. The low yields on JGBs in the face of well publicised levels of government debt suggest that this intention is believed by the public. Furthermore, while the change in the primary balance required to stabilise the net debt/GDP ratio looks daunting at first sight (simple calculations suggest a required adjustment of perhaps 7% of GDP; see Lebow (2004)), there may be some attenuating factors. As mentioned earlier, assumptions about both demographics (Broda and Weinstein (2004)) and potential output growth (Posen (2001)) that underlie many budget projections may be too pessimistic. Furthermore, such an adjustment is by no means unprecedented. For instance, Canada, Italy, and Sweden all improved their cyclically adjusted primary balances by more than 7% of GDP over the 1990s. Finally, the central bank's commitment to avoid high inflation can itself provide the fiscal authority with additional incentive to make the necessary fiscal adjustments.

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[10] This discussion assumes that the *nominal* value of government liabilities is unaffected by the price increase. In fact, the redistributions caused by an unexpected jump in prices may affect government obligations. For example, they may affect the government's contingent liability for implicitly guaranteed loans. The outcome is especially complicated when one also considers the political economy issue of whether the government may intervene to limit adverse outcomes for some individuals, such as pensioners.

[11] There could, in principle, be a technical aspect to this possibility as well. A large increase in interest rates would reduce the market value of the BOJ's holdings of long-term government bonds significantly. If the value of these assets declined by enough, the BOJ could be in a situation where it cannot engage in open market sales on a large enough scale to generate the desired reduction in the monetary base: in the language of Section 2, the BOJ's true net worth could approach zero. In fact, such an outcome seems unlikely. Suppose the BOJ decides that it would like to reduce the monetary base by ¥43 trillion as discussed in the text. The BOJ holds assets of about ¥67 trillion even excluding its holdings of long-term government bonds, including ¥29 trillion in short-term government debt plus another ¥34 trillion in other domestic assets (mostly bills purchased). This amount would appear sufficient to cover the desired monetary reduction.

4. Fiscal implications of policy reversal

To assess the implications of a price increase for government debt ratios, it will be useful to return to the budget identities presented in Section 1. I repeat equation (5) with two adjustments. First, I divide the consolidated net debt ($ND = NDG + NDM$) into two components: domestic net debt (ND^d) less the exchange rate (e, measured as the price of foreign exchange in yen) times foreign-denominated assets (A^f). Second, I express all terms in the equation as a share of nominal GDP (Y). Thus, the consolidated budget identity becomes:

$$(G_t - T_t)/Y_t + i\,(ND^d_{t-1} - e_{t-1}A^f_{t-1})/Y_t \;=\; \Delta ND^d_t/Y_t - e_t\,\Delta A^f_t/Y_t + \Delta M_t/Y_t \quad \text{or}$$

$$(g_t - t_t) + i\,(nd^d_{t-1} - e_{t-1}a^f_{t-1})\;Y_{t-1}/Y_t \;=\; nd^d_t - nd^d_{t-1}\;Y_{t-1}/Y_t - e_t\,a^f_t + e_t\,a^f_{t-1}\,Y_{t-1}/Y_t + \Delta M_t/Y_t$$

where lower-case letters denote values as a ratio to nominal GDP. Finally, noting that $\Delta nd_t = \Delta nd^d_t - e_t\Delta a^f_t - a^f_{t-1}\Delta e_t$, this equation can be written as:

$$\Delta nd_t \;=\; (g_t - t_t) - \Delta M_t/Y_t + (i - \Delta Y_t/Y_{t-1})/(1+\Delta Y_t/Y_{t-1})\;nd_{t-1} - (\Delta e_t/e_{t-1})/(1+\Delta Y_t/Y_{t-1})\;e_{t-1}\,a^f_{t-1} \qquad (6)$$

The third term of equation (6) shows that if the growth rate of nominal GDP increases, and if this increase is not matched one for one by a higher average nominal interest rate paid on the debt, then the consolidated net debt as a share of GDP (nd) will be reduced for any given primary deficit ratio and monetary expansion. And as shown in the fourth term, if the rise in prices leads the exchange rate to depreciate, the net debt ratio will decline further because the government's holdings of foreign-denominated assets, unlike the other categories of assets and liabilities, will approximately maintain their value as a share of GDP. Thus, the extent of changes in these three variables - prices (nominal GDP), interest rates, and the exchange rate - are the key factors (aside from future primary deficits and monetisation) determining changes in the consolidated debt ratio.

I begin by providing calculations for the case in which the monetary base is reduced enough to limit the eventual price increase to 15% - the amount that Bernanke (2003) implicitly recommended. As discussed above, I assume that real GDP increases by 10% such that the overall increase in nominal GDP is 25%; based on the calculations in Section 3, this would require a reduction in the monetary base of some ¥43 trillion, or about 8.5% of GDP. I further assume that the yen depreciates in step with the price level such that foreign-denominated assets approximately retain their value in real terms. Finally, I assume at first that interest rates are entirely unaffected. Using equation (6) and the balance sheet figures from Table 1, this combination of factors would bring the consolidated net debt to 50.5% of GDP (shown in the penultimate column of Table 4).

This calculation probably generates too low a consolidated net debt ratio because it assumes that the average interest rate paid on the net debt remains unchanged in the face of higher inflation. Gauging the likely increase in interest rates in these circumstances is very difficult, for any increase should depend on how persistent the inflation is perceived to be. (The standard analysis that considers a *permanent* increase in inflation that is matched by permanently higher interest rates, with debt consequences governed by the maturity structure of existing debt, is not appropriate in this case of an assumed *temporary* period of inflation.)

Therefore, I provide two additional interest rate alternatives. In both cases, short-term interest rates are assumed to rise by the same amount as prices over a five-year period (in this case, about 3% per year for five years cumulating to a 15% increase); after five years interest rates revert to their original level. The two alternatives differ in the degree to which this reversion is anticipated. In the first alternative, the rise in interest rates is fully understood to be temporary. In this case, longer-term interest rates rise by less than short-term rates and we have a flattening of the term structure. (I assume that the expectations theory of the term structure holds so that, to a first approximation, movements in long-term interest rates are simple geometric averages of expected movements in short-term rates.) In the second alternative, the higher short-term interest rates are initially believed to be permanent, so that interest rates increase by the same amount throughout the entire term structure. In either case, the new interest rates - higher for five years and the original rates thereafter - are applied to new government debt as it is rolled over, first gradually raising and then gradually

lowering the average interest rate paid on the debt (the variable that enters into equation (6)).[12] As shown in Table 4, the effect of these higher interest costs boosts the consolidated net debt to 53.5% of GDP under the first alternative and to 57.5% of GDP under the second.[13] These numbers compare with the 50.5% debt ratio assuming no rise in interest costs at all.

Table 4

Japanese price level and consolidated debt ratios under alternative degrees of monetary contraction

	Monetary contraction from 2003 levels, ¥ trillions (as a percentage of 2003 GDP)				
	0.0 (0.0)	25.3 (5.0)	35.3 (7.0)	42.8 (8.5)	50.3 (10.0)
Implied rise in nominal GDP (in per cent)	110.8	60	40	25	10
Assumed rise in real GDP	10	10	10	10	10
Rise in price level	100.8	50	30	15	0
annual increase for five years	(15.0)	(8.4)	(5.4)	(2.8)	(0.0)
Excess reserves (¥ trillions)	25.7	0.4	0.0	0.0	0.0
Consolidated net debt (as a percentage of 2003 GDP)	62.0	62.0	63.9	65.4	66.9
Consolidated net debt (as a percentage of eventual nominal GDP):	22.1	33.9	42.4	50.5	60.8
With no rise in interest rates					
With temporary rise in interest rates, understood to be temporary	32.0	41.0	47.5	53.5	60.8
With temporary rise in interest rates, initially believed to be permanent	48.9	51.3	54.6	57.5	60.8

I view the first interest rate alternative, in which the increase is credibly believed to be temporary, as being the most reasonable of the various possibilities. The Bank of Japan has made it clear that it places a very high value on price stability, and this may make it more likely that any rise in prices will be viewed as a one-time event rather than a signal of ongoing inflation. Certainly, for people to presume, as in the last alternative, that a rise in inflation is permanent despite assurances from the BOJ that they have no such intention would appear to be an extreme assumption. Of course, the

[12] The calculation is based on the maturity structure for Japanese government bonds at the beginning of FY 2003 (Ministry of Finance (2003)). As the existing debt comes due during the next five years, the government is assumed to issue new debt, with the same maturity structure as at present, at a higher spot interest rate that varies over the term structure according to either interest rate alternative as discussed in the text. This gradually raises the average interest rate on the debt. After the five-year period, new debt is assumed to roll over at the original, lower interest rate, and the average interest rate gradually declines again. The cumulative increase in the average interest rate over the whole period comes to 6% and 13% in the first and second alternatives, respectively. These figures are the ones used in equation (6).

[13] The consolidated net debt figures in Table 4 are only moderately sensitive to the choice of five years over which the inflation and interest rate increase is assumed to occur. In the case where the increases are understood to be temporary, a shorter but sharper increase would generate lower debt figures than reported in Table 4. In the case where the increases are believed to be permanent, a shorter but sharper increase would generate slightly higher debt figures. Note, however, that the shorter the period of elevated rates, the more extreme would be the assumption that the increases are expected to be permanent.

larger is the assumed price increase, the larger will be the effect of the different interest rate assumptions on the debt calculations.

Given that the desirable price increase is subject to debate, Table 4 presents a menu of options in addition to the case just discussed. The different columns of the table present different degrees of monetary contraction from current levels, generating different price increases and consolidated net debt ratios. (As before, the table assumes that 10 percentage points of the incipient rise in nominal GDP occurs through higher real GDP, and the remainder occurs through a higher price level.)

The calculations are conducted in terms of the monetary base, though of course there will be counterparts to these calculations in terms of the overnight interest rate consistent with any monetary reduction. Of particular note is the fact that substantial excess reserves (the bulk of the current deposits that the BOJ is targeting under the quantitative easing policy) are not consistent with positive overnight interest rates. Thus, a policy reversal that intends to raise the overnight rate above zero will require a reduction in the monetary base from its end-2003 level that is at least as large as these excess reserves, or about ¥25 trillion.[14] This outcome, shown in the second column of the table, would be consistent with about a 50% rise in the price level - for example, inflation near 8% per year for five years - and would leave the consolidated net debt ratio at around 34-51% of GDP depending on the reaction of interest rates. The even more extreme assumption of leaving the monetary expansion through the end of 2003 in place with no reversal, shown in the first column, would bring the consolidated debt ratio to 22-49% of GDP.

Three examples of monetary contraction beyond this ¥25 trillion lower bound are presented.[15] They correspond to cumulative price increases of 30%, 15%, and zero, respectively. (As the figures are intended to give rough estimates only, the reader of course can interpolate estimates for other price increases as desired.) As was already discussed, a price increase of 15% (or, for example, inflation of about 3% per year for five years) would require about a ¥43 trillion reduction of the monetary base from end-2003 levels and would generate a consolidated net debt ratio of around 50-57% of GDP - noticeably lower than the commonly cited levels that ignore the central bank (79% for general government net debt). These figures are little affected by the alternative interest rate assumptions as the assumed inflation is small.

Finally, a reduction in the monetary base of about ¥50 trillion from current levels would be sufficient to prevent any price increases at all - a scenario perhaps most consistent with the BOJ's stated intentions. Even in this scenario, including the BOJ's true net worth implies that the consolidated net debt would be 61% of GDP, which again is lower than commonly cited debt figures.

5. Conclusions

Japan's government debt is very high, especially considering the fact that the data exclude likely future liabilities stemming from an ageing population and possible requirements of the financial system. Nevertheless, an offsetting factor is the degree to which the Bank of Japan has already monetised the debt. The monetary expansion up to the end of 2003 has increased the net worth of the Bank of Japan, properly measured, to more than 17% of GDP, directly reducing the debt position of the consolidated government and central bank - the most relevant measure for assessing fiscal solvency. Furthermore, the consolidated debt ratio would fall further if the monetary expansion is allowed to generate a temporary period of rising prices. Even a reversal of the bulk of the monetary expansion (implying only modest price increases) would leave consolidated debt levels noticeably lower as a share of GDP than commonly recognised.

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[14] One alternative policy option, however, would be to raise reserve requirements such that a higher level of reserves becomes compatible with positive interest rates.

[15] Among the many practical decisions that must be made in implementing such a monetary reversal is the speed with which such a reversal will occur, for too rapid a reversal may lead to problems at banks or other financial institutions.

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