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7 Fiscal Remedies for Japan's Slump

Laurence Ball

7.1 Introduction

When an economy slumps, policymakers typically stimulate demand by reducing short-term interest rates. Japan's experience in the last decade has renewed interest in an old question: what to do when rates can't be lowered. Weak demand has produced an output slump and deflation. But short-term rates cannot fall because they are already at their lower bound of zero. Japan has experienced this "liquidity trap" since 1998. Can policy still stimulate demand?

The textbook remedy for a liquidity trap is a fiscal expansion. Japanese policy is complicated, however, by a large and rising government debt. This problem led the major rating agencies to downgrade Japan's debt in 2002. Policymakers resist a fiscal expansion because they believe it would exacerbate the debt problem.

Others, however, argue for a fiscal expansion. Kuttner and Posen (2001) suggest that this policy would not only boost output but also have benign effects on Japan's debt problem. They argue that Japan's large budget deficits have mainly been caused by its output slump. By ending the slump, a fiscal expansion would eventually raise tax revenues, and higher inflation would reduce the real value of debt. These effects would offset the direct costs of a fiscal expansion.

Several advocates of a fiscal expansion suggest a twist: money finance (e.g., Mankiw 1999; Stevens 2001). They advocate a "helicopter drop" of money—or, equivalently, a bond-financed fiscal expansion coupled with purchases of the new debt by the central bank. Monetization of the debt

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would eliminate the direct fiscal costs of the policy, leaving only the benefits from economic stimulus. Bernanke (2003) summarizes the argument for a money-financed tax cut:

> Isn't it irresponsible to recommend a tax cut, given the poor state of Japanese public finances? To the contrary, from a fiscal perspective, the policy would almost certainly be stabilizing, in the sense of reducing the debt-to-GDP ratio. The BOJ's purchases would leave the nominal quantity of debt in the hands of the public unchanged, while nominal GDP would rise owing to increased nominal spending. Indeed, nothing would help reduce Japan's fiscal woes more than healthy growth in nominal GDP and hence in tax revenues.

This paper examines these ideas. It uses a textbook-style macromodel calibrated to fit the Japanese economy. The model's initial conditions are based on the situation in 2003. I determine the fiscal transfer needed to boost output to potential, and derive the effects over time on output, inflation, and the debt-income ratio. I compare results for a bond-financed transfer, a money-financed transfer, and a baseline case with passive fiscal policy. In most exercises, I assume monetary policy follows a Taylor rule once interest rates become positive.

The results are generally favorable to fiscal expansions. For base parameter values, a transfer of 6.6 percent of gross domestic product (GDP) returns output to potential in the following year, and thereafter only small transfers are needed to keep it there. The output recovery ends deflation, and the interest rate becomes positive; then the Taylor rule guides the economy to a steady state with low positive inflation. If the fiscal transfer is financed with bonds, the debt-income ratio jumps up when the transfer occurs, but then it falls as output and inflation rise. Two years after the transfer, the debt-income ratio falls below its level under passive policy, and it remains lower in steady state. Thus the transfer improves the long-run fiscal situation as well as ending the output slump.

Does it matter if the fiscal expansion is financed with money rather than debt? Money finance prevents the debt-income ratio from jumping up when the transfer occurs. For base parameter values, this ratio remains lower with money finance than with debt finance for nine years. In year ten, however, the debt paths under the two policies converge. The initial financing of the transfer is irrelevant in the long run.

These results arise because the Taylor rule becomes operative in year ten. In that year the central bank sets a positive interest rate, which requires a contraction of the monetary base. It reduces the base by selling government bonds. The necessary contraction is larger if the initial transfer was money financed, and the extra sales of debt offset the initial savings from monetization.

The rest of this paper contains seven sections. Section 7.2 presents additional background and Section 7.3 presents the model. Sections 7.4–7.8 derive the implications of passive fiscal policy, debt-financed transfers, and money-financed transfers. Section 7.7 considers robustness and Section 7.8 concludes.

7.2 Background

7.2.1 Japan's Slump

Figure 7.1 presents annual data on Japan's economy from 1990 to 2003. I use the experience of this period to guide my modeling of the economy. The situation in 2003 is summarized in table 7.1. In simulating alternative policies, I use data from 2003 as initial conditions.

Panel A of figure 7.1 shows the log of real output. Output growth averaged 1.3 percent per year over 1990–2003, compared to 4.0 percent from 1980 to 1990. Early in the slump, some blamed it on slow growth of potential output due to "structural" factors. Today, however, most economists agree that output has fallen below potential because of deficient demand. Apparent demand shocks include a collapse in asset prices, a credit crunch, and policy mistakes (e.g., Hoshi and Kashyap 2004; Posen 2003).

There is, of course, uncertainty about the gap between output and potential output. Following McCallum (2000) and Hoshi-Kashyap, figure 7.1 presents a path for potential based on the assumption that it has grown 2 percent per year since 1990. This approach produces an output gap of –9 percent in 2003. Using production functions, some researchers have esti-

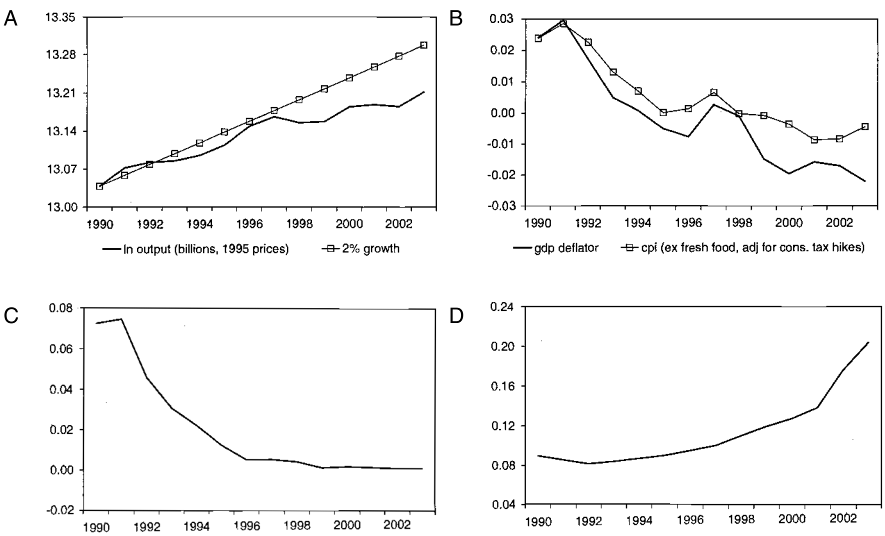

Fig. 7.1 Japan's slump: *A,* output; *B,* inflation; *C,* short-term interest rate; *D,* monetary base/GDP

Table 7.1 **Conditions in 2003 (initial conditions for simulations)**

	Conditions
Output gap	–7.5%
Inflation	–1.0%
Nominal interest rate	0
Base/GDP	0.20
Debt/GDP	0.79

mated recent gaps of around –5 percent (e.g. Ahearne et al. 2002; Leigh 2004). In my simulations, I assume an initial output gap of –7.5 percent).

Figure 7.1 also shows inflation, as measured by the GDP deflator and by core Consumer Price Index (CPI). The slump of the 90s dragged inflation down, as predicted by the accelerationist Phillips curve. In 2000, inflation reached about –1 percent (a bit higher for the CPI and a bit lower for the deflator). Since then, inflation has remained fairly constant. I use –1 percent as the initial value of inflation.

The stability of inflation since 2000 is *not* consistent with a conventional Phillips curve. Such an equation predicts accelerating deflation when the output gap is negative. The cause of this anomaly is unclear, but Blanchard (2000) suggests one possibility. The accelerationist Phillips curve is based on the assumption that expected inflation equals past inflation. This relation breaks down if people view deflation as transitory—if they expect a return to nonnegative inflation. In this case, an output slump causes deflation but not accelerating deflation. I will incorporate this idea in the chapter's model.[1]

Panels C and D of figure 7.1 show the behavior of monetary policy. The Bank of Japan (BOJ) responded to the slump and falling inflation by cutting the short-term interest rate. Leigh (2004) shows that a conventional Taylor rule captures this behavior up to 1998. At that point, the Taylor-rule interest rate became negative, and the actual rate hit the zero bound. The interest rate has stayed close to zero since then.

The monetary base grew steadily as the interest rate fell. Base growth accelerated under the policy of "quantitative easing," which entailed large open market operations. The base grew 26 percent in 2002 and 16 percent in 2003, reaching 20 percent of GDP. With the interest rate stuck at zero, this monetary expansion did not have obvious effects on output or inflation. This experience is consistent with a textbook liquidity trap.

7.2.2 A Fiscal Solution?

The classic solution to a liquidity trap is a fiscal expansion. However, Japanese policymakers are reluctant to try this policy, for two reasons.

1. Econometric research suggests that the Japanese Phillips curve broke down sometime in the 1990s. See Fukao (2004).

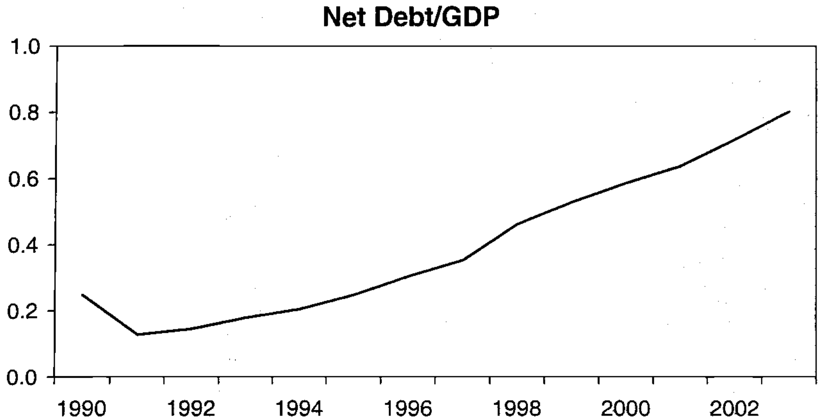

Fig. 7.2 Rising debt

First, many argue that fiscal policy is ineffective in raising output. Second, they fear that a fiscal expansion would exacerbate the problem of a growing national debt.

This chapter rejects the first reason. It is based on the view that Japan tried fiscal expansions in the 1990s without success (e.g., Friedman 2001). This view has been debunked by Posen (1998) and Kuttner and Posen (2001). They show that several "expansion" programs failed because they were not really expansions—they consisted mainly of normal expenditures. There were large fiscal deficits, but these mainly reflected revenue losses caused by the slump. In periods of true fiscal loosening, such as 1995, output responded.

Kuttner and Posen also estimate multipliers for fiscal policy in Japan. They use the structural VAR approach of Blanchard and Perotti (2002), which controls for the cyclical behavior of deficits. Kuttner and Posen find that a 100 yen tax cut raises output one year later by about 125 yen.

This chapter will worry more about the second objection to fiscal expansion: its effects on Japan's public debt. Figure 7.2 shows the path of net government debt as a percent of GDP. This ratio rose from 0.13 in 1991 to 0.79 in 2003, and forecasters predict that it will continue to rise. Long-term budget projections are bleak because of Japan's aging population. Many analysts fear an eventual fiscal crisis, possibly even default. As a result, Japan's debt has been downgraded to A2/AA–, the level for many developing countries.[2]

This chapter will look for policies that end Japan's slump without worsening its debt problem. I will ask whether a fiscal transfer can do so—

2. According to the Organisation for Economic Co-operation and Development (OECD), Japan's gross government debt for 2003 was 157 percent of GDP and government assets were 78 percent, yielding net debt of 79 percent. Broda and Weinstein (2004) suggest two adjustments to this figure. Like this chapter, they view the government and the central bank as the

whether the fiscal benefits from higher output and inflation outweigh the direct costs of the transfer. I will also consider the effects of financing the transfer with money rather than bonds.

7.3 The Model

Japan's problems are largely explained by textbook macromodels. A fall in aggregate demand has reduced output, and monetary policy is ineffective because the interest rate has hit zero. Kuttner and Posen say "the basic lesson of Japan's Great Recession for policymakers is to trust what you learned in intermediate macroeconomics class." In that spirit, I study a model with textbook equations such as an IS curve and a money-demand function. I add simple dynamics following Svensson (1997) and Ball (1999). The only unorthodox equation is the Phillips curve, which is modified to capture Japan's steady deflation.

7.3.1 Assumptions

Output: Potential output Y^* grows by g percent per year. Actual output Y deviates from potential according to an IS equation:

$$(1)\qquad \frac{(Y_t - Y_t^*)}{Y_t^*} = \frac{\lambda(Y_{t-1} - Y_{t-1}^*)}{Y_{t-1}^*} - \beta(r_{t-1} - r_{t-1}^*) + \delta\left(\frac{G_{t-1}}{Y_{t-1}^*}\right)$$

where t indexes years, G is real transfers from the government, r is the real interest rate, r^* is the "neutral" interest rate, and all parameters are positive. The real rate r is $i - \pi$, where i is the nominal rate and π is inflation. In words, the output gap depends on the lagged gap, the lagged real interest rate, and lagged transfers. The one-year lags are consistent with Japanese evidence (see Kuttner and Posen 2001).

Inflation: Inflation is determined by an expectations-augmented Phillips curve:

$$(2)\qquad \pi_t = \pi_t^e + \frac{\alpha(Y_{t-1} - Y_{t-1}^*)}{Y_{t-1}^*},$$

where π^e is expected inflation. A conventional assumption is that expected inflation equals lagged inflation, $\pi_t^e = \pi_{t-1}$. I assume instead that

$$(3)\qquad \pi_t^e = \max\{\pi_{t-1}, 0\}.$$

The conventional assumption holds when lagged inflation is nonnegative, but expectations do not follow actual inflation below zero. When $\pi_{t-1} \geq 0$,

same entity, and thus subtract government bonds owned by the central bank. This reduces net debt by 16 percent of GDP. Second, they add bad loans from the government to the private sector, which by coincidence are also 16 percent of GDP. The two adjustments cancel, so net debt is still 79 percent.

equations (2) and (3) imply that output determines the change in inflation. When $\pi_{t-1} < 0$, output determines the *level* of inflation, as suggested by Blanchard.

Section 7.7 replaces equation (3) with the assumption that π_t^e always equals π_{t-1}. This change does not greatly affect the economy's response to fiscal expansions. It does change the baseline case with passive fiscal policy. If $\pi_t^e = \pi_{t-1}$ and policy is passive, the economy falls into a spiral of accelerating deflation.

Money: The central bank controls the stock of base money, M, through open market operations. Money evolves according to

$$M_t = M_{t-1} + Z_t, \tag{4}$$

where Z is central-bank purchases of government bonds ($Z < 0$ means sales of bonds). The demand for base money is given by

$$\ln\left(\frac{M_t}{P_tY_t}\right) = k - \gamma i_t,\ i_t > 0; \tag{5}$$

$$\geq k, \quad i_t = 0,$$

where P is the price level. This equation imposes a unit income elasticity of money demand (which is consistent with Japanese data). At positive interest rates, there is a constant interest rate semi-elasticity; at a zero interest rate, money demand becomes flat. Figure 7.3 shows the money-demand function in a graph.[3]

Debt: I measure Japan's fiscal problem with privately-held debt, which excludes debt held by the central bank. Thus I ignore the separate balance sheets of the government and central bank and treat them as one entity. Nominal debt D_t evolves according to

$$D_t = D_{t-1} + i_{t-1}D_{t-1} + P_tG_t - Z_t - \theta(P_tY_t - P_tY_t^*). \tag{6}$$

Debt is past debt plus changes from four sources: interest payments on the past debt; current nominal transfers; open market purchases, which reduce debt; and a term for the government's primary surplus in the absence of transfers. This surplus is assumed to be zero when output equals potential ($Y_t = Y_t^*$). It varies procyclically when output fluctuates.[4]

In reality, Japan's primary surplus would probably be negative even if output were at potential. Ignoring this fact helps us isolate the effects of ex-

3. It is common to specify a demand function like equation (5) for M1 rather than the monetary base. This would not affect the analysis if one assumes a constant ratio of M1 to the base (i.e., a constant money multiplier). This multiplier is fairly stable in Japan.

4. Equation (6) implicitly assumes that government debt has a maturity of one year. In reality, much of Japan's debt is long term. Adding long-term debt to the model would strengthen the case for fiscal expansion. As shown below, an expansion raises the path of interest rates. Higher rates imply capital losses for holders of long-term debt, which are capital gains for the government.

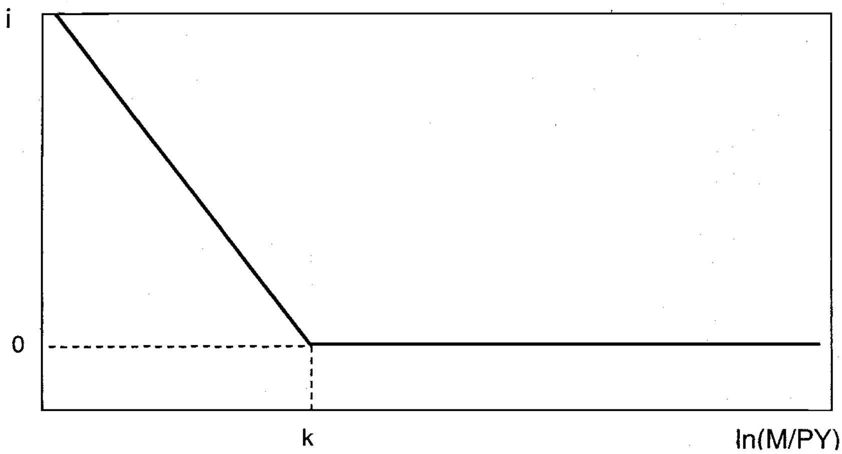

Fig. 7.3 Money demand

ogenous fiscal expansions. Section 7.7 extends the model to include a primary deficit when $Y = Y^*$.

7.3.2 Calibration

Table 7.2 presents base values for the model's parameters. Section 7.7 considers robustness to changes in these parameters.

In the IS equation, I set β, the coefficient on the real interest rate, to 1.0. This follows Ball's (1999) calibration for the United States (I have not found Japanese evidence). For the other IS parameters, I use Kuttner and Posen's econometric results. They estimate that δ, the effect of lagged transfers on output, is 1.25 and λ, the effect of lagged output, is 0.6. The effect of transfers is smaller than Blanchard and Perotti's estimates for the United States.[5]

I also use Kuttner and Posen's estimate of θ, the effect of output on the primary surplus. They find $\theta = 0.25$. This appears conservative, as taxes are 20 percent of Japanese output and marginal taxes are higher than average taxes.

The Phillips curve slope, α, is 0.2. This estimate comes from studies at the BOJ (e.g., Hirose and Kamada 2002). The Phillips curve appears flatter in Japan than in the United States, where α is often estimated around 0.4.

In the money-demand equation, the interest rate semi-elasticity, γ, is 0.1, based on estimates by Fujiki, Hsiao, and Shen (2002), and Miyao (2002). The parameter k is the point at which the money-demand curve hits an interest rate of zero. I calibrate it using the historical evidence in figure 7.1.

5. More precisely, Kuttner and Posen estimate an equation for log output, and get a coefficient of –0.25 on log taxes. Dividing by the ratio of taxes to GDP (approximately 0.2) yields the yen-for-yen effect of taxes and transfers on output.

Table 7.2 **Base parameter values**

	Values
IS	
β	1.0
λ	0.6
δ	1.25
Revenue	
θ	0.25
Phillips curve	
α	0.2
Money demand	
γ	0.1
k	ln(0.1)
Potential output	
g	0.02
Neutral rate	
r^*[a]	–0.02
r^*[b]	+0.02

[a]In year 0.
[b]Grows linearly to year 10.

When the interest rate reached zero in 1998, the ratio of the monetary base to GDP was about 0.1. This implies $k = \ln(0.1)$.

The growth rate of potential output, g, is 2 percent per year.

7.3.3 The Neutral Interest Rate

It remains to calibrate the neutral real interest rate, r^*. This is a thorny issue. There is debate about whether this parameter is positive or negative in Japan (e.g. Krugman 2000). My view is that r^* is currently negative, but unlikely to stay negative forever. My calibration will capture this idea.

The neutral interest rate is the one that produces $Y = Y^*$ in the absence of a fiscal expansion. It seems clear that r^* has been negative in the early 2000s. The actual real rate has been about 1 percent and Y has been far below Y^*. Thus r^* must be well below 1 percent. I assume an initial r^* of –2 percent, which implies $r - r^* = 3$ percent. For this value of $r - r^*$, the output gap converges to –7.5 percent if there is no fiscal transfer. Thus the calibration captures the idea that output is stuck at a low level.

It is unlikely, however, that r^* will stay negative forever. Iwamura, Mitsuru, and Watanabe (2004), and Leigh (2004) estimate that r^* was well above zero before the 1990s, but fell during the 90s slump. The fall in r^* means the IS curve shifted in. This shift reflected adverse demand shocks, such as the credit crunch and fall in confidence. It is likely that these problems will someday abate. Eventually, a cleanup of banking may spur greater lending. Or a recovery due to external demand will raise confidence and improve balance sheets. Whatever the reason, the IS curve will shift back out and r^* will return to a positive level.

I assume that r^* eventually rises to +2 percent. Of course it is hard to guess how quickly this will happen. In the base specification, I assume that r^* rises linearly from –2 percent to +2 percent over ten years. The IS curve shifts outward, but slowly. Since this assumption is arbitrary, variations on the r^* path are a top priority among robustness checks.

7.4 A Baseline Case

This section derives the path of the economy if there is no fiscal expansion: $G_t = 0$ for all t. The economy starts in year zero with the initial conditions in table 7.2. This exercise provides a baseline for measuring the effects of fiscal policy.

7.4.1 Monetary Policy

To close the model, I must specify the behavior of monetary policy. I assume an interest rate rule based on the past behavior of the Bank of Japan. Recall that the BOJ appeared to follow a Taylor rule until the interest rate hit zero. This behavior is captured by

$$(7) \qquad i_t = \max\{i_t^T, 0\},$$

$$i_t^T = r_t^* + \pi_t + \frac{a(Y_t - Y_t^*)}{Y_t^*} + b(\pi_t - \pi^*),$$

where π^* is an inflation target. The variable i^T is the interest rate dictated by a Taylor rule: it depends on the output gap and inflation. The BOJ sets an interest rate of i^T if i^T is positive, and zero if i^T is negative. BOJ officials have suggested the same rule in describing their policy (Baba et al. 2004).

When the rule delivers a positive interest rate, the money-demand equation determines M. M and lagged M determine open market purchases, Z. When $i = 0$, M is not determined by the rule, because money demand is flat. In this case, I make the additional assumption that $Z = 0$, so M equals lagged M. That is, I assume the BOJ does not pursue open market operations if they do not affect the interest rate. (Section 7.6 examines an alternative assumption.)

In the Taylor rule, the coefficients a and b are chosen as follows. Taylor rules with certain parameters are equivalent to "flexible" inflation targeting: a policy that returns inflation to π^* at a fixed rate (see Svensson [1997] and Ball [1999] for proofs in similar models). I assume that inflation moves halfway to its target each period. One can show that this implies $a = 1.1$ and $b = 2.5$.

I assume the inflation target π^* is 2 percent, which is close to the targets of many countries.

Given initial conditions and the policy rule, it is straightforward to derive the evolution of the economy. Each period, Y and π are determined by past conditions through equations (1)–(3). Inflation π determines the price level P. The policy rule determines i, M, and Z, as described above. Finally, equation (6) determines D.

7.4.2 Results

Figure 7.4 shows the paths of some key variables: the output gap, π, i, and the ratios of Z, M, and D to GDP. Starting from period zero, output

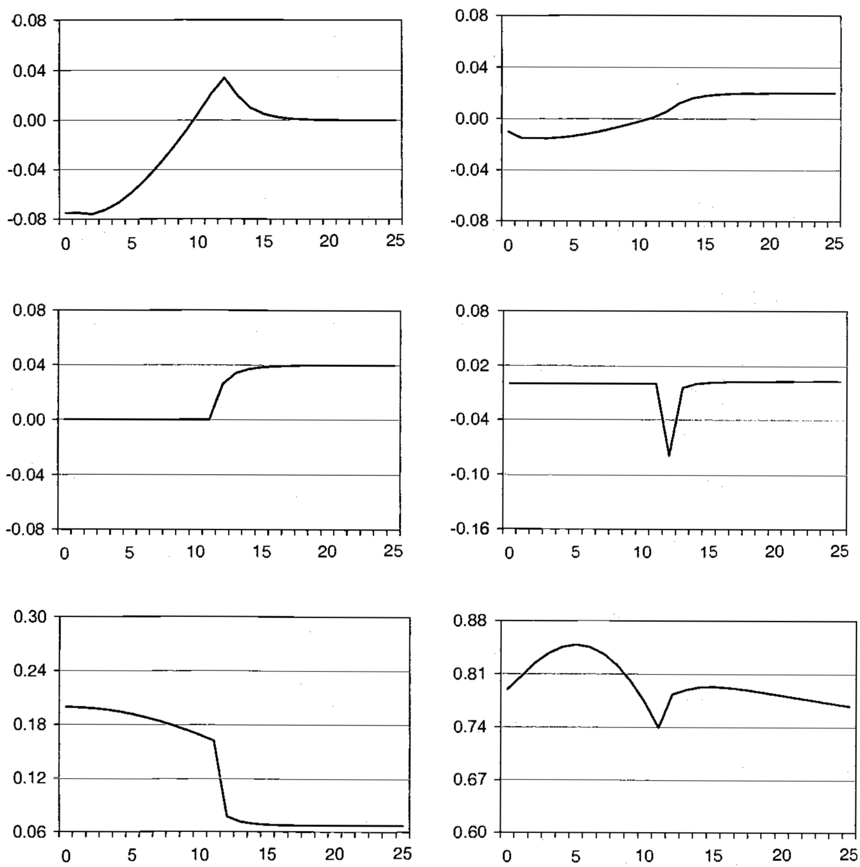

Fig. 7.4 Baseline case: output gap; inflation; nominal interest rate; OMO/GDP; monetary base/GDP; debt/GDP

stays in a deep slump for several years and then slowly recovers as r^* increases. The output gap rises above –5 percent in year six, and it becomes positive in year ten. From years one to nine, there is a cumulative output gap of –54 percent.

Inflation falls to –1.5 percent and then inches up as the economy recovers. It becomes positive in year eleven. Through that year the Taylor rule prescribes a negative interest rate, so i is stuck at zero.

In year twelve, the recovery pushes the Taylor-rule interest rate above zero. The rule begins to operate, and it guides inflation smoothly to the target of 2 percent. Output temporarily overshoots potential as inflation rises.

While the interest rate is zero, the money stock is constant and nominal GDP grows (the growth in Y exceeds the fall in P). The money-GDP ratio declines slowly. In year twelve, when the interest rate becomes positive, the money-GDP ratio falls by more than half. This occurs through a large monetary contraction: open market purchases, Z, are –8 percent of GDP. This action is needed because of the high level of money at the start of the simulation. Although the money-GDP ratio falls in years one to eleven, it remains far above the level that produces a positive interest rate. Thus a large money absorption is needed when the Taylor rule takes effect.

The debt-income ratio rises initially, because the output slump produces primary deficits. The ratio peaks at 0.85 in year five, then falls as the economy recovers. It jumps up in year twelve, when the large monetary contraction occurs. The BOJ's sales of government bonds raise the level of privately-held debt.

In steady state, the debt-income ratio falls slowly. The primary deficit is zero, and interest payments are balanced by income growth, since $r = g =$ 2 percent. The fall in the debt ratio results from seignorage revenue, as $Z >$ 0 in steady state. The ratio reaches 0.77 in year twenty-five.

7.5 A Bond-Financed Fiscal Expansion

This section examines how a bond-financed fiscal expansion changes the evolution of the economy.

7.5.1 The Policy

In this experiment, interest rate policy is the same as before: $i = \max\{i^T, 0\}$. And once again, $Z = 0$ when $i = 0$.

However, this policy is now accompanied by fiscal transfers. These transfers add to government debt through equation (6). The transfers begin in year one; given the lag in the IS curve, they start affecting output in year two. The transfers are chosen to end the slump quickly and permanently: the output gap is nonnegative in years two, three, ... Each period, the government makes the smallest transfer sufficient to achieve this result.

To state this policy formally, let G_t^* be the real transfer that produces $Y_{t+1} = Y_{t+1}^*$. G_t^* can be computed from the IS curve given the state at t. The rule for transfers is

(8) $$G_t = \max\{G_t^*, 0\}, t \geq 1.$$

If a positive transfer is needed to keep output at potential, it is made. If a negative transfer would keep output at potential, no transfer is made. In this case, output exceeds potential.

7.5.2 The Path of Transfers

Figure 7.5 shows the series of fiscal transfers implied by equation (8). In year one, the transfer is 6.6 percent of output (Y), or 6.1 percent of potential output (Y^*). Given the multiplier of 1.25, this transfer is needed to produce a zero output gap in period two, rather than the –7.6 percent gap of the baseline case. The transfer is 2.2 percent of output in year two, less than 1 percent in years three and four, and zero thereafter. The necessary transfer peters out because $r - r^*$ falls, stimulating spending. (The real rate falls because π rises, and r^* rises by assumption.) The cumulative transfer over years one through four is 9.4 percent of output.

This fiscal expansion is large by historical standards, but not gigantic. Over the 1990s, Japan experienced a series of changes in taxes and government spending (Kuttner and Posen 2001). Several of these shifts amounted to 2 percent of GDP or more; a 1998 stimulus package was 4 percent. The total effect of fiscal policy was small, because expansions in some years were offset by contractions in others (such as the 1997 tax increase). The key difference between the transfers proposed here and recent practice is that policy pushes consistently in one direction.

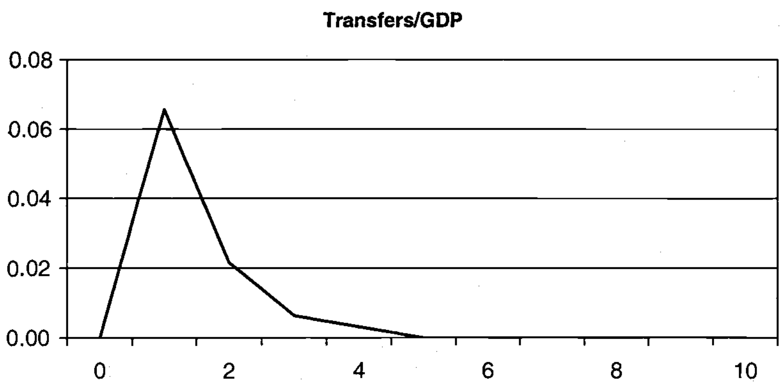

Fig. 7.5 The fiscal expansion

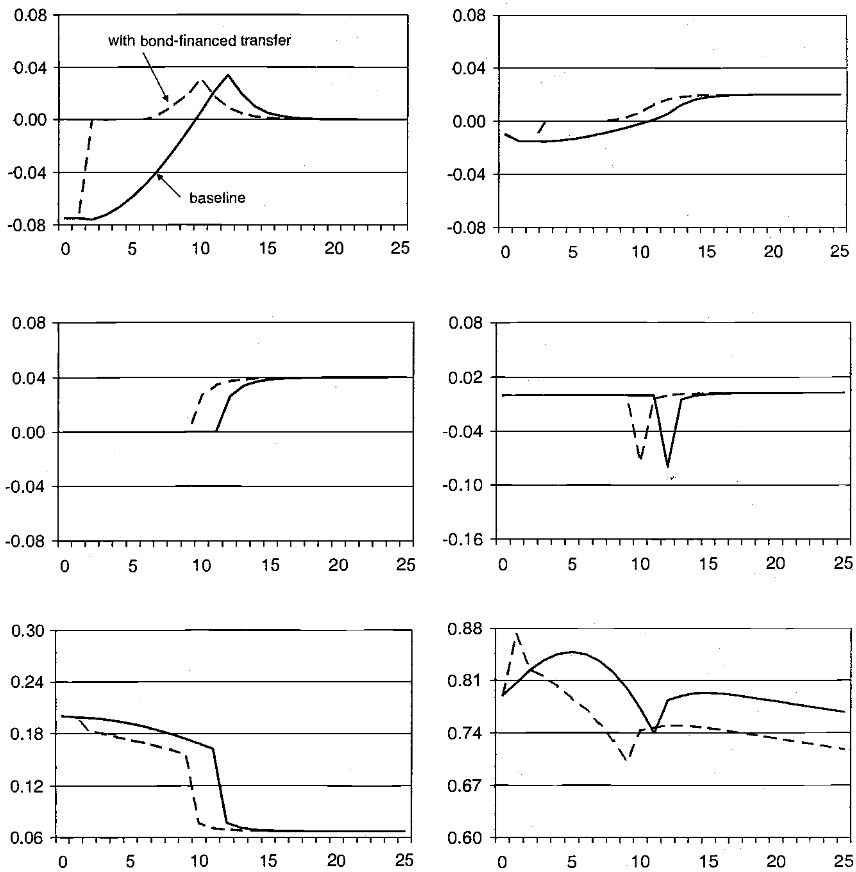

Fig. 7.6 Effects of fiscal expansion: output gap; inflation; nominal interest rate; OMO/GDP; monetary base/GDP; debt/GDP

7.5.3 Effects of the Transfers

Figure 7.6 shows the effects of fiscal transfers. It compares the economy's path under the transfer rule (8) (the dashed line) to the baseline case without transfers (the solid line). By construction, the transfers return output to potential in period two; most of the long slump in the baseline case is eliminated. The faster recovery implies that inflation and the interest rate start rising sooner than before. Nonetheless, the Taylor rule guides the economy to the same steady state, with 2 percent inflation.

The large transfer in period one causes the debt-income ratio to jump up: it reaches 0.87, compared to 0.81 in the baseline case. After that the ratio falls rapidly as the transfers fuel growth and inflation. In year two, the debt-income ratio with transfers (0.825) is very close to the ratio in the baseline case (0.824); in year three, the ratio with transfers falls below the baseline case. It remains lower in all future years, except for year eleven when it is slightly higher. (The result for year eleven reflects the fact that the nominal interest rate rises earlier with transfers. The jump in debt from the necessary monetary contraction occurs sooner.)

In steady state the debt-income ratio falls slowly in both the baseline case and the case with transfers. However, the path of the ratio is lower with transfers. In year twenty-five, the ratio is 0.72 with transfers and 0.77 without them. Thus the transfers produce a win-win: they end the output slump quickly *and* they improve the long-run fiscal situation.

To better understand these results, note that the cumulative output gap in the baseline case is –44 percent of potential output. The cumulative gap with transfers is –5 percent, so the transfers raise output by a total of 39 percent of potential. The effect of output on government revenue, θ, is 0.25; thus revenue rises by (0.25)39 percent = 9.8 percent of potential output. This gain more than offsets the initial transfers, which total 9.4 percent of potential. The transfers also reduce the debt-income ratio by raising inflation. Inflation reaches zero in period three, while it stays negative through period ten in the baseline case. The faster rise in inflation reduces real interest rates on the debt.

7.6 A Money-Financed Fiscal Expansion

This section considers fiscal transfers financed by printing money rather than issuing debt. I ask whether money finance produces lower debt-income ratios, as suggested by Bernanke and others.

7.6.1 The Policy

In this experiment, the fiscal transfers are the same as before (see the path in figure 7.5). There are positive transfers in years one through four. The government finances the transfers by issuing bonds and the central bank buys the bonds. The central bank's purchases equal the nominal level of transfers:

$$Z_t = P_t G_t,\ t = 1, \ldots, 4. \quad (9)$$

These actions raise the money stock by the amount of the transfers, and leave privately-held debt unchanged. Thus they are equivalent to a helicopter drop of money.

After year four, monetary policy behaves as in the previous experiments. Open market purchases are zero until the Taylor rule prescribes a positive interest rate, and then this rule determines policy.

7.6.2 Results

The fiscal multiplier does not depend on how transfers are financed. Thus switching from debt to money finance does not change the path of output.

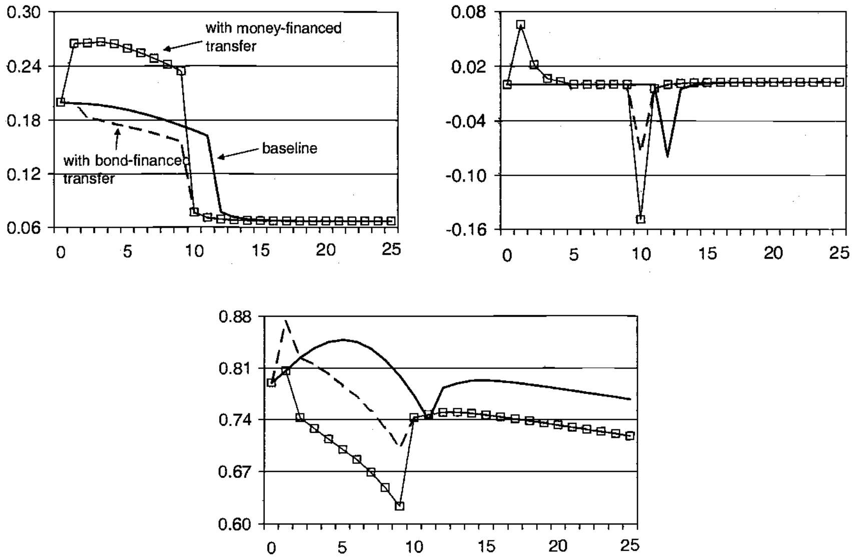

Fig. 7.7 Money-finance versus debt-finance: monetary base/GDP; OMO/GDP; debt/GDP

There is also no effect on inflation or the interest rate, since the Phillips curve and Taylor rule are unchanged. The only changes are in open market operations, the money stock, and debt. Figure 7.7 shows the paths of these variables. It compares the case of money-financed transfers (the dotted lines) to the cases of bond-financed transfers and no transfers.

When the transfers are money financed, the money-income ratio jumps up in year one. In contrast to the case of bond finance, the debt-income ratio does *not* rise sharply. In years one through nine, the money-income ratio is higher with money finance, and the debt-income ratio is lower by the same amount. Policymakers have substituted money for debt.

Things change in year ten, when the Taylor rule becomes operative. As before, contractionary open market operations are needed to reduce money to the level consistent with the Taylor rule. The necessary open market sales are larger in the case of money-financed transfers, because the money-income ratio is higher in year nine. The extra sales of debt raise the debt-income ratio to its path in the bond-finance case. In other words, the monetization of debt in years one through four is reversed in year ten: money is turned back into debt. Starting in year ten, the initial financing of transfers is irrelevant to all variables in the model.

In light of these results, does it matter how transfers are initially financed? Monetization has no effect on output or inflation, and no long-run effect on debt. However, it prevents the jump in the debt-income ratio that occurs in year one if transfers are debt financed. With money finance, the debt-income ratio never significantly exceeds its level in the baseline case. Thus monetization matters if we care about the short-run path of debt, not just its steady-state behavior.

Do we care about the short-run path of debt? To address this question, we must go beyond the model and ask why debt matters. A high debt-income ratio is dangerous because investors may start to fear default, sparking a financial crisis (Ball and Mankiw 1995). Higher debt at a point in time might increase this danger, even holding constant the long-run behavior of debt. Investors are more likely to panic when they hold more debt, because they have more to lose from an immediate default. However, the importance of this effect is unclear. The case for money-financed transfers is not as compelling as some economists suggest.[6]

7.6.3 A Permanent Monetary Expansion

In the previous experiment, the increase in money that finances transfers is reversed in the long run. This fact follows from the conventional assumption that the central bank eventually follows a Taylor rule. However, the reversal of the monetary expansion differs from some economists' suggestions. Bernanke, for example, advocates money-financed transfers for which "much or all of the increase in the money stock is viewed as permanent." Here I consider such a policy. As one might guess, the policy prevents the debt-income ratio from jumping up at any point. Unfortunately, it also produces hyperinflation.

Specifically, I assume again that transfers are governed by equation (8), and that they are financed by money creation. Monetary policy after the transfers is the same as in earlier experiments, except for a constraint: open market purchases must be nonnegative. That is, after the money stock rises, it can never fall. This constraint first binds in year eleven, when the Taylor-rule interest rate becomes positive. When the Taylor rule implies $Z_t < 0$, the central bank sets $Z_t = 0$ instead.

Figure 7.8 shows the effects of this policy. Through year nine we see the same effects of money-financed transfers as before. In year ten, the Taylor rule starts calling for large open market sales, but they do not occur. Con-

6. Goodfriend (2000) and Suda (2003) argue that a monetary expansion to finance transfers would eventually have to be reversed, with adverse fiscal consequences. Their arguments anticipate the results of this section.

Auerbach and Obstfeld (2004) present a model in which expansionary open market operations reduce debt permanently. This result contradicts my finding that monetization of debt is irrelevant in the long run. The differences between Auerbach-Obstfeld's results and mine arise from different assumptions about inflation. In the Auerbach-Obstfeld model, a monetary expansion causes inflation to rise, reducing real government debt, even when the interest rate is zero. After that, inflation falls without a fall in output. In my model, monetary policy cannot affect inflation at a zero interest rate, and a fall in inflation requires lower output and tax revenue.

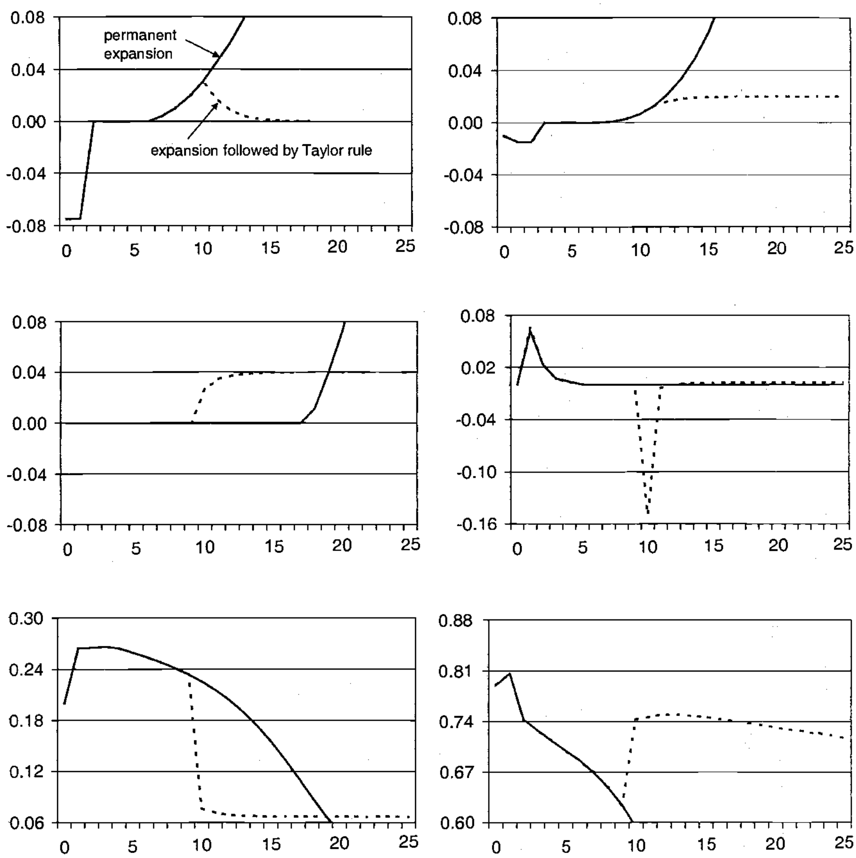

Fig. 7.8 A permanent monetary expansion: output gap; inflation; nominal interest rate; OMO/GDP; monetary base/GDP; debt/GDP

sequently, the money-income ratio stays high and the nominal interest rate stays at zero. The failure to tighten policy causes output and inflation to rise. At this point, the economy enters an unstable spiral: higher inflation reduces the real rate, which raises output, which further raises inflation. Without reducing money, the central bank cannot raise the interest rate to abort this process. Inflation reaches 7 percent in year fifteen and 90 percent in year twenty-five, and keeps rising forever.[7]

BOJ officials have criticized the idea of money-financed transfers on the grounds that they would eventually produce high inflation. Figure 7.8 shows a scenario in which this fear is realized. We have seen that policy-

7. Eventually inflation reduces the money-income ratio sufficiently that the nominal interest rate starts rising. However, it rises more slowly than inflation, so the real rate falls forever.

makers can prevent this outcome by reducing the money stock when inflation starts rising. But this action reverses the fiscal gain that money finance is intended to achieve.

7.7 Robustness

This section considers the robustness of my results. I first vary the model's parameters, and then consider broader changes in assumptions.

The chapter's main conclusions are fairly robust. A fiscal expansion always produces a faster output recovery. The long-run effects on the debt-income ratio vary across specifications. In most cases, however, a fiscal expansion reduces debt below its level under passive policy. In some cases, this gain is large. At worst, a fiscal expansion raises long-run debt by a small amount.

7.7.1 The Neutral Real Rate

As discussed in section 7.3, Japan's neutral real interest rate appears to be negative, but is unlikely to stay negative forever. So far, I have assumed the neutral rate r^* starts at –2 percent and rises linearly to +2 percent over ten years. Here I continue to assume r^* rises linearly from –2 percent to +2 percent, but vary the speed of this rise. A fast increase in r^* means the IS curve shifts out quickly.

A faster increase in r^* weakens the case for fiscal expansion. This is illustrated by figure 7.9. Like figure 7.6, this figure compares the economy's evolution with passive policy and with the fiscal rule (8). But it assumes that r^* rises to +2 percent in five years rather than ten. Fiscal expansion still raises output, but its effects on debt are a bit less favorable than before. The debt-income ratio in year twenty-five is about one percentage point higher with the expansion than without.

This result reflects the effects of the r^* path on output. If r^* rises more quickly, then output recovers more quickly in the case of passive policy. This reduces the benefits of ending the initial slump with a fiscal expansion. There are smaller output gains, and hence smaller revenue gains to offset the initial cost of the expansion.

Figure 7.10 considers a range of paths for r^*. I assume this parameter rises linearly from –2 percent to +2 percent in n years, and vary n from one to twenty. For each n, the figure shows the debt-income ratio in year twenty-five with passive policy and with a fiscal expansion. The expansion raises the debt-income ratio for $n < 6$, but only by modest amounts. The costs of expansion when n is small are lower than the gains when n is large.

7.7.2 Equation Coefficients

Table 7.3 examines robustness to varying the coefficients in the model's equations—the IS and Phillips curves and the debt equation. Starting from

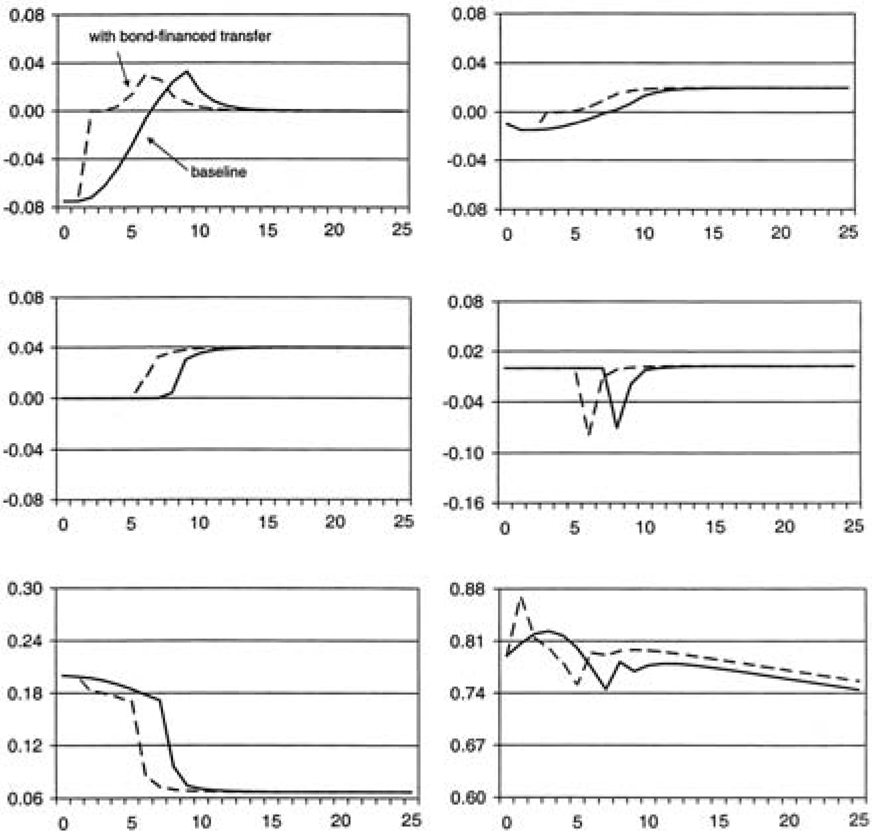

Fig. 7.9 A faster rise in r^*: output gap; inflation; nominal interest rate; OMO/GDP; monetary base/GDP; debt/GDP

the base values in table 7.2, I change one coefficient at a time, trying values that are twice as large and half as large. For each variation, table 7.3 reports the debt-income ratio in year twenty-five with passive policy and with a fiscal expansion.[8]

Not surprisingly, a key coefficient is δ, the fiscal multiplier. A larger multiplier means a smaller transfer is needed to return output to potential. This reduces the debt-income ratio in the case of expansionary policy. Recall that the base value of δ is 1.25; for this value, the debt-income ratio in year twenty-five is 5 points lower with expansionary policy than with pas-

8. As I vary the model coefficients, I also vary the coefficients in the central bank's interest rate rule, equation (7). As discussed in section 7.4, the coefficients in equation (7) are chosen so that inflation moves halfway to its target each period. The coefficients defined by this rule are functions of the IS and Phillips-curve coefficients.

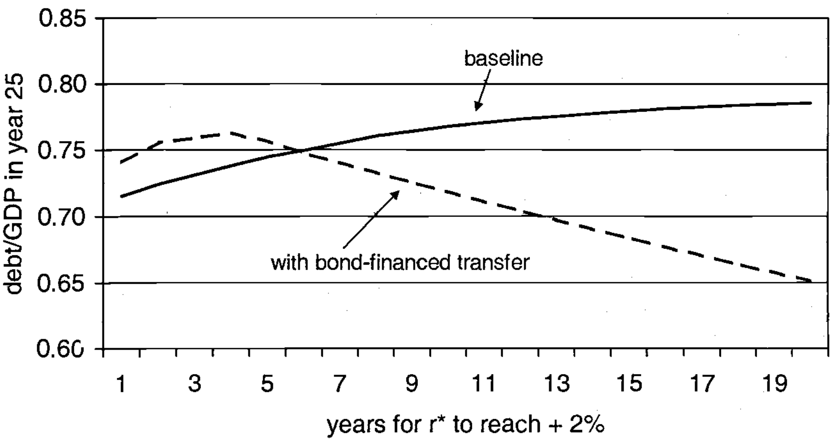

Fig. 7.10 Varying the path of r^*

Table 7.3 Varying the parameter values

	Debt/GDP in year 25	
	With baseline policy	With fiscal transfer
$\delta = 0.625$	0.77	0.79
$\delta = 2.5$	0.77	0.68
$\beta = 0.5$	0.67	0.66
$\beta = 2$	1.13	0.81
$\lambda = 0.3$	0.66	0.67
$\lambda = 1.2$	[very large]	0.86
$\alpha = 0.01$	0.65	0.64
$\alpha = 0.125$	0.73	0.72
$\theta = 0.5$	0.85	0.71

sive policy. This gain rises to 9 points for $\delta = 2.5$, but it falls to –3 points for $\delta = 0.625$. The gain is positive for all $\delta > 0.76$.

When the other coefficients change, the fiscal gains from transfers are robust. Transfers raise the long-run debt ratio in only one case ($\lambda = 0.3$), and then by a trivial amount. Often transfers reduce debt by large amounts (e.g., 41 percent of GDP for $\alpha = 0.4$).

7.7.3 Perpetual Deficits

So far I have assumed the government's primary budget is balanced if output is at potential and the transfers G are zero. This assumption does not fit Japan today. There is a large primary deficit, which is only partly cyclical. It appears this deficit would be about 5 percent of GDP if output were at potential.

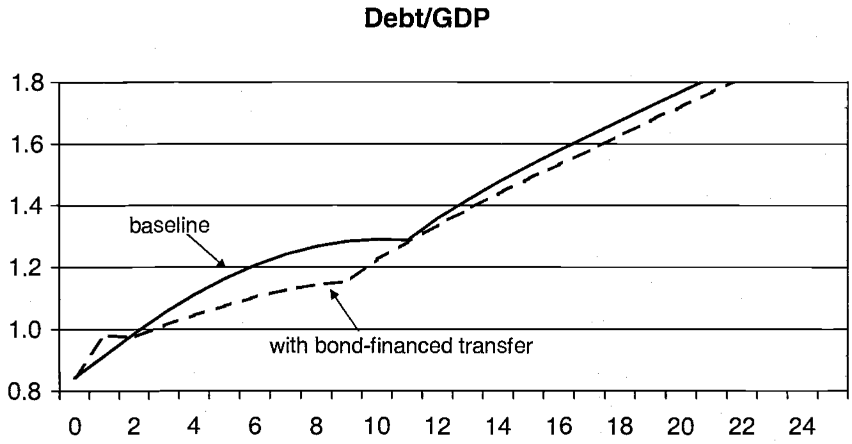

Fig. 7.11 Perpetual deficits

This fact can be captured by adding a term to the debt equation, (6). The equation becomes

(9) $$D_t = D_{t-1} + i_{t-1}D_{t-1} + P_tG_t - Z_t - \theta(P_tY_t - P_tY_t^*) + (0.05)P_tY_t^*.$$

The last term is the primary deficit when output is at potential.

This modification does not change the behavior of output or inflation, but it does affect the debt path. For base parameter values, figure 7.11 shows this path for the cases of passive and expansionary fiscal policy. In both cases the debt-income ratio rises forever. A permanent budget deficit leads to disaster.

However, fiscal expansion still compares favorably to passive policy. Starting in year two, the debt-income ratio is always smaller with the expansion. This policy does not eliminate the underlying deficit problem, but it slows the growth of debt.

7.7.4 A Textbook Phillips Curve

The main model assumes that expected inflation cannot fall below zero. Here I assume that expected inflation equals past inflation, even if past inflation is negative:

(10) $$\pi_t^e = \pi_{t-1}.$$

This assumption and equation (2) produce an accelerationist Phillips curve:

(11) $$\pi_t = \pi_{t-1} + \frac{\alpha(Y_{t-1} - Y_{t-1}^*)}{Y_{t-1}^*}.$$

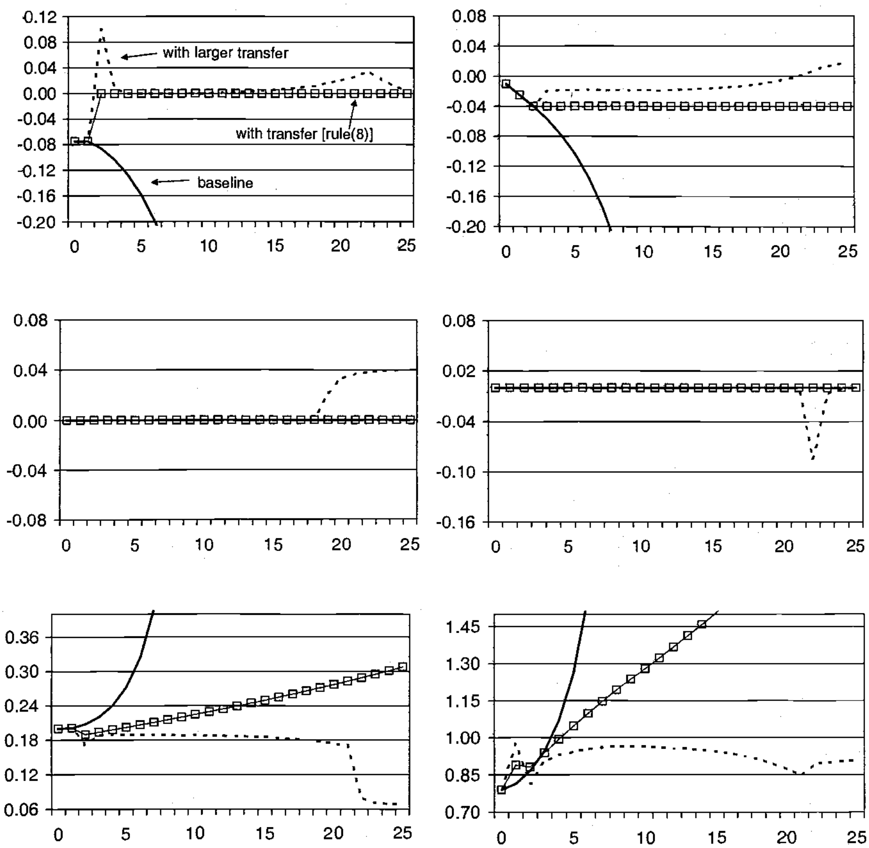

Fig. 7.12 A textbook Phillips curve: output gap; inflation; nominal interest rate; OMO/GDP; monetary base/GDP; debt/GDP

Figure 7.12 shows how this modification affects the economy under alternative policies.

The largest changes occur for the case of no fiscal expansion—the solid line in the figure. In this case, the output slump leads to a deflationary spiral. Low output reduces inflation, which raises the real interest rate, which further reduces output. Inflation and output head to minus infinity. With an accelerationist Phillips curve, passive policy is disastrous.

The dashed line in figure 7.12 shows the effects of the fiscal rule (8). The outcomes from this policy are better than from passive policy, but still not good. Inflation falls to –4 percent and then remains at that level. The nominal interest rate stays at zero, and the real rate rises to +4 percent. The economy stays in a liquidity trap. To keep output at potential, as required by rule (8), the government must provide transfers forever. This causes the debt-income ratio to rise without bound.

In this version of the model, a more aggressive fiscal expansion is better. The dotted line in figure 7.12 shows what happens if the transfer in year one is 15 percent of potential output, rather than 7 percent as dictated by equation (8). This transfer creates a boom in year two, pushing inflation from –4 percent to –2 percent in year three. With 2 percent inflation, the real interest rate is low enough for the economy to escape the liquidity trap. Eventually a nonnegative output gap can be sustained without transfers. The debt income ratio peaks at 0.91 in year twenty-six and then falls.

7.7.5 A Forward-Looking Real Interest Rate

The main model is backward-looking—there is no role for expectations of future variables. Here I introduce some forward-looking behavior. I define the real interest rate as the nominal rate minus expected future inflation, not current inflation. Since the model is nonstochastic, expected inflation equals actual future inflation. The real interest rate is

$$r_t = i_t - \pi_{t+1}. \tag{12}$$

This variation has only minor effects on the results. Once again, a fiscal expansion ends the output slump and reduces long-run debt. The debt-income ratio in year twenty-five is 0.73 with fiscal expansion and 0.79 with passive policy.

7.8 Conclusion

This chapter examines the effects of fiscal transfers in a model of the Japanese economy. Initial conditions are set to capture Japan's slump as of 2003. I determine the level of transfers needed to return output to potential, and the effects on inflation and the debt-income ratio. I assume that monetary policy follows a Taylor rule once the interest rate becomes positive.

A quick output recovery requires transfers totaling 9.4 percent of potential GDP over four years. After the recovery, the Taylor rule guides the economy to a steady state with output at potential and 2 percent inflation. If the transfers are financed with bonds, they cause the debt-income ratio to jump up. After that, the ratio falls rapidly due to higher growth, inflation, and tax revenue. In steady state, the debt-income ratio is lower than in a baseline case with no transfers. Thus the transfers produce a win-win: they end the output slump and reduce Japan's long-run fiscal problem.

I also consider transfers financed with money rather than debt. The finance method does not influence the paths of output or inflation. It also does not affect the debt-income ratio in steady state, because the initial monetization of debt is eventually reversed. However, money finance prevents the initial run-up of debt that occurs with bond-financed transfers.

Thus money finance is preferable if policymakers care about short-run as well as long-run debt levels.

The results in this paper capture the ideas of some Japan-watchers. For example, in discussing the downgrade of Japan's debt, Thomas Byrne of Moody's argues that Japan needs a fiscal expansion:

> Japan can't consolidate its way out of this (debt problem), it has to grow its way out. Any policy that ends deflation and stimulates growth (is good). A fiscal policy that didn't include a lot of wasteful spending may present near-term anxiety but, if it really did stimulate growth, it would be good over the long term. (Pilling 2002)

Byrne suggests that the long-run fiscal benefits from expansionary policy would outweigh the costs, as this paper finds. The "near-term anxiety" he mentions is presumably caused by the temporary rise in debt from a bond-financed expansion. Thus Byrne also provides a rationale for money finance, which reduces debt in the short run.

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Comment Mitsuru Iwamura

Government's Intertemporal Budget Constraint

The model discussed in the chapter is very simple, and contains no forward-looking expectations. This is not a serious shortcoming of the chapter. In most cases, backward-looking expectations are enough and even more realistic. However, this may not be good if we discuss the Japanese fiscal problem in the last ten years.

The Japanese government conducted a series of fiscal stimulus during

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the 1990s. Through the series of fiscal package, we have learned several important things as follows.

(1) Simple Ricardian equivalence does not hold, so fiscal stimulus has some impacts on the economic activity.

(2) The effectiveness of fiscal stimulus depends on the level of the existing public debt. If the level of public debt is very high, fiscal stimulus becomes less powerful. In an extreme case, fiscal expansion leads to a decrease in private consumption. Some empirical papers report that this mechanism did exist in the latter half of the 1990s.

(3) Temporary and permanent fiscal expansions have different impacts. If it is permanent, it has a larger impact on the economic activity. However, if it is temporary, its impact is very limited. A famous example is "Shopping Coupon" or CHIIKI-SHINKOKEN in March 1999, in which the government delivered a coupon of about 20,000 yen to each family. This was a one-time money transfer. It had some effects on the consumers' behavior, but its impact was very small. People recognized well that this was a temporary transfer, so that they did not revise much their permanent income.

These three things have important implications about the value of δ in the IS equation, equation (1). Ball assumes that δ is equal to 1.25. I am not quite sure if this is an appropriate number in the case of the Japanese economy in the last five years. Before deciding the value of δ, we have to be very careful about how it depends on the level of public debt, and whether the fiscal shock is a temporary one or a permanent one.

Monetary Expansions and Base Money Market

Ball compared a bond-financed fiscal expansion and a money-financed fiscal expansion, and then he concluded monetization has no effect on output or inflation. However, suppose that the government and the central bank implement a money-financed fiscal expansion, so the supply of base money increases. I wonder what will happen on the demand for base money. Simply speaking, the demand for base money depends on the nominal interest rate. In the situation discussed in this chapter, the short-term nominal interest rate is zero, but the medium- or long-term interest rate is probably above zero. Therefore, if the medium- or long-term nominal interest rate falls in response to the money-financed fiscal expansion, people demand more base money, and consequently the market-clearing condition for base money is satisfied. In contrast, if the medium- or long-term nominal interest rates do not decline, the demand for base money does not increase, so that we have an excess supply in base money market.

This argument indicates that what is essentially important to escape from the liquidity trap is not monetary expansion itself, but a decline in the medium- or long-term nominal interest rate. If we think in this way, we can make a good connection between Ball's argument and the arguments made by previous papers like Eggertsson and Woodford. As Ball mentioned in this chapter, the main source of a liquidity trap is a substantial decline in the neutral rate, or equivalently the natural rate of interest. Then the issue is how to lower the real interest rate in accordance with its natural rate counterpart. Given the zero lower bound on nominal interest rates, we can fix this problem only by changing the expected rate of inflation or changing medium- or long-term nominal interest rates.

Furthermore, Ball argued that a permanent monetary expansion might produce hyperinflation, because such a permanent monetary expansion shall be accompanied by a monetary policy avoiding raising the interest rate forever. I fully agree with this argument and also emphasize the importance of considerations to base money market-clearing condition.

Distinction between Money and Public Debt

Ball discussed that monetization might ease investors' fear to default in virtue of preventing the jump in the debt-income ratio. Regarding this, I would call our attention to denomination of public debt.

If the public debt is denominated by foreign currency, the distinction between a bond-financed fiscal expansion and a money-financed fiscal expansion is so vital. Huge amounts of government bonds denominated by foreign currency are directly linked to the fear of default. Such experiences are so common in the cases of Latin American debt problems.

On the other hand, if such a fiscal expansion is financed by the home currency, fear to default depends on the relationship between the government and the central bank. As long as there are no serious conflicts between them, the central bank will purchase government bonds to cope with crises in the money market caused by the accumulation of government debt. Moreover, especially speaking about Japan, as government bonds occupy 67 percent of asset of the central bank (as of the end of March 2005), it is unlikely that people distinguish between money and government bonds: they must recognize these two are almost identical. They will not trust money any more when they do not trust government bonds. And once people cease to trust money, inflation will start to take place. Inflation is not good, but it will reduce real debt burden, thereby removing the threat of default.

Someone might say that money is good because the central bank is not obliged to repay it. But this is simply wrong. If that is true, the government is able to reduce debt burden just by repaying debts in terms of government money. Needless to say, this is a wrong argument, because government bonds and government money are both on the liability side of the government's balance sheet.