

Japanese Monetary Policy, 1991–2001

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During recent years, Japanese monetary policy has been the topic of a great deal of discussion, commentary, and debate. This is not only because of the great practical importance of the long-lasting slump of the world's second largest national economy, but also because the situation in Japan has raised interesting issues concerning some fundamental topics in monetary theory. Accordingly, this paper considers issues relating to recent and prospective policy measures of the Bank of Japan (BOJ).

It is hard to avoid the impression that Bank of Japan (BOJ) policy has been overly restrictive for approximately a decade. That statement does not imply that Japan's poor economic performance during the 1990s was entirely or even primarily attributable to monetary policy, for structural flaws have also been very important.¹ It does suggest, however, that Japanese economic performance would have been less undesirable if BOJ policy had been less restrictive. In the pages that follow, I will attempt to support the foregoing claim, discuss the difficulty faced by the BOJ because of the zero lower bound on nominal interest rates, and illustrate this difficulty with a small quantitative study. Then I will take up some of the nonstandard policy approaches that have been proposed and will argue that the most promising of these would entail rapid monetary base growth effected largely through purchases of foreign

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¹ Major banking-system difficulties are widely recognized, and in addition it is likely that the growth rate of "potential" or "natural-rate" output has fallen from the level of the 1970s and 1980s. But the severity of the bank-solvency problem has been increased by the deflation of the past several years, and it is almost certainly the case that actual output has fallen far below potential.

exchange. Such a strategy has faced two major objections, however, so much of the paper is devoted to counterarguments to these objections. The first objection is based on legal provisions of the Bank of Japan Law and the second on the concern that such actions would constitute a “beggar-thy-neighbor” policy that would reduce Japanese demand for imports. It is argued that neither of these objections is appropriate. With respect to the former, it is suggested that the BOJ Law, as written, includes conflicting provisions and that foreign exchange purchases for the purpose of monetary control could be conducted if the BOJ were to request permission of the government. In this regard, the intimate connection between monetary and exchange-rate policies is emphasized. With respect to the beggar-thy-neighbor issue, it is argued that in fact an expansionary monetary policy of the type recommended would increase net Japanese imports. In this regard, a major portion of the paper is devoted to a quantitative analysis of the trade-balance effects of a policy of the recommended type. The analysis is carried out in the context of a dynamic optimizing model of an open economy, which is explicated in some detail. Policy simulation exercises conducted with this model represent a major feature of the paper.

1. HAS BANK OF JAPAN POLICY BEEN TIGHT?

That BOJ policy has been quite tight—low interest rates notwithstanding—is suggested by the most prominent and widely-respected guideline for the conduct of monetary policy, i.e., the policy rule developed by John Taylor (1993a). The Taylor rule can be expressed as

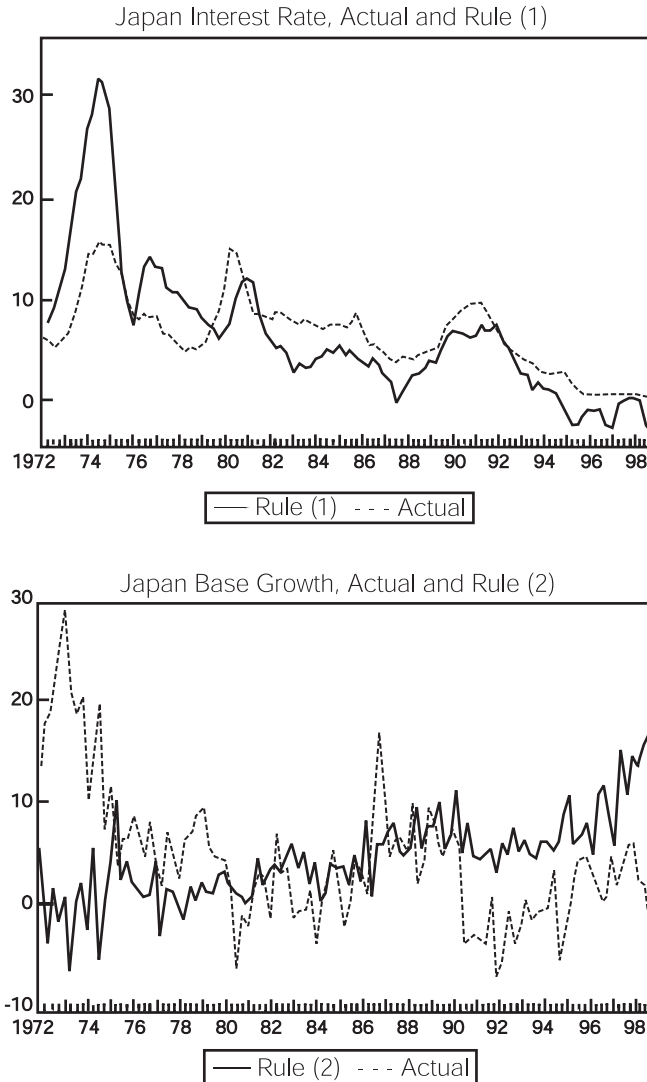
$$R_t = 3 + \Delta p_t^a + 0.5(\Delta p_t^a - 2) + 0.5(y_t - \bar{y}_t), \quad (1)$$

where R is the call rate, Δp_t^a is the average inflation rate (GDP deflator) over the previous four quarters, y is real GDP and \bar{y} is its potential value.² A chart contrasting Taylor-rule prescriptions for the overnight call rate³ with actual values of this rate over the years 1972–1998 appeared in a recent paper in this journal (McCallum, 2000b) to which the reader is referred for various details.⁴ That comparison is reproduced in the top half of Figure 1. There it is clear that the actual value exceeded the setting prescribed by Taylor’s rule during almost every quarter beginning with 1993Q1 and continuing through 1998Q4. Of course, the negative values called for by the rule are not feasible,

² Here the long-run average real rate of interest is taken to be 3 percent per annum (p.a.) and the inflation target rate to be 2 percent. Some versions of the rule use other values for these and for the coefficients attached to the target variables.

³ The (uncollateralized) overnight call rate was the BOJ’s operating target or instrument variable through the period of the 1990s. The procedure was changed in March 2001.

⁴ The most important of these, of course, is the measurement of “potential” output—which has been especially problematic for Japan in recent years. Its reliance on this inherently difficult concept is one weakness of the Taylor rule.

Figure 1 Policy Rule Indications

but that does not alter the fact that Taylor's policy guideline has called for greater monetary ease through this period.

An alternative rule involving management of the monetary base has been promoted in several of my papers (e.g., McCallum 1988, 1993, 2000b). It can be written as

$$\Delta b_t = 5 - \Delta v_t^a + 0.5(5 - \Delta x_{t-1}), \quad (2)$$

where b and x are logs of the monetary base and nominal GDP, while Δv_t^a is the average rate of base velocity growth over the previous four years. Here 5 is the target value for nominal GDP growth, obtained from a 2 percent inflation target and a 3 percent assumed long-run average growth rate for real GDP. This rule is much less prominent than Taylor's, primarily because actual central banks focus upon interest rates, not monetary base growth rates, in designing their policy actions. Especially in an environment with near-zero call rates, however, its prescriptions may be of interest. In any event, the actual and rule (2) settings for base growth rates are shown in the lower panel of Figure 1.⁵ There the indication is that actual BOJ policy has been too tight virtually all of the time since the middle of 1990!⁶

Increased base money growth rates have been recommended for several years by Mr. Nobuyuki Nakahara, a member of the BOJ's Monetary Policy Board (MPB).⁷ But until the change that was announced at the MPB meeting on March 19, 2001, the BOJ's position was that additional base growth would have no stimulative effect since short-term nominal interest rates were close to zero. With such low rates, base money and short-term government securities (bills) become almost perfect substitutes, so purchases of the latter by the BOJ have no effect on asset markets and consequently none on the economy, according to the BOJ view. That position will be discussed in the next two sections.

2. THE BANK OF JAPAN'S DIFFICULTY

Over the period 1999–2001, commentary in influential nonacademic publications including the *Economist*, the *Financial Times*, and the *Wall Street Journal* became increasingly critical of the BOJ for not providing more monetary stimulus to aggregate demand in Japan. The plots presented in the previous section also suggest that more stimulus is needed and has been needed for years, but nevertheless I believe that much of the press commentary has failed to recognize the difficulty of the problem that has faced the BOJ. It is not just stubbornness that has prevented the BOJ from providing such stimulus, for the nature of monetary policy actions is sharply different when short-term interest rates are effectively equal to zero. It is not true that there has been “nothing more that the BOJ can do,” but what needs to be done is different than in normal conditions and the policy actions are more difficult to design.

⁵ The plot is reproduced from the same source as before, which provides details.

⁶ Some early indication that BOJ policy was too tight during 1990–92 appears in McCallum (1993, 35–36). Also see McCallum and Hargraves (1995).

⁷ Mr. Nakahara's term as an MPB member ended in April 2002. The MPB currently includes Mr. Shin Nakahara, who is not related to Mr. Nobuyuki Nakahara.

For some years, the BOJ took the position that nothing more could be done, beyond lowering its overnight call rate well below one percent and finally almost to zero. These statements were of questionable validity, as we shall see, and perhaps reflected a fundamentally misguided tendency to think of levels of nominal interest rates as direct indicators of monetary conditions, with low rates representing expansionary policy. In fact, nominal rates will be low (for given real rates) when expected inflation is low; thus low rates are in large part an indication that monetary policy has been tight in the past, not that it is loose in the present. Recognizing this last point, several critics have argued that the BOJ should gauge its actions in terms of monetary base growth rates, rather than interest rates, and should provide stimulus by increasing the growth rate of the monetary base. As can be seen in the bottom half of Figure 1, my base-growth-oriented policy rule would have called for about 11 percent (per annum) growth rates over the period 1996–1998, rather than the values of about half that magnitude that were actually recorded.

It is crucial to recognize, however, that just expanding the base growth rate will not be effective, in the face of zero interest rates, unless nontraditional assets are purchased. Normally, open market operations are conducted by exchanging base money for short-term government bills. But when short-term interest rates are near zero, such purchases will have virtually no effect. One way to understand this point is to recall that both base money and bills are nominally-denominated paper assets that are virtually free from default risk. What then is the difference between them as assets; why do people and firms hold money when bills normally provide the holder with a higher rate of interest? The answer, from traditional monetary theory, is that money is a generally accepted medium of exchange that provides transaction-facilitating services to its holders—services not provided by bills.⁸ Rational economic agents then adjust their holdings of these two assets so as to equalize their *net* benefits at the margin. The sum of pecuniary interest earnings plus transaction-facilitating services is equated at the margin, for the two assets, with interest earnings usually being lower and services higher for base money assets.

But when short-term interest rates fall to zero, then there is no difference in the interest component of the net yield for the two assets, so their marginal service yields will also be equal. That condition is brought about by holders choosing to keep on hand a quantity of money large enough that its service yield at the margin is driven down to zero. But then, at the margin, base money and bills become perfect substitutes—the distinguishing characteristic of base money is lost (at the margin, not overall)! Consequently, open-market operations that exchange bills for money in private portfolios have effects that are like those of replacing a billion dollars' worth of \$5 Federal Reserve Notes with

⁸ Or provided to a lesser extent by bills. For a review of traditional monetary analysis, see McCallum and Goodfriend (1988).

a billion dollars' worth of \$10 Federal Reserve Notes. To an approximation, in other words, there is no effect. Accordingly, an expansionary monetary policy needs to be implemented in some nontraditional manner, e.g., by purchase of nontraditional assets. Such a purchase would alter the composition, in private portfolios, of these other assets relative to the sum of money plus government bills, thereby stimulating some response on the part of private asset holders.⁹

3. SOME QUANTITATIVE RESULTS

Is there any empirical evidence supportive of the theoretical view just described? A very simple but straightforward way to approach that question is to examine the relationship between base money growth and the growth rate of nominal GDP. To that end, let us consider an updated and modified version of the simplest macroeconomic model of aggregate demand utilized in McCallum (1993). It is a single-equation dynamic relationship of nominal income growth and its dependence on money base growth. Let x_t and b_t denote logarithms of nominal GDP and the adjusted monetary base, respectively, so that Δx_t and Δb_t are quarterly growth rates. The data series utilized extend from 1970Q1 through 2001Q3 and are seasonally adjusted.¹⁰

Least-squares estimation over the period 1970Q3–2001Q3 yields the following relationship:

$$\Delta x_t = -0.0002 + 0.261 \Delta x_{t-1} + 0.344 \Delta x_{t-2} + 0.248 \Delta b_{t-1} \quad (3)$$

(0.0019) (0.0873) (0.0840) (0.0887)

$$R^2 = 0.483 \quad SE = 0.0116 \quad DW = 2.15.$$

The numbers in parentheses are standard errors, so Δb_{t-1} evidently has a highly significant effect on Δx_t and its subsequent values. Thus if this relation were structural, it would indicate that a money base rule could be devised to keep nominal GDP growth reasonably close to a desired target path. A similar relationship was utilized in that manner in McCallum (1993), where it provided results quite comparable to those of small but somewhat more complex models intended to be structural.¹¹

The issue to be examined here, by contrast, is whether the relationship between base growth and nominal income has “broken down” in recent years—as

⁹ One reader has suggested that it would be stimulative for the central bank to simply print base money and give it to private individuals. In fact such a process would create an imbalance in private portfolios and thereby lead to some type of reaction. But such a scheme combines both monetary and fiscal policy. It is equivalent to a fiscal transfer of government bills to private agents plus an open-market purchase of bills.

¹⁰ These series were obtained from the web pages of the BOJ (monetary base) and the Japanese government's Economic and Social Research Institute (GDP).

¹¹ For a discussion of the potential vulnerability of the relationship to the Lucas critique, see McCallum (1993, 37–38).

would arguably be the case with near-zero interest rates and traditional open-market purchases of government bills. In fact, such an impression is supported by visual inspection of a simple plot of those two variables against time. To consider the matter more formally, however, I have reestimated relationship (3) permitting crucial parameters to change in 1995Q1.¹² Inclusion of a 0-1 dummy variable, that changes from 0 to 1 in 1995Q1, indicates a downward shift in the equation's constant term, with a highly significant t-statistic of -3.05 . If instead the slope coefficient on the base growth variable is permitted to change at that time, again a significant decrease is detected, with the t-statistic being -3.31 . Inclusion of both effects seems most appropriate (since the two variables are highly collinear) and leads to the following estimates:

$$\Delta x_t = 0.0031 + 0.137\Delta x_{t-1} + 0.210\Delta x_{t-2} + 0.399 \quad (4)$$

(.0022) (.091) (.090) (.103)

$$\Delta b_{t-1} - 0.318 D95 \cdot \Delta b_{t-1} - 0.0045 D95$$

(.192) (.0041)

$$R^2 = 0.531 \quad SE = 0.0111 \quad DW = 2.10.$$

Here we see that the estimate of the net effect of Δb_{t-1} on Δx_t for the post-1995 observations is $0.399 - 0.318 = 0.081$, a very small value. Furthermore, a Wald test of the hypothesis that the net effect equals zero gives a P-value of 0.617, indicating that a zero-effect hypothesis could not be rejected at any conventional significance level.¹³ For all practical purposes, then, the recent effect on nominal GDP growth of additional money base growth has been zero, according to these last estimates. This finding is consistent with the notion that, in a situation with near-zero short-term interest rates, BOJ purchase of treasury bills will be ineffective as means of stimulating aggregate demand.

Of course, the simple investigation just conducted falls well short of what would be required for a convincing counterfactual policy exercise, which would require a well-specified structural model. But the results here are not being used in that manner, i.e., to assess the effects of an alternative policy rule. Instead they are being used only to indicate that a substantial breakdown in the money-GDP relationship has occurred. For that purpose, the foregoing exercise should be adequate.

¹²This break date, or one close to it, is suggested by the extensive recent empirical study by Miao (2000).

¹³Together the two shift terms are highly significant; a Wald test of the hypothesis that both coefficients equal zero results in a P-value of 0.0022.

4. POLICY PROPOSALS

Let us now turn to the crucial issue, namely, how monetary policy can be conducted in a situation with interest rates near zero. Several prominent monetary economists have taken up this issue, including Marvin Goodfriend (1997, 2000), Paul Krugman (1998, 2000), Allan Meltzer (1998, 1999, 2000), Athanasios Orphanides and Volker Wieland (2000), Willem Buiter and Nikolaos Panigirtzoglou (2001), Lars Svensson (2001), and myself (McCallum 2000a, 2002). Goodfriend (2000) and Buiter and Panigirtzoglou propose a tax on base money that would keep it from being a perfect substitute for short-term securities and thereby open the way for an effective monetary policy even when a zero-lower-bound situation is in effect. This scheme's logic is evidently impeccable, but the probable unpopularity of the explicit tax on money would seem to present a formidable practical barrier (even though it would make possible a reduced average level of the implicit tax on money). Accordingly we will focus on the other proposals, which involve the central bank purchase with base money of assets other than the traditional short-term yen securities. Meltzer (2000), for example, suggests that the purchase of long-term Japanese government bonds would be stimulative. McCallum and Svensson suggest instead the purchase of foreign exchange (i.e., short-term securities that are claims to dollars or other non-yen currencies). The general ideas behind these asset-purchase proposals are basically similar, but there are important practical differences.

As explained above, the basic idea is that for increased growth of base money to be stimulative, it is necessary that the assets bought from private portfolios be ones that are not perfect substitutes for government bills (or for money). Otherwise, the composition of private portfolios will not be affected in an economically relevant manner so no response will be induced. Obviously, longer term government bonds represent one leading possibility. But according to the expectations theory of the term structure, which says that long-term interest rates are appropriate averages of expected short-term rates, long-term and short-term government securities are perfect substitutes. Now, there is evidence strongly suggesting that this theory is not empirically accurate, but there is no widely accepted alternative to rely upon. What is needed is a theory of the term premium that relates *variations* in that premium to asset positions. In the absence of any widely accepted theory of that type, it is not obvious how to design an appropriate policy or even that purchases of long-term bonds would have an effect on aggregate demand in the appropriate direction.¹⁴

Consequently, I have suggested that the best course of action would be for the BOJ—or any central bank in a similar situation—to purchase foreign exchange (McCallum, 2000a, 2002). Lars Svensson (2001) has made a closely

¹⁴ A different and more optimistic position has recently been expressed by Goodfriend (2001).

related proposal.¹⁵ The difference is that in this case there is a more well understood transmission channel, working via the exchange rate. It is clear that the purchase of foreign exchange tends to depreciate the value of the yen. With prices in Japan initially rising less rapidly than the price of foreign exchange,¹⁶ a real exchange rate depreciation would result, and this would tend to stimulate exports and to increase Japanese income and production. That is of course what is desired—to increase Japanese income and spending.

It is important to keep in mind, in this regard, that increases in income have strong and reliable positive effects on imports. Indeed, the strength of income effects on imports is probably strong enough that the overall effect of the stimulative policy would be to *increase* Japan's imports (in real terms) from its trading partners. Under that assumption it is not the case that the recommended policy would tend to depress aggregate demand in other nations. Fear of that outcome is therefore not a sensible reason for avoiding stimulative monetary policy.¹⁷ Indeed, it is not even clear that such a policy would induce the real exchange rate to appreciate for more than a short period of time. These issues will be quantitatively explored below, in Sections 5 and 6.

A few critics of the foreign-exchange strategy have contended that a central bank cannot reliably influence its currency's exchange rate. In that regard it is widely believed by analysts that *raising* a currency's real foreign-exchange value by monetary policy is not possible, and that keeping its nominal value high would require extreme measures that would not be tolerated for long in a nation with democratic political processes. But to depreciate a fiat currency in nominal terms is not difficult; the basic requirement is simply the creation of an excess quantity of the currency.¹⁸ And a reduction in value is what is needed in the case of Japan.¹⁹

Proceeding under the presumption that a central bank can exert adequate control over its currency's nominal exchange rate, McCallum (2000a, 2002) has considered a policy rule for use in a zero-lower-bound situation of the following form, with s_t representing the log of the home-country price of

¹⁵ It should be noted that a few economists, including myself, Marvin Goodfriend (1997), Allan Meltzer (1998, 1999, 2000), and John Taylor (1997), have been urging a more expansionary policy for the BOJ at least since 1995. Our first proposals did not, however, emphasize purchases of foreign exchange per se.

¹⁶ Even in the event that Japanese domestic prices increased along with the price of foreign exchange, there would be a benefit—this would raise nominal interest rates, leading to an escape from the “liquidity trap” situation described above.

¹⁷ It is my impression that fear of this outcome did, in fact, keep U.S. and international agencies from supporting policy proposals of the type expressed here, until recently. See Section 5 below.

¹⁸ For a more detailed argument, see McCallum (2000a, 2002).

¹⁹ Even a depreciation could not be effected if the currency were literally a perfect substitute for foreign currencies, but such is not the case. Interesting new evidence of a market-microstructure type has recently been developed by Evans and Lyons (2000, 2002).

foreign exchange:

$$\Delta s_t = \mu_0 + \mu_1(2 - \Delta p_t) + \mu_2(\bar{y}_t - y_t), \quad \mu_1, \mu_2 > 0. \quad (5)$$

Here the rate of depreciation of the exchange rate Δs_t is increased when inflation and/or output are below their target values. Such a rule would be implemented in a manner similar to that typically used with an interest-rate instrument. Specifically, the central bank would observe the relevant asset price almost continuously and make open-market purchases (sales) when a depreciation (appreciation) is indicated.²⁰ It is important to note that rule (5) does not represent a fixed exchange rate. To the contrary, it represents a regime that subordinates the exchange rate entirely to macroeconomic conditions.

Quite recently, in 2001 and 2002, the BOJ has taken actions that indicate an intention to pursue a more stimulative policy than in the past. To date, however, it has not given any official recognition to the possibility of purchasing foreign exchange as a way of providing a more stimulative monetary policy.²¹ We need to look into the reasons for this neglect, of which two are prominent. One of these involves the BOJ's legal charter and the other stems from beliefs concerning the effects on other nations' balance of payments magnitudes. Since the latter topic is the more analytical in nature, it will be considered first.

5. THE BALANCE OF PAYMENTS ISSUE

In this section we take up a major analytical issue concerning the policy position presented above. During the late 1990s, some leading officials of the International Monetary Fund were opposed to monetary stimulus as a means for combating Japan's ongoing economic weakness.²² Their reason was a belief that monetary stimulus would lead to exchange rate depreciation, which would be harmful to other nations seeking to expand (or, during the Asian crisis, maintain) exports to Japan. This source of objection to a more stimulative monetary policy is, however, inappropriate. First, it is highly unlikely that such a policy would lead to lessened imports by Japan, for an increase

²⁰ As with current practice, market participants may to some extent move rates as desired by the central bank, even without actual open-market operations, if the central bank's intentions are made clear.

²¹ In an interview with Bloomberg reported on July 19, 2001, Dr. Kunio Okina, Director of the BOJ's Institute for Monetary and Economic Studies, suggested that the BOJ should consider purchase of foreign exchange as a tool of monetary policy, while leaving exchange rates to the currency market. But on July 25, Mr. Sakuya Fujiwara, Deputy Governor of the BOJ, indicated (in a question-and-answer session at the Tokyo Foreign Correspondents' Club) that Okina's suggestion does not reflect BOJ policy.

²² This claim is based in part on personal conversations. For some evidence, see Fischer (1998), which proposes fiscal expansion and banking reforms but does not mention monetary policy. In his very recent comment in the *Brookings Papers*, Fischer accepts the need for Japanese monetary stimulus, but still labels this a "beggar-thy-neighbor" policy (2001, 165).

in Japanese real income would tend to increase imports and most likely to an extent greater than any decrease brought about by Japanese exchange rate depreciation. Second, according to recent views of most academics and policymakers alike, monetary policy should be directed primarily toward keeping inflation low (but non-negative!), with the avoidance of real cyclical fluctuations a possible secondary objective.²³ From this perspective, fiscal and structural policies are more appropriate tools to use in managing balance-of-payments problems. Thus, if Japan is not going to share a common currency with, e.g., the United States, then their bilateral exchange rate should be free to float with each country managing its monetary affairs so as to keep a low inflation rate.²⁴ From this perspective, one could argue that the United States should not try to use its political influence to prevent a depreciation of the yen. More generally, it would seem undesirable for any country to attempt to induce other nations to manage their monetary policy in ways that are domestically harmful but temporarily helpful for the country in question.²⁵ From a long-term perspective, the United States will benefit from having other important nations conduct their monetary policies in a manner that yields low inflation with domestic macroeconomic stability.

Not all analysts would agree, however, with the contention that monetary stimulus of the type here suggested would not have a depressing effect on other nations' exports to Japan. Accordingly, this section and the next will be devoted to a substantial consideration of that position. For such an issue it is necessary to conduct analysis in a quantitatively specified structural model, and the convincingness of the exercise will depend upon the qualifications of the model utilized. The one that will be used was developed by McCallum and Nelson (1999) and utilized subsequently by them (2000) in an exploration of relationships between CPI inflation and exchange-rate depreciation. The model is not econometrically estimated using Japanese time series data, but is a "new open-economy macroeconomic model"—i.e., is based on dynamic optimizing analysis assuming sticky-price adjustments and solved assuming rational expectations—that has been calibrated to match certain characteristics of the Japanese economy. It differs from other contributions in the area, however, in the manner in which imported goods are treated. In particular, the M-N model treats imports not as finished goods, as is common, but instead as raw-material inputs to the home economy's producers. This alternative

²³ Real cyclical conditions should provide only a secondary objective for monetary policy because monetary effects on these conditions are temporary and poorly understood, whereas monetary effects on prices (and thus on inflation rates) are long-lasting and well understood.

²⁴ Moreover, decisions to share a common currency should be made on grounds of microeconomic efficiency, not in an attempt to solve macroeconomic stabilization difficulties.

²⁵ Indeed, it may well have been U.S. pressure that led the BOJ to be somewhat too loose (even on traditional standards that ignore asset price movements—see Figure 1, lower panel) during 1986–88, a stance that permitted Japan's asset price boom of the late 1980s and set the stage for a clampdown that began the past decade's slump.

modelling strategy leads to a cleaner and simpler theoretical structure, relative to the standard treatment, and is empirically attractive. Since the optimizing, general equilibrium analysis has previously been presented in McCallum and Nelson (1999), here I will take an informal expository approach designed to facilitate understanding of the model's basic structure.

It is well known that optimizing analysis leads, in a wide variety of infinite-horizon models that involve imperfect competition, to a consumption Euler equation that can be expressed or approximated in the form

$$c_t = E_t c_{t+1} + b_0 + b_1 r_t + v_t, \quad (6)$$

where c_t is the log of a Dixit-Stiglitz consumption-bundle aggregate of the many distinct goods that a typical household consumes in period t .²⁶ In (6), r_t is the real interest rate on home-country one period bonds (private or government) and v_t is a stochastic shock term that pertains to household preferences regarding present versus future consumption. In closed-economy analysis, relation (6) is often combined with a log-linearized, per-household, overall resource constraint to yield an "expectational IS function," to use the term of Kerr and King (1996). That step presumes that investment and capital are treated as exogenous. The simplest version of that assumption is that the capital stock is fixed; since that assumption is rather common in the literature, it is adopted here.

For an open-economy extension, one might be tempted to write the resource constraint as

$$y_t = \omega_1 c_t + \omega_2 g_t + \omega_3 x_t - \omega_4 im_t, \quad (7)$$

where y_t , g_t , x_t , and im_t are logarithms of real output, government consumption, exports, and imports while ω_1 , ω_2 , ω_3 , and ω_4 are steady state shares of output for consumption, government purchases, exports, and imports. But if imports are exclusively material inputs to the production of home-country goods, and $Y_t = \ln^{-1} y_t$ is interpreted as units of output, then the relevant resource constraint is

$$y_t = \omega_1 c_t + \omega_2 g_t + \omega_3 x_t. \quad (7')$$

It is desirable that import demand be modelled in an optimizing fashion. Toward that end, assume that output of all consumer goods is effected by producers that are constrained by production functions all of the same CES form, with labor and material imports being the two variable inputs. Then the cost-minimizing demand for imports is

$$im_t = y_t - \sigma q_t + const., \quad (8)$$

²⁶ Thus $c_t = \ln C_t$, with $C_t = [\int C_t(z)^{(\theta-1)/\theta} dz]^{\theta/(\theta-1)}$, where $\theta > 1$, z indexes distinct goods, and the integral is over $(0, 1)$, while the corresponding price index is $P_t = [\int P_t(z)^{1-\theta} dz]^{1/(1-\theta)}$.

where σ is the elasticity of substitution between materials and labor in production, and where “*const.*” denotes *some* constant.²⁷ Also, q_t is the log price of imports in terms of produced consumption goods. We will refer to $Q_t = \ln^{-1} q_t$ as the real exchange rate. Let P_t and S_t be the home-country money price of goods and foreign exchange, with P_t^* the foreign money price of home-country imports. Then if p_t , s_t , and p_t^* are logs of these variables, we have

$$q_t = s_t - p_t + p_t^*. \quad (9)$$

Symmetrically, we assume that export demand is given as

$$x_t = y_t^* + \sigma^* q_t + \text{const.}, \quad (10)$$

where y_t^* denotes production abroad and σ^* is the price elasticity of demand from abroad for home-country goods.

Now consider output determination in a flexible-price version of the model. Taking a log-linear approximation to the home-country production function, we have

$$y_t = (1 - \alpha)a_t + (1 - \alpha)n_t + \alpha im_t + \text{const.},$$

where n_t and a_t are logs of labor input and a labor augmenting technology shock term, respectively. Suppose for simplicity that labor supply is inelastic, with 1.0 units supplied per period by each household. Thus with full price flexibility we would have $n_t = 0$ and the flexible-price, natural rate (or “potential”) value of y_t will be $\bar{y}_t = (1 - \alpha)a_t + \alpha im_t + \text{const.}$ so that $\bar{y}_t = (1 - \alpha)a_t + \alpha[\bar{y}_t - \sigma q_t] + \text{const.}$, or

$$\bar{y}_t = a_t - [\sigma\alpha/(1 - \alpha)]q_t + \text{const.} \quad (11)$$

But while \bar{y}_t would be the economy’s output in period t if prices could adjust promptly in response to any shock, we assume that prices adjust only sluggishly. And if the economy’s demand quantity as determined by the rest of the system (y_t) differs from \bar{y}_t then the former quantity prevails—and workers depart from their (inelastic) supply schedules so as to provide whatever quantity is needed to produce the demanded output, with im_t given by (8).

In such a setting, the precise way in which prices adjust has a direct impact on demand and consequently on production. There are various models of gradual price adjustment utilized in the recent literature that are intended to represent optimizing behavior. In the analysis that follows, I will use

$$\Delta p_t = 0.5(E_t \Delta p_{t+1} + \Delta p_{t-1}) + \phi_2(y_t - \bar{y}_t) + u_t, \quad (12)$$

where u_t is a behavioral disturbance. This form of equation has been fairly prominent, primarily because it tends to impart a more realistic degree of

²⁷ That is, the expression “*const.*” in different equations appearing through the remainder of the article will typically refer to different constant magnitudes.

inflation persistence than does the Calvo-Rotemberg model (which is theoretically more attractive).²⁸

A standard feature of most current open-economy models is a relation implying uncovered interest parity (UIP). Despite its prominent empirical weaknesses, accordingly, the basic M-N model includes one:

$$R_t - R_t^* = E_t \Delta s_{t+1} + \xi_t. \quad (13)$$

We include a time-varying “risk premium” term ξ_t , however, that may have a sizeable variance and may be autocorrelated.

It remains to describe how monetary policy is conducted. In most recent research in monetary economics, it is presumed that the monetary authority conducts policy by adjusting a one-period nominal interest rate in response to prevailing (or forecasted future) values of inflation and the output gap, $\tilde{y}_t = y_t - \bar{y}_t$:

$$R_t = (1 - \mu_3)[\mu_0 + \Delta p_t + \mu_1(\Delta p_t - \pi^*) + \mu_2 \tilde{y}_t] + \mu_3 R_{t-1} + e_t. \quad (14)$$

Here $\mu_3 > 0$ reflects interest rate smoothing. Quantitative results reported by M-N (1999, 2000) are based on estimated or calibrated versions of this rule, in most cases with E_{t-1} applied to \tilde{y}_t and Δp_t .

To complete the model, we need only to include the Fisher identity, $(1 + r_t) = (1 + R_t)/(1 + E_t \Delta p_{t+1})$, which we approximate in the familiar fashion:

$$r_t = R_t - E_t \Delta p_{t+1}. \quad (15)$$

Thus we have a simple log-linear system in which the ten structural relations (6)–(15) determine values for the endogenous variables y_t , \bar{y}_t , Δp_t , r_t , R_t , q_t , s_t , c_t , x_t , and im_t . Government spending g_t and the foreign variables p_t^* , y_t^* , R_t^* are taken to be exogenous—as are the shock processes for v_t , a_t , e_t , and ξ_t .

Of course, it would be possible to append a money demand function such as

$$m_t - p_t = \gamma_0 + \gamma_1 y_t + \gamma_2 R_t + \eta_t, \quad (16)$$

and one of this general form—perhaps with c_t replacing y_t —would be consistent with optimizing behavior.²⁹ But, as many writers have noted, that equation would serve only to determine the values of m_t that are needed to implement the R_t policy rule.

With the structure given above, a useful measure of the balance on goods and services account—i.e., net exports—is

$$net_t = x_t - (im_t + q_t), \quad (17)$$

²⁸ See Fuhrer and Moore (1995) and Clarida, Gali, and Gertler (1999).

²⁹ See McCallum and Nelson (1999) or many other papers.

where it is assumed that $\omega_3 = \omega_4$. This measure is used in what follows. Also, incidentally, it is possible to calculate the log of the GDP deflator as

$$p_t^{DEF} = [p_t - \omega_3(s_t + p_t^*)]/(1 - \omega_3). \quad (18)$$

Before moving on, it should be noted that an advantage of our strategy of modelling imports as material inputs to the production process is that the relevant price index for produced goods is the same as the consumer price index, which implies that the same gradual price adjustment behavior is relevant for all domestic consumption. In addition, it avoids the unattractive assumption, implied by the tradeable versus nontradeable goods dichotomization, that export and import goods are perfectly substitutable in production.

Theoretical advantages would not constitute a satisfactory justification, of course, if in fact most imports were consumption goods. Such is not the case, however, at least for the United States. Instead, an examination of the data suggests that (under conservative assumptions) intermediate productive inputs actually comprise a larger fraction of U.S. imports than do consumer goods (including services).³⁰

There is one way in which the model developed in McCallum and Nelson (1999) differs significantly from the 10-equation formulation just presented. Specifically, the M-N model includes a somewhat more complex form of consumption versus saving behavior, one that features habit formation. Thus in place of the time-separable utility function that leads to equation (6), we assume that each period- t utility term includes $c_t/(c_{t-1})^h$, with $0 \leq h < 1$, rather than c_t alone. That specification gives rise to the following replacement for (6):

$$c_t = h_0 + h_1 c_{t-1} + h_2 E_t c_{t+1} + h_3 E_t c_{t+2} + h_4 (\log \lambda_t) + v_t. \quad (6')$$

Here λ_t is the Lagrange multiplier on the household's budget constraint, which obeys

$$\log \lambda_t = \text{const.} + E_t \lambda_{t+1} + r_t, \quad (19)$$

and there are constraints relating the h_j parameters to others in the system. For details and additional discussion, see M-N (1999) and the recent study of Fuhrer (2000).

Calibration of the model draws on M-N (1999) but differs in a few ways that, in retrospect, seem appropriate. For the parameters governing spending

³⁰ For the year 1998, imported consumer goods amounted to \$453 billion while imports of business inputs came to \$624 billion, approximately. These figures are based on an examination of categories reported in the August 1999 issue of the *Survey of Current Business*. For several categories it is clear whether they are composed predominantly of consumer or business goods. For others, judgmental assignments were required. Those assignments are as follows, with the reported figure being the fraction of the category classified as "business inputs": automotive vehicles, engines, and parts, 25 percent; travel, 25 percent; passenger fares, 25 percent; foods, feed, and beverages, 50 percent; and other private services, 75 percent.

behavior, I retain here the $h = 0.8$ value taken from an early version of Fuhrer (2000), but for the counterpart of b_1 I now use -0.4 , rather than $-1/6$, in order to reflect the greater responsiveness of investment spending, which is not included explicitly in the model.³¹ For σ , the elasticity of substitution in production (and therefore the elasticity of import demand with respect to Q_t), I again begin with $1/3$ —and for the elasticity of export demand with respect to Q_t the same value is used—but also consider larger values. In (11), the labor-share parameter $1 - \alpha$ equals 0.64 . The steady state ratio of imports (and exports) to domestic production is taken to be 0.10 , a slightly lower value than in M-N (1999) so as to reflect the Japanese degree of openness. For the present application government consumption is included, with $\omega_2 = 0.2$.

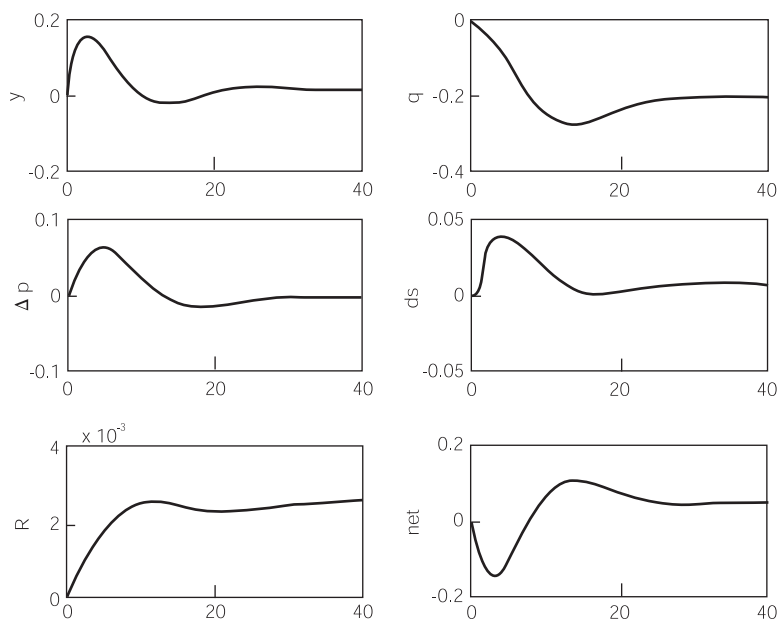
In the price adjustment relation, the specification is that $\phi_2 = 0.03$. The latter value is based on my reading of a wide variety of studies, plus conversion into nonannualized fractional terms for a quarterly model. Policy rule parameters should be thought of in relation to realistic values close to $\mu_1 = 0.5$, $\mu_2 = 0.4$, and $\mu_3 = 0.8$, the latter reflecting considerable interest rate smoothing. In the experiments reported in this paper, however, rule (14) is replaced by the rule (5) that is designed for the zero-lower-bound situation. In most cases, expectations based on $t - 1$ data are used for the Δp_t and \tilde{y}_t variables appearing in the policy rule, in order to make the latter operational.

The stochastic processes driving the model's shocks must also be calibrated, of course. For both foreign output and the technology shock, I have specified AR(1) processes with AR parameters of 0.95 , rather than the 1.0 values used in M-N (1999). The innovation standard deviations (SD) are 0.03 and (as before) 0.0035 . The latter value might appear smaller than is usual, but is appropriate to generate a realistic degree of variability in \bar{y}_t when the latter is not exogenous but instead is dependent on q_t . The UIP risk premium term ξ_t is generated by an AR(1) process with AR parameter 0.5 and innovation 0.04 ; these values are based on work reported in Taylor (1993b). Government consumption (in logs) follows an AR(1) process, with AR parameter 0.99 and innovation SD of 0.02 . Finally, the v_t , u_t , and e_t shock processes are taken to be white noise with SD values of 0.011 , 0.002 , and 0.0017 , respectively.

6. SIMULATION RESULTS

In McCallum (2000a, 2002) I have conducted exercises with this model under the assumption that the nominal interest rate is immobilized at zero, in order to show that monetary policy conducted by means of a rule such as (5) would provide stabilizing influence despite the “liquidity trap” situation. Those policy experiments were not designed, however, to reflect the transitional effects of

³¹The parameter in question is the intertemporal elasticity of substitution in consumption when $h = 0$.

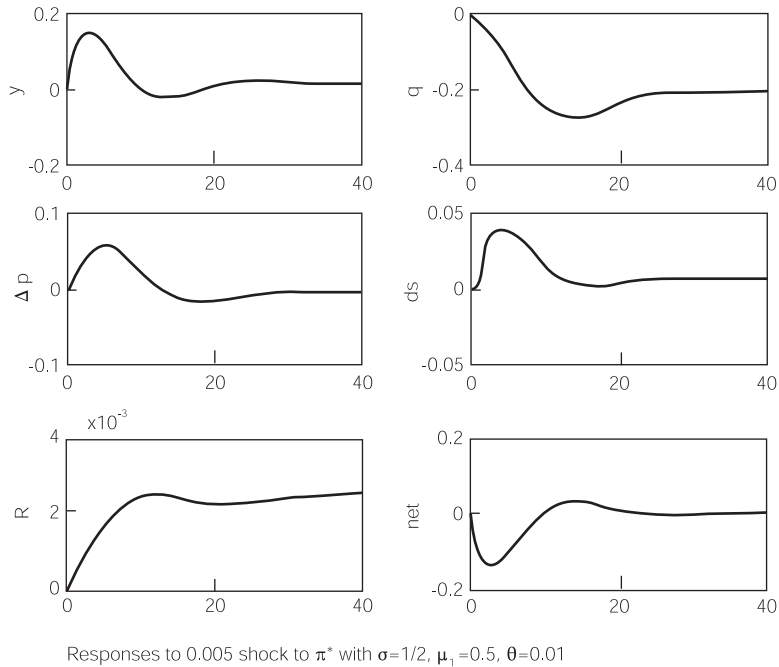
Figure 2 Responses to Policy Change, Initial Case

Responses to 0.005 shock to π^* with $\sigma=1/3$, $\mu_1=0.5$, $\theta=0.01$

the *adoption* of such a rule; they were conducted as if the rule had been in effect for a long period of time. In what follows, I will use a different strategy. It will again be assumed that an exchange-rate rule has been in effect, but the initial equilibrium is one that leaves the zero-interest situation intact. The objective is to break out of that situation, so the “shock” to which the system is subjected is an increase in the target rate of inflation. This is represented as a permanent upward shock to π^* , the inflation target in the policy rule. Arbitrarily, the experiment assumes a 2.0 percent per-annum shock, e.g., from -1.0 percent inflation to +1.0 percent. In quarterly fractional units, that amounts to an increase of 0.005 in π^* .³² The precise rule utilized is as follows, with $\mu_1 = 0.5$ and $\mu_2 = 0$:

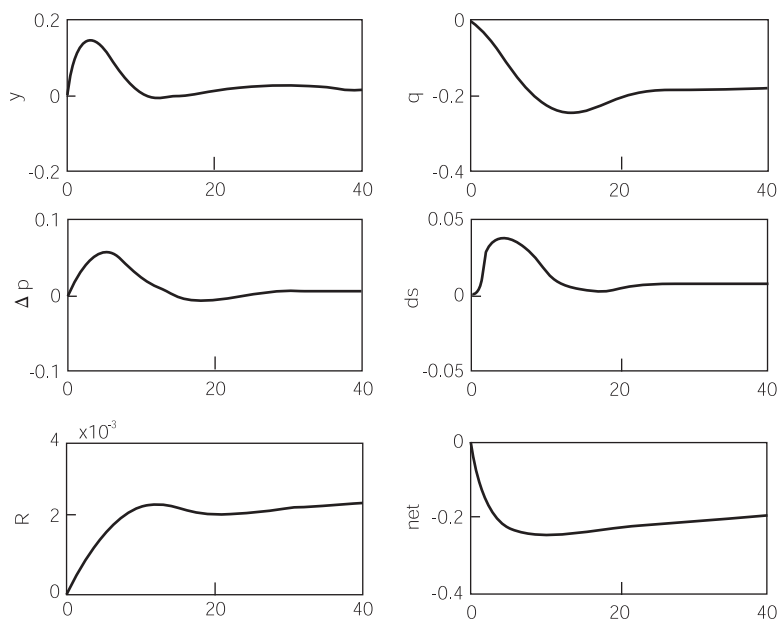
$$\Delta s_t = E_{t-1} \Delta p_t + \mu_1 (\pi^* - E_{t-1} \Delta p_t) + \mu_2 (\bar{y}_t - y_t). \quad (20)$$

³² It should be said that I am not entirely comfortable with analysis of this type of “shock,” which seems more like a regime change than the type of shock that *RE* policy analysis is best designed to handle. Consequently, I would not take details of the dynamics too seriously, but would limit attention to the general nature of the responses. (Many economists do, of course, use rational expectations to analyze the effects of policy regime changes—i.e., to study transition periods—but I have generally been skeptical of such studies.)

Figure 3 Responses to Policy Change, Preferred Case

The variable on whose response we shall focus is the home country's—i.e., Japan's—net export balance in real terms. Since the model is formulated to be linear in logarithms of most variables, the measure actually calculated is the log of real exports minus the log of real imports. These have to be expressed in common price units, so induced changes in the real exchange rate have to be taken into account. The negative of that measure is taken to reflect the increase in net real exports by Japan's trading partners.

Results of the first experiment are shown in Figure 2. Responses over 40 quarter-years are shown for six variables: the log of real output (y), the inflation rate (Δp), the nominal interest rate (R), the log of the real exchange rate (q), the rate of depreciation of the nominal exchange rate (ds), and the net export variable in (17) (net). In Figure 2 we see that the upward jump in the target inflation rate (π), which occurs in period 1, does indeed induce an exchange-rate depreciation rate that remains positive for over two years. Inflation, not surprisingly, rises and stays above its initial value for over two years, then oscillates and settles down at a new steady state rate of 0.005 (in relation to its starting value). Quite surprisingly, p responds more strongly

Figure 4 Responses to Policy Change, Alternative Case

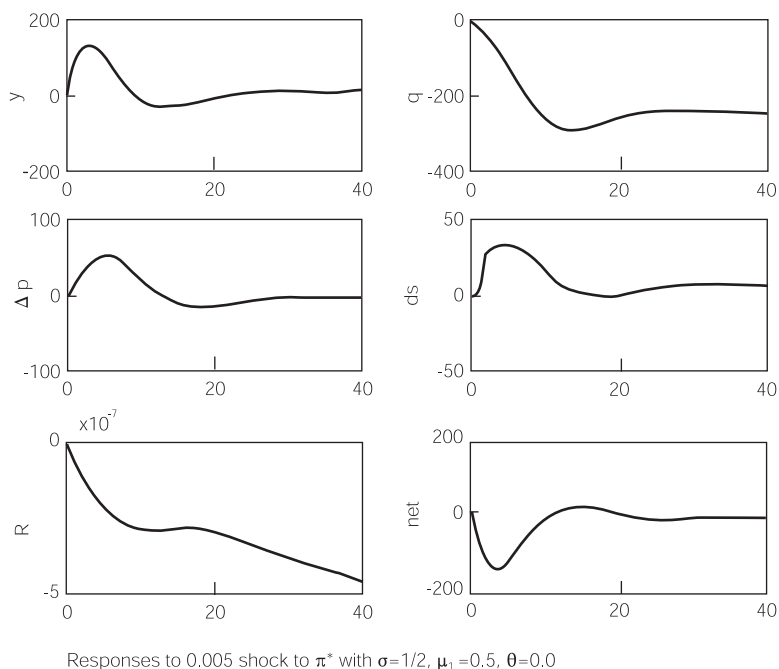
Responses to 0.005 shock to π^* with $\sigma=1$, $\mu_1=0.5$, $\theta=0.01$

than s so the real exchange rate appreciates.³³ As expected, however, real output rises strongly for two years. Most importantly, the real (Japanese) export balance is so affected by the two-year increase in real output that it turns negative and stays negative for almost two years, although it levels off at a positive value. This pattern is only partly supportive of the argument advanced above, but a single plausible change in the calibration alters it so as to be almost entirely supportive.

The relevant point is that the parameter values used in Figure 2 include figures of 1/3 for the import price elasticities (σ) both at home and abroad.³⁴ That figure, originally selected by McCallum and Nelson (1999) for reasons that do not pertain in the present exercise, are quite small. Most specialists contend that such magnitudes are substantially larger, at least large enough to satisfy the venerable Marshall-Lerner condition (i.e., that their sum equals 1.0 or more). Accordingly, in Figure 3 the same experiment is repeated but with

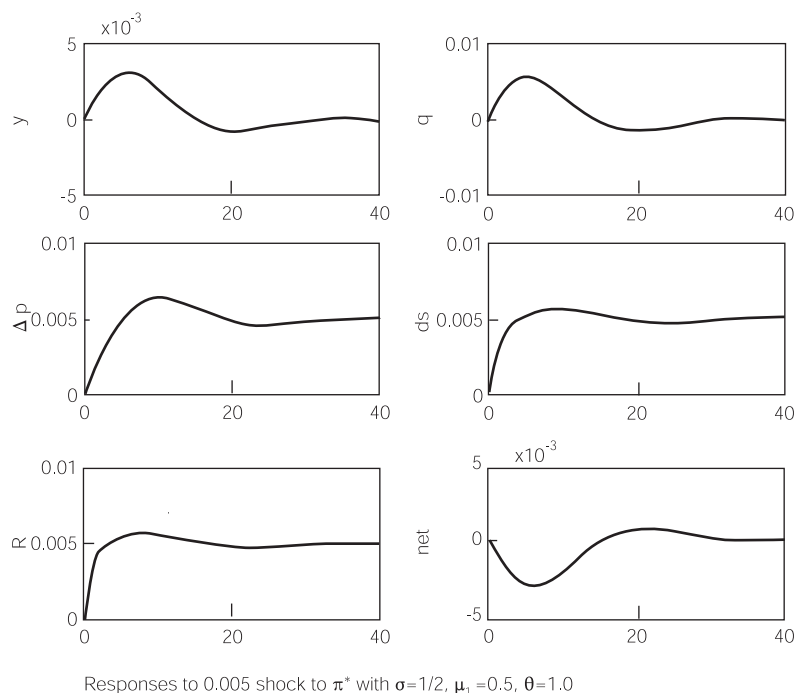
³³ It has been verified that steady state response value is zero, reflecting long-run monetary neutrality. But it takes many years for q to return to its original vicinity.

³⁴ In what follows, I will describe these elasticities as if they were both positive numbers.

Figure 5 Responses with R_t Kept at Zero

values of 1/2 for each of these import price elasticities. There the effect of the real exchange rate appreciation is eliminated, and the net export balance reflects only the movement of output. Thus Japan's net exports remain negative for about two years, briefly turn positive, and then finally stay slightly negative for a long time (despite long-run neutrality). Setting each country's import price elasticity instead at 1.0, close to the conventional wisdom, gives an entirely different picture, with net exports staying strongly negative for a very long time—see Figure 4.

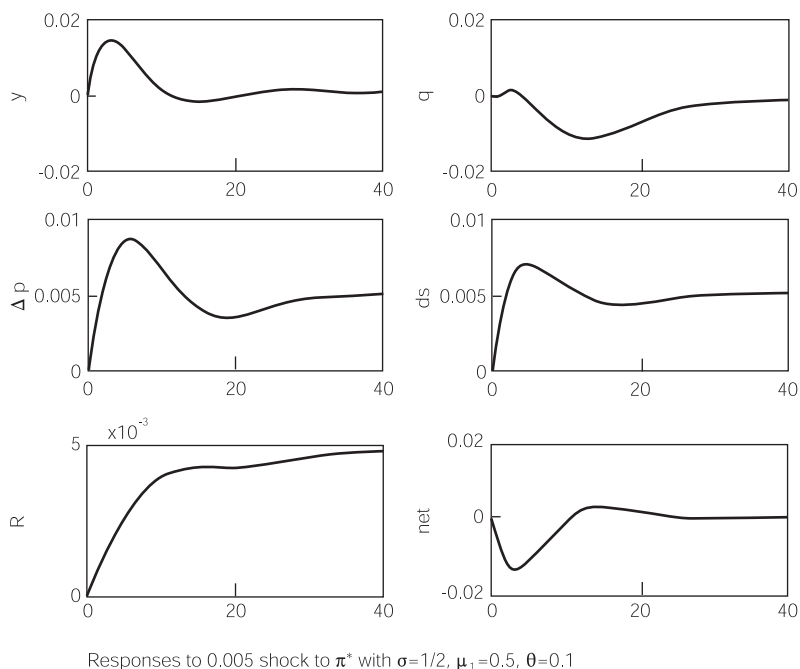
There are many parameter changes that could be considered, but the more important order of business is to discuss the upward movement of the interest rate R_t that occurs in Figures 2–4. It is clear that the long-run response is a rise of 0.005, which must of course be the case if there is monetary superneutrality and an upward jump in target inflation of that magnitude. But how are the dynamics in R_t being modeled? One extreme possibility is that uncovered interest parity is maintained throughout. But that would be inconsistent with my basic position (and with huge quantities of empirical research). Accordingly, my first attempts at this simulation exercise assumed that the interest rate remains immobilized at its initial zero-lower-bound level.

Figure 6 Responses with UIP Maintained Throughout

That specification leads, however, to the results shown in Figure 5. There the responses are implausibly large, with inflation rising to almost 20,000 percent per year. (Recall that the numbers shown are in fractional quarterly units.) This might seem to reflect some kind of calculation error, but actually the point is that if R_t were held unchanged, the increased inflation rate would imply a reduction in the real interest rate of 2 percent per year, maintained forever. In a forward-looking rational expectations model, such a change has enormous effects. Furthermore, this way of treating the nominal interest rate is inconsistent with superneutrality and inconsistent with what one believes would happen in the face of a permanently increased inflation rate.

The other extreme treatment of R_t dynamics is to impose uncovered interest parity in all periods. In that case, which I have already described as unrealistic, we have the results shown in Figure 6, where the responses are all very small. Consequently, for the experiments reported in Figures 2–4, I have imposed the following compromise formula:

$$R_t = \theta R_t^{uip} + (1 - \theta)R_{t-1}, \quad (0 \leq \theta \leq 1), \quad (21)$$

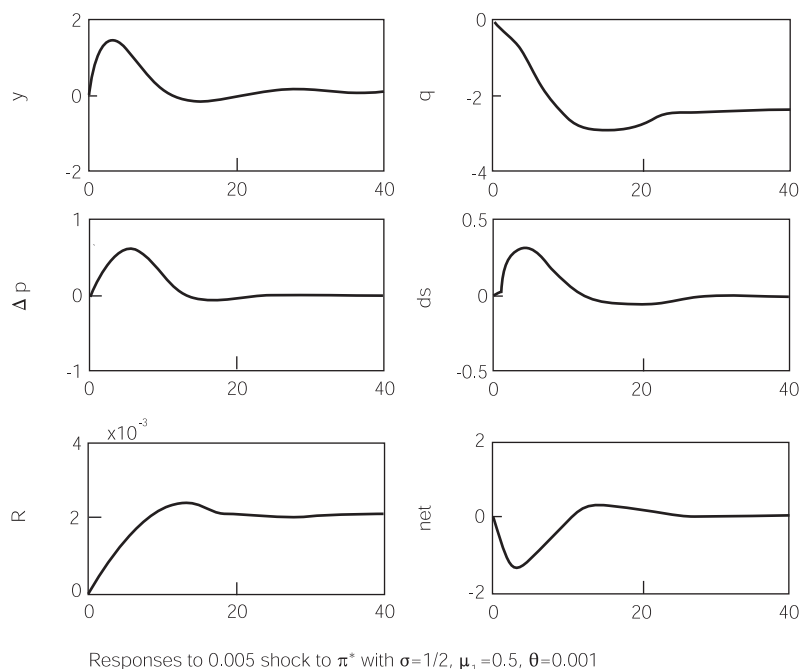
Figure 7 Responses with Fast R_t Adjustment

where R_t^{uip} is the value that would prevail if uncovered interest parity held in each period. The value used for θ in Figures 2–4 is 0.01, but the results for x_t are not much different qualitatively if one adopts a value of 0.1 or 0.001—see Figures 7 and 8. That is, the net export variable follows a pattern of the same shape; quantitatively the effects are larger the smaller is θ . In all of Figures 5–8, the import price elasticity was kept at 1/2.

In sum, the simulation results suggest strongly that the move to a more expansionary monetary policy by the BOJ, implemented by policy rule (5), would not have beggar-thy-neighbor effects on Japan's trading partners but instead would induce an increase in their net exports to Japan.

7. THE BANK OF JAPAN LAW, MONETARY POLICY, AND EXCHANGE-RATE POLICY

Let us now turn to the second major objection that has been voiced to the adoption of a policy rule such as (5), namely, that foreign exchange purchases and sales cannot legally be conducted by the BOJ according to its charter. Only a few years ago, in 1998, did the BOJ gain monetary policy independence,

Figure 8 Responses with Slow R_t Adjustment

i.e., the right and duty to conduct monetary policy as judged appropriate by itself (rather than by the Ministry of Finance).³⁵ The provisions of this independence are codified in a legal document that, in English, is termed “The Bank of Japan Law.” The provisions of this law are of direct relevance because the BOJ evidently has seen the Law as an obstacle to a policy of the type recommended above. Purchases of foreign exchange, it is contended, are the province of the Ministry of Finance, not the BOJ. An unofficial English translation of the Law, made by the BOJ, can be found on the BOJ’s web site (<http://www.boj.or.jp>). The following comments and interpretation are based on that version, as amended January 6, 2001.

The BOJ Law mentions foreign exchange purchases only in Articles 15, 40, 41, and 42. These references all simply *presume* that such purchases will be made either for the purpose of “cooperating... with foreign central banks and international institutions...” or else “to stabilize the exchange rate of the national currency.” Those activities, furthermore, are to be conducted

³⁵The law was promulgated on June 11, 1997, and put into effect on April 1, 1998. It has been amended several times.

in a manner specified by the Ministry of Finance. So viewed alone these passages do apparently suggest that the BOJ has no mandate to purchase foreign exchange in the manner suggested above, i.e., for macroeconomic demand management.

However, Articles 1 and 2 of the Law stipulate that a primary duty of the BOJ is to “carry out currency and monetary control. . .” in a manner “aimed at, through the pursuit of price stability, contributing to the sound development of the national economy.” Also, Article 3 states that “the BOJ’s autonomy regarding currency and monetary control shall be respected.” Thus the Law also gives support to the idea that foreign exchange purchases *for the purpose of monetary control* would be consistent with the duties that are explicitly assigned to the BOJ. Evidently, then, there is some internal inconsistency in the Law.

Furthermore, Article 15 states that the Policy Board will decide on matters inclusive of “determining or altering the guidelines for currency and monetary control in other forms,” i.e., forms other than money-market operations. This suggests that the Law could be interpreted as stating that the Policy Board has the authority to adopt policies *for exerting monetary control* by the purchase or sale of foreign exchange. In that regard it is important to emphasize again that the purpose of the foreign exchange transactions in question is definitely not to stabilize the exchange rate. Instead, the recommended policy makes the level of the exchange rate subservient to monetary policy, with the latter directed at maintaining price stability so as to promote the sound development of the Japanese national economy. So Article 15 adds to the evident inconsistency in the Law.

Finally, however, we need to consider Article 43, which states that the BOJ “. . . may not conduct any business other than those prescribed by this Law unless such business is necessary to achieve the Bank’s objectives prescribed by this Law and the Bank obtains authorization from the Minister of Finance and the Prime Minister.” It would appear that this article does not rule out the suggested activities *per se*, because they are integral to the BOJ’s achievement of its assigned objectives. Under recent conditions, moreover, they might well be deemed “necessary.” Nevertheless, it would seem to be appropriate for the BOJ to seek approval from the Minister of Finance and the Prime Minister, since such a step would keep the proposed actions from conflicting with Article 43. If the government were to favor more monetary stimulus, a well-formulated proposal would presumably meet with approval (although it is possible that political infighting could interfere).

That the BOJ Law does not recognize foreign exchange transactions as a means for conducting monetary policy is illogical but not actually surprising, partly because transactions involving government bills are satisfactory and desirable under normal conditions—i.e., with interest rates substantially above zero. Furthermore, it must be noted that the Japanese arrangements are not

out of line with those pertaining to central banks in other economies. In the United States, for example, it is generally understood (despite unclear legislation) that foreign exchange policy is primarily the province of the Treasury.³⁶ That assignment has not been troublesome for U.S. monetary policy in recent years, but arguably that is so because the Treasury has seen fit to let the foreign exchange value of the dollar be determined by market forces without substantial intervention. Even in the euro area, where monetary legislation for the European Central Bank is expressly designed to protect central bank independence and direct it toward price level stability, there is an anomalous provision regarding exchange rates of the euro vis-a-vis the dollar, the yen, and other currencies. This anomaly appears in Article 109 of the Maastricht Treaty, which gives the E.U. Council of Ministers (i.e., the member nations' finance ministers³⁷) the power to make agreements on an exchange-rate system for the euro (relative to non-EU currencies) or to adopt "general orientations" for exchange-rate policy. These actions are supposed not to conflict with the goal of price stability, but the provision could nevertheless create difficulties.

Despite the existence of these actual arrangements, I suggest that it is a mistake to view monetary policy and exchange-rate policy as independent entities, as they implicitly suggest. Indeed, although it would be a slight exaggeration to claim that monetary and exchange-rate policies are merely different aspects of one macroeconomic policy tool, that claim comes closer to the truth than the view suggesting that there are two distinct tools. (In making this statement, I am assuming that the nation under discussion does not attempt to manage exchange rates by means of direct controls, which would of course introduce serious microeconomic inefficiencies and inducements for corruption.) Let us develop that argument in the remainder of this section.

One way to proceed is to recall the nature of monetary arrangements under a gold standard (or any other metallic standard). Any such arrangement on an international basis clearly dictates exchange rates among all nations that adopt gold-standard regimes. But such regimes are simultaneously specifications of domestic monetary standards, ones that require monetary policy to be governed by the overriding obligation of maintaining the domestic-money price of gold—and consequently the value of money in terms of gold.

For fiat money systems the relevant analytical point is that, from a long-run perspective, money stock and exchange-rate paths cannot be independently controlled or managed, basically as a consequence of the long-run neutrality of money. Short-run non-neutralities are a fact of life, of course, so there is some scope for temporary departures of exchange rates from the paths implied by monetary policy. These departures can be effected by fiscal actions or

³⁶ On this topic see Broaddus and Goodfriend (1996), which takes a position similar to that of the present section, and Hetzel (1996). The quotes on page 21 of the latter are useful.

³⁷ The Council members are finance or economics ministers when the business is finance or economics, in which case the Council is known as Ecofin. For other issues, other ministers will represent the member countries. When the Council is attended by the countries' prime ministers, the meeting becomes a "summit."

possibly by sterilized—hence nonmonetary—exchange market interventions. But since such departures will only be temporary, it is inappropriate (and dangerous) to think of them as reflecting distinct macroeconomic policies.

A counterargument that some might raise would point out that real exchange rates can be affected permanently by fiscal stances. A higher steady state ratio of government spending to income tends, for example, to generate a higher real foreign-exchange value of a nation's currency. But an increased ratio of government consumption to income has a one-time effect on the real exchange rate, not a continuing or ongoing effect. Thus a monetary policy that generates an average inflation rate that is inconsistent with a fixed nominal exchange rate—or more generally a specified nominal exchange-rate path featuring a nonzero rate of depreciation or appreciation—will eventually lead to a breakdown. Fiscal policy cannot, that is, be used to overcome long-run inconsistencies between money stock, price level, and exchange-rate paths. Useful papers elaborating on this point have been written by Bordo and Schwartz (1996), Garber and Svensson (1995), and Obstfeld and Rogoff (1995).

Furthermore, it is important to keep in mind that a large fraction of fiscal policy actions involves switches between bond finance and tax finance for given streams of government purchases. This reminder is relevant because many standard and widely-used macroeconomic models incorporate the property of Ricardian equivalence, i.e., the property that switches between bond and tax finance have no effect on macroeconomic variables of primary importance, including real and nominal exchange rates (and net exports).³⁸ Admittedly, it is quite unlikely that actual economies possess this Ricardian property in full, but evidence suggests that deviations are fairly minor. Thus for most fiscal policy actions, there will be at most minor or short-lived effects on exchange rates.

The other possible way of exerting a policy effect on exchange rates is via sterilized interventions, i.e., foreign exchange transactions that are offset so as to result in no net change in the economy's outstanding stock of base money. It is widely agreed by students of the issue, however, that effects of sterilized interventions are at most small and temporary.³⁹ Thus they too cannot provide a means for escaping the long-run links between money stock and exchange rate magnitudes.

Yet another way to put the argument is as follows. Most economists agree that central banks possess only one significant monetary policy tool. Some would describe it as control over the monetary base whereas others would emphasize the setting of short-term interest rates. But that distinction is unimportant with regard to the issue at hand; what matters is that there is only one significant tool. Consequently, if the central bank is required (externally or

³⁸ An early statement of this result is provided by Stockman (1983, 151–2).

³⁹ For a survey of the literature, see Edison (1993).

by its own choice) to devote that policy tool to the achievement of some target path for an exchange rate, then the tool is not available for achievement of a domestic macroeconomic objective—be it expressed in terms of inflation alone or, e.g., some combination of inflation and output deviations from their target values. In short, legislation or arrangements that give exchange-rate control to the finance ministry, or some other branch of government, are basically inconsistent with central bank independence.

8. CONCLUSION

On the basis of the arguments developed above, plus those presented in previous papers, it would appear that an appropriate policy would be for the Bank of Japan to temporarily maintain a growth rate of base money of 10–15 percent per year, with most of the newly created base used to purchase foreign exchange (the remainder being used to purchase long-term government bonds).⁴⁰ After a growth rate of nominal GDP of 4–5 percent has been achieved, policy could then revert to more normal arrangements, with a target of about 2 percent measured inflation or 4–5 percent nominal GDP growth.⁴¹

There have been two prominent objections to this type of proposal. One is that the proposed policy would have undesirable “beggar-thy-neighbor” effects on Japan’s trading partners. Simulations with a calibrated model of the “new open-economy macroeconomics” type suggest, however, that the policy’s expansionary effects on output would lead to an increase, not a decrease, in Japanese imports. Presentation of the model and the simulation study constitutes a major undertaking of the paper.

The second main objection has been that purchase of foreign exchange is inconsistent with the Bank of Japan Law. But the arguments developed above indicate that purchase of foreign exchange for the purpose of monetary control is basically consistent with those provisions of the Law that call for the BOJ to exert monetary control so as to contribute to the sound development of the Japanese economy. Therefore, since the Law does not mention this reason for conducting foreign exchange transactions, the BOJ could overcome the Law’s internal inconsistencies by requesting approval from the Minister of Finance and the Prime Minister. It could also seek amendment of the Law so as to recognize the close relationship between monetary policy and exchange-rate policy, thereby strengthening Japan’s statutory basis for central bank independence.

⁴⁰ The range 10–15 percent is suggested, admittedly loosely, by the plots in the bottom panel of Figure 1.

⁴¹ Studies including Shiratsuka (1999) suggest that measured overstates actual inflation in Japan by about 1 percent per year.

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