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5 Monetary Policy and the Real Economy in Japan

Hiroshi Yoshikawa

This chapter considers the role money plays in the economy. At present, there is considerable disagreement among economists over the role of money in economic fluctuations. On the one hand, monetarists (Friedman 1968; Lucas 1972, 1977) consider unanticipated changes in the money supply exogenously caused by central banks to be the major shock driving economic fluctuations. On the other hand, real business cycle theorists argue that macroeconomic fluctuations are set off by technological shocks such as changes in total factor productivity, and that the propagation of these shocks through the economy is due to nonmonetary factors such as optimal consumption smoothing by individuals and lags in the construction of new capital. According to this theory, therefore, money does not play a major role either as a shock or as a propagation mechanism: money is nothing but a veil (King and Plosser 1984; Plosser 1990). Between these two polar views, Keynesians hold that both real demand and monetary shocks are important in business cycles. Yoshikawa and Ohtake (1987) argue that neither rational-expectations-based monetarism nor real business cycle theory can reasonably explain postwar business cycles in Japan, arguing instead that real demand shocks played the major role. This chapter focuses on money and considers its role in economic fluctuations.

To make progress toward fully understanding the role money plays in the economy, it is essential to grasp precisely how monetary policy is conducted. Irrespective of the views expressed by their authors, most macroeconomic analyses, both theoretical and empirical, assume either that the money supply is exogenous or that very simple feedback rules guide monetary policy. These

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simplifying assumptions make feasible the calculations of equilibrium that are consistent with rational expectations, but it is rarely questioned whether the assumptions made are a good approximation to how monetary policy is conducted in the real world.

This chapter argues that the money supply very often becomes endogenous, passively reflecting various shocks to the economy. The basic reason money becomes endogenous is that central banks smooth the nominal interest rate. Occasionally, however, central banks do change the money supply independently or exogenously, thus affecting the real economy ("dynamic operations" in Roosa's (1956) terminology). Monetary policy, therefore, follows *time-varying* nominal interest rate smoothing, and consists of a regime somewhere between the two polar cases of interest rate pegging and dynamic operations.

Section 5.1 demonstrates the endogeneity of the money supply using a simple model. To shed light on the role of money in economic fluctuations, section 5.2 analyzes monetary policy in seasonal fluctuations. Section 5.3 studies monetary policy at business cycle frequencies and shows that the nominal interest rate is indeed very often smoothed. This section also analyzes the proximate targets the Bank of Japan (BOJ) has pursued in its policymaking. Section 5.4 analyzes the transmission mechanism of monetary policy. The experiences of Japan over a thirty-year period are examined and then compared with those of the United States. Not surprisingly, the transmission mechanism of monetary policy is found to differ substantially over time and also across countries. Section 5.5 offers concluding remarks.

5.1 Nominal Interest Smoothing and Endogenous Money Supply

Monetarists take changes in the money supply to be exogenous. As will be observed below, however, this is not a good description of observed changes in the money supply because the BOJ very often smooths the nominal interest rate. Of course, another issue is whether nominal interest smoothing is a desirable policy, but in fact such policies have been adopted by the BOJ. When the BOJ smoothes the nominal interest rate, specifically, the call rate in the case of Japan, the money supply must endogenously change in response to real disturbances. In this case, changes in the money supply become nothing but mirror images of real shocks.

Keeping this point in mind, I first consider the relationship between the money supply and the real economy in a simple macroeconomic model. This model will form a basis for the discussion in subsequent sections.

Although the basic points I want to make in sections 5.3 and 5.4 are not model-specific, to facilitate explanation I consider a simple Taylor-type macroeconomic model (Taylor 1979, 1980). The model consists of five equations:

(1) $$Y_t = -\gamma(W_t - P_t),\ \gamma > 0;$$

(2) $$Y_t = -a[i_t - E(P_{t+1} \mid \Omega_t) + P_t] + \tilde{u}_t, \quad a > 0;$$

(3) $$W_t = \alpha E(P_{t+1} \mid \Omega_{t-1}) + (1 - \alpha)P_{t-1} + \tilde{\eta}_t, \quad 0 < \alpha < 1;$$

(4) $$M_t - P_t = Y_t - \beta i_t + \tilde{v}_t, \quad \beta > 0;$$

(5) $$M_t = d(i_t - i_t^*) + \tilde{\varepsilon}_t .$$

Y is real GNP, P is the price level, W is nominal wages, and M is the nominal money supply; all are measured in logs. $E(x \mid \Omega)$ denotes taking the expected value of x conditional on the information set Ω. $\tilde{u}$, $\tilde{\eta}$, $\tilde{v}$, and $\tilde{\varepsilon}$ are disturbances in each equation.

The BOJ is assumed to smooth the nominal interest rate i around the target rate i^*. The extent of nominal interest rate smoothing is expressed by the parameter d in (5). When d becomes large, the nominal interest rate is virtually pegged. On the other hand, when d is zero, the money supply is equal to the disturbance ε, which is supposed to reflect changes in the BOJ's policy stance, and in this case the nominal rate i becomes an endogenous variable. Note that this characterization of the BOJ's behavior implicitly assumes that the BOJ systematically reacts to income, price, or money demand shocks *within the period.*[1] In fact, the analysis of the seasonal cycle below suggests that the BOJ systematically reacts to various shocks with a lag of less than one month.

The model is otherwise standard and needs no explanation. Output Y, the price level P, the money supply M, and the nominal interest rate i in this model are determined as follows (for simplicity, i^* is taken to be zero):

(6) $$\begin{aligned} Y_t = \frac{1}{A}[&\gamma a(\phi^2 - bc)P_{t-1} - \gamma ab\tilde{\eta}_t \\ &+ \gamma a(b - 1)(\tilde{\varepsilon}_t - \tilde{v}_t) + \gamma\tilde{u}_t]; \end{aligned}$$

(7) $$\begin{aligned} P_t = &\frac{1}{A}[\gamma c\{(b - 1)a + 1\} + a\phi^2]P_{t-1} \\ &+ \frac{1}{A}[\gamma\{(b - 1)a + 1\}\tilde{\eta}_t + (b - 1)a(\tilde{\varepsilon}_t - \tilde{v}_t) + \tilde{u}_t]; \end{aligned}$$

(8) $$\begin{aligned} M_t = &\frac{1}{\left(1 + \frac{\beta}{d}\right)A}[\{cA + (\gamma + 1)a(\phi^2 - bc)\}P_{t-1} \\ &+ \{A - (\gamma + 1)ab\}\tilde{\eta}_t + (\gamma + a)\tilde{v}_t \\ &+ \{\frac{\beta A}{d} + (\gamma + 1)(b - 1)a\}\tilde{\varepsilon}_t + (\gamma + 1)\tilde{u}_t]; \end{aligned}$$

1. McCallum (1983) argues that in vector autoregression systems, monetary policy surprises may be more accurately represented by interest rate than by money stock innovations if the monetary authority aims to hit a money supply target but uses an interest rate instrument. His analysis, however, rests on the assumption that the monetary authority does *not* systematically react to income, price, or money demand shocks within the period.

and

$$(9)\quad i_t = \frac{1}{(d+\beta)A}[\{cA + (\gamma+1)a(\phi^2 - bc)\}P_{t-1} + \{A - (\gamma+1)ab\}\bar{\eta}_t + (\gamma+a)\bar{v}_t - (\gamma+a)\bar{\varepsilon}_t + (\gamma+1)\bar{u}_t],$$

where

$$A = \gamma\left(1 + \frac{a}{\beta+d}\right) + \left(\frac{a}{\beta+d}\right) + a;$$
$$b = 1 + \frac{1}{\beta+d}, \quad b > 1; \text{ and}$$
$$c = \alpha\phi^2 + (1-\alpha), \quad 0 < c < 1;$$

and ϕ ($0 < \phi < 1$) is a root of the following characteristic equation of the system:

$$(10)\quad f(x) = \left[\frac{a}{((b-1)a+1)} + \gamma\alpha\right]x^2 - \left[\frac{ab}{((b-1)a+1)} + \gamma\right]x + \gamma(1-\alpha) = 0.$$

The basic message is that in general changes in the money supply M_t contain various shocks: price shocks η, real demand shocks u, portfolio shocks v, and changes in the BOJ's policy stance ε. Monetarism takes it for granted that the ε's are by far the most dominant shocks.

Before I proceed to the empirical analysis, I will consider some special but important cases of the solutions (6)–(9).

When the BOJ smooths the nominal interest rate to a considerable degree ($d \to \infty$), we obtain

$$(11)\quad Y_t = \frac{1}{(\gamma+a)}[\gamma a(\phi^2 - c)P_{t-1} - \gamma a\bar{\eta}_t + \gamma\bar{u}_t],$$

$$(12)\quad P_t = \frac{1}{(\gamma+a)}[(\gamma c + a\phi^2)P_{t-1} + \gamma\bar{\eta}_t + \bar{u}_t],$$

$$(13)\quad M_t = \frac{1}{(\gamma+a)}[\{c(\gamma+a) + (\gamma+1)a(\phi^2 - c)\}P_{t-1} + \gamma(1-a)\bar{\eta}_t + (\gamma+a)\bar{v}_t + (\gamma+1)\bar{u}_t],$$

and

$$(14)\quad i_t = i^*.$$

Real output Y and the price level P become independent of portfolio shocks v, whereas the money supply responds to $\bar{v}$ one for one.

Under the same assumption that d is large, if we further assume that the marginal cost curve is fairly flat ($\gamma = \infty$), then we obtain

(15) $$Y_t = a(\phi^2 - c)P_{t-1} - a\bar{\eta}_t + \bar{u}_t,$$

(16) $$P_t = cP_{t-1} + \bar{\eta}_t,$$

and

(17) $$M_t = \{c + a(\phi^2 - c)\}P_{t-1} + (1 - a)\bar{\eta} + \bar{v} + \bar{u}_t.$$

If a, the interest elasticity of aggregate demand, is small, output is virtually determined by the real demand shock u. On the other hand, real demand shocks do not affect price. Price is affected only by the price shock η.

We next consider the other extreme case, in which the BOJ does not attempt to smooth the nominal interest rate ($d = 0$). In this case, we obtain

(18) $$Y_t = \frac{1}{[\gamma\{(b - 1)a + 1\} + (b - 1)a + a]}[\gamma a(\phi^2 - bc)P_{t-1} - \gamma ab\bar{\eta}_t + \gamma a(b - 1)(\bar{\varepsilon}_t - \bar{v}_t) + \gamma\bar{u}_t],$$

(19) $$P_t = \frac{1}{[\gamma\{(b - 1)a + 1\} + (b - 1)a + a]} \times [\{\gamma c((b - 1)a + 1) + a\phi^2\}P_{t-1} + \gamma((b - 1)a + 1)\eta_t + (b - 1)a(\bar{\varepsilon}_t - \bar{v}_t) + \bar{u}_t],$$

(20) $$M_t = \tilde{\varepsilon}_t,$$

and

(21) $$i_t = \frac{1}{\beta A'}[\{cA' + (\gamma + 1)a(\phi^2 - b'c)\}P_{t-1} + \gamma(1 - a)\bar{\eta}_t + (\gamma + a)\bar{v}_t - (\gamma + a)\tilde{\varepsilon}_t + (\gamma + 1)\tilde{u}_t],$$

where $A' = \gamma(1 + a/\beta) + a/\beta + a$ and $b' = 1 + 1/\beta$. Output is affected by ε, the independent change in the money supply. This corresponds to Roosa's (1956) "dynamic" operations.

With different degrees of interest rate smoothing d, observed changes in the money supply either passively reflect various shocks to the economy (13) or embody exogenous changes in the BOJ's policy stance (20). The relative importance of the exogenous component ε in the variance of money supply M, $\sigma_\varepsilon^2/\sigma_m^2$, is

(22) $$\left[\frac{\beta A}{d} + (\gamma + 1)(b - 1)a\right]^2\sigma_\varepsilon^2 \Big/ [\{A - (\gamma + 1)ab\}^2\sigma_\eta^2 + (\gamma + a)^2\sigma_v^2 + \{\left(\frac{\beta A}{d}\right) + (\gamma + 1)(b - 1)a\}^2\sigma_\varepsilon^2 + (\gamma + 1)^2\sigma_u^2].$$

$\sigma_\varepsilon^2/\sigma_m^2$ approaches 1 or 0 as d vanishes or becomes infinite, respectively. With these results, I turn to the empirical analysis, in which monetary policy in both the seasonal and the business cycles is examined.

5.2 Money Supply and the Seasonal Cycle

Although seasonal cycles have long been recognized, until very recently most research on macroeconomic fluctuations used seasonally adjusted data, treating seasonal fluctuations as unworthy of study. It was against this current of research that Barsky and Miron (1989) and Yoshikawa (1989) began to study seasonal cycles in the United States and in Japan, respectively. Although the main interest here is the role of money in business cycles, much information can be obtained by studying seasonal cycles.

Fluctuations of monthly real output (in the index of industrial production [IIP] compiled by MITI) and of the money supply (M_2 + CD) in Japan are shown in figure 5.1 (in rates of change relative to the previous month). They are highly periodic and regular. This initial impression is confirmed by examining the spectrum of these variables (figs. 5.2 and 5.3): real output and the money supply indeed show very similar patterns of seasonal fluctuation. The peaks and troughs of the deterministic seasonality of the two variables, however, do not exactly coincide (table 5.1).[2] The rate of change in the money supply peaks in December, is high in March and June, and bottoms out in January and February. On the other hand, the rate of change in IIP peaks in March, is high in September, bottoms out in January, and is low in August, April, and May. This difference in the timing of fluctuations is most likely due to two facts: (1) industrial production is not equal to expenditures, and (2) there is a lag between production and other transactions on the one hand and payments on the other.[3] The money supply usually increases in December because consumption and custom payments such as interfirm settlements and wages peak during that month.

2. The seasonality measures shown in table 5.1 are the *deterministic* seasonality captured by twelve monthly dummies. The estimated coefficient for each monthly dummy can be interpreted as the average rate of change in each month. A tacit assumption is that the variance of the errors around the average is the same from January to December. Although stochastic seasonality exists, Barsky and Miron (1989) report that deterministic seasonality is quantitatively much more important than stochastic seasonality in the majority of the economic variables they examined.

3. Take the example of investment. Construction would take a year or two, and a typical payment pattern is that a quarter is paid when construction starts, another quarter in the middle, and the remaining half at the time of completion. Similarly, in the case of machinery, there is, first of all, a three-to-six-month lag between order and shipment. Payment is then made three to six months after delivery. Finally, if payment is made by a three-to-six-month bill, the lag between orders and final settlements can be at longest a year and a half. An additional point to be noted in the case of Japan is that, by custom, interfirm settlements are made at the end of March, September, or December.

So far the discussion has concerned payment made by firms that order investment goods. When firms that produce investment goods take orders and start production, it soon becomes necessary for them to pay for labor and raw materials. The lags for these payments are much shorter than those for investment orders.

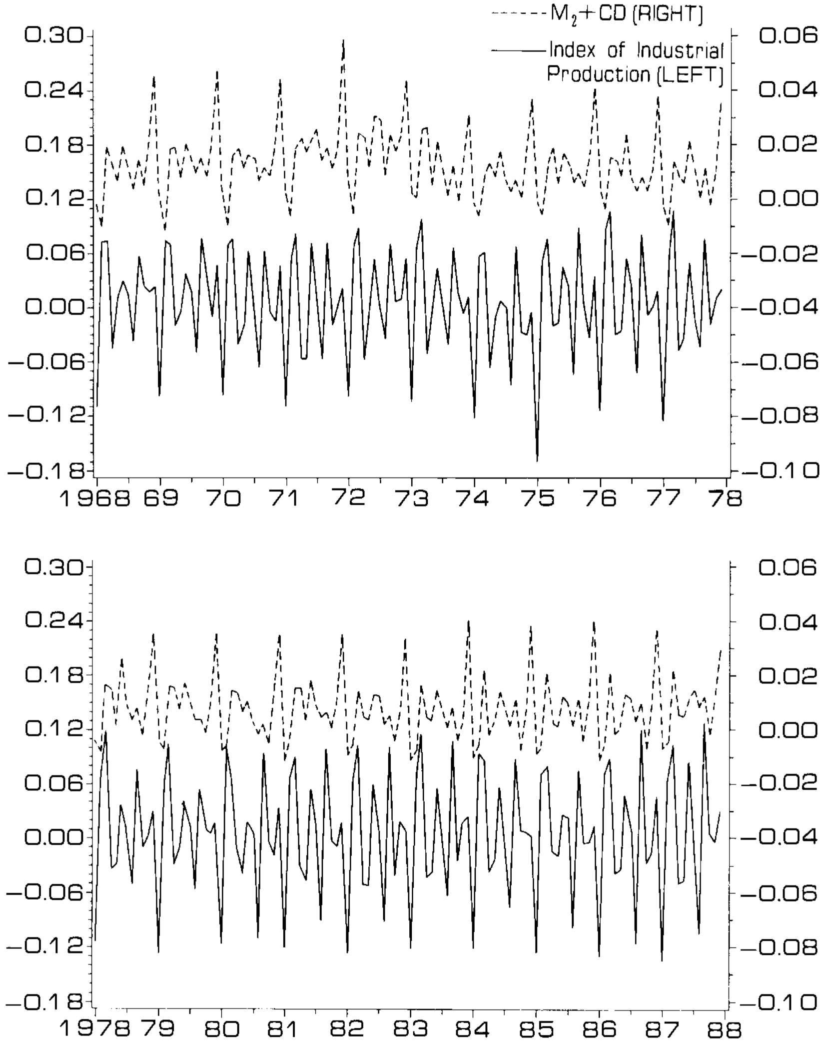


Fig. 5.1 Money and production

For reference, the deterministic seasonality in other variables is shown in tables 5.2 and 5.3. It is observed, for example, that consumption peaks in December and is high in March, whereas investment peaks in March and September. On the other hand, consumption bottoms out in January, and investment bottoms out in January, April, and October. In passing, the seasonal fluctuations in consumption, measured by the coefficient of variation (31.7), are smaller than those in machinery orders (71.3) but larger than those in shipments of capital goods (15.9). Finally, table 5.2 also shows that wage

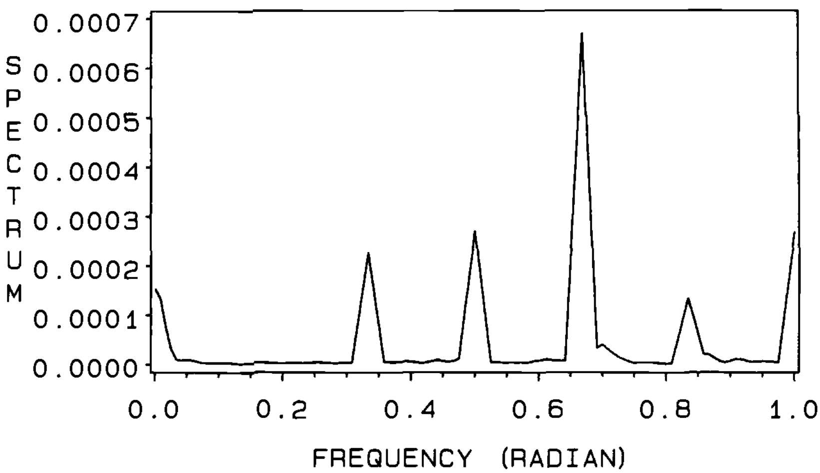


Fig. 5.2 Spectrum of M2 + CD

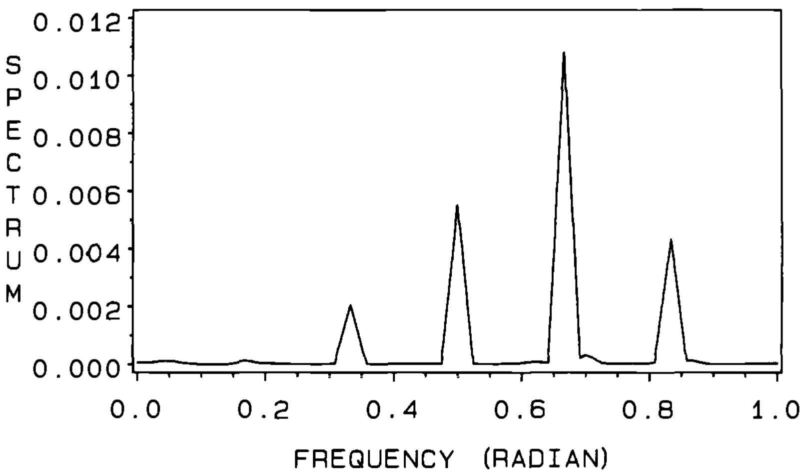


Fig. 5.3 Spectrum of index of industrial production

payments peak in December and June, a consequence of the celebrated bonus system.

Aside from a peak in consumption in December, therefore, production and expenditures tend to move concurrently over the seasonal cycle: they both increase in June and September and decrease in January.[4] A comparison of indices of production, shipments, and inventory stocks (table 5.3) in fact

4. Indices of industrial production in all industries except for food peak in March and September. Production in the food industry peaks in December.

Table 5.1 **The Deterministic Seasonality of Money and Output**

	(1) Mean (×10)	(2) S.D. (×10)	(3) (2)/(1)	(4) S.E.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sample
IIP	0.05	0.62	12.40	0.18	−1.20	0.66	0.90	−0.41	−0.24	0.46	0.08	−0.68	0.81	−0.05	−0.02	0.25	67.2
					(−30.29)	(17.08)	(23.32)	(−10.63)	(−6.26)	(11.89)	(2.11)	(−17.68)	(21.12)	(−1.21)	(−0.63)	(6.43)	~87.12
M2 + CD	0.10	0.13	1.30	0.06	−0.04	−0.07	0.18	0.12	0.06	0.18	0.12	0.04	0.10	0.01	0.13	0.39	67.2
					(−3.43)	(−5.45)	(14.66)	(10.21)	(4.57)	(14.77)	(9.71)	(3.44)	(8.56)	(1.23)	(10.99)	(32.46)	~88.1

Note: t = values in parentheses.

Table 5.2 **The Deterministic Seasonality of Household Income and Consumption**

	(1) Mean (×10)	(2) S.D. (×10)	(3) (2)/(1)	(4) S.E.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sample
Household income	0.07	4.44	63.43	0.30	−10.17	0.12	1.37	−0.72	0.03	4.81	−0.89	−2.92	−0.87	0.18	0.13	9.80	67.2
					(−155.54)	(0.89)	(21.01)	(−10.98)	(0.52)	(73.57)	(−13.59)	(−44.64)	(−13.34)	(2.73)	(1.97)	(149.83)	~88.1
Consumption	0.06	1.90	31.67	0.24	−4.13	−0.58	1.99	−0.44	−0.48	0.26	0.75	−0.46	−0.75	0.59	−0.19	4.19	69.10
					(−73.93)	(−10.02)	(34.71)	(−7.65)	(−8.39)	(4.52)	(13.07)	(−8.00)	(−13.08)	(10.63)	(−3.38)	(74.99)	~88.1

Note: t = values in parentheses.

shows that there is little production smoothing. The variance of shipments (0.76) is slightly greater than that of production (0.62), but the difference is rather marginal. As a result, seasonal fluctuation in inventory stocks is small. Substantial production smoothing is observed only in December: the high consumption in December is met by a decumulation of inventory stocks. The fact that production and expenditures broadly move together contradicts the notion of an increasing short-run marginal cost curve and suggests a flat marginal cost curve. This case is also strengthened by the fact that seasonal fluctuations in expenditures are largely anticipated by producers.

Aside from timing, money and real output show very similar seasonal fluctuations. As noted at the beginning of this chapter, it is a matter of much dispute whether the high correlation between money and real output over the

Table 5.3 **The Deterministic Seasonality of Investment**

	(1) Mean (×10)	(2) S.D. (×10)	(3) (2)/(1)	(4) S.E.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sample
Orders of machinery	0.04	2.85	71.25	1.21	−2.90	1.34	4.80	−3.78	−0.40	0.81	−0.92	−0.08	4.18	−3.50	−0.58	1.61	69.5
					(−10.48)	(4.71)	(16.89)	(−13.29)	(−1.43)	(2.94)	(−3.32)	(−0.28)	(15.11)	(−12.67)	(−2.11)	(5.81)	~88.1
Shipment of capital goods	0.08	1.27	15.88	0.43	−1.28	1.14	2.32	−1.77	−0.55	0.69	0.06	−0.27	1.63	−1.39	−0.17	0.46	67.2
					(−13.26)	(12.13)	(24.68)	(−18.84)	(−5.80)	(7.30)	(0.69)	(−2.89)	(17.32)	(−14.79)	(−1.86)	(4.87)	~87.12

Note: t = values in parentheses

business cycle reflects a causal mechanism running from money to output or the other way around. In contrast to the case of business cycles, however, it is absurd to argue that seasonal fluctuations in real activities are caused by similar fluctuations in money: they clearly reflect real factors such as weather or customs (for example, New Year's Day in Japan or Christmas in the United States). In other words, there is an "identifying restriction" that fluctuations in real output are independent of money in the case of seasonal cycles.

It is theoretically possible, in the context of models in which agents are solving intertemporal optimization problems, that seasonal power in output is due in part to a white-noise monetary shock. This possible effect is not very important, however, because real variables such as outputs in various industries, consumption, and investment have similar spectral patterns but different seasonal patterns of peaks and troughs (tables 5.1–5.3). To the extent that (as a first approximation) all the agents are subject to the same monetary shocks, it is difficult to understand that optimum responses of the agents to a *common* monetary shock produce changes in real variables which have similar spectral patterns but at the same time different seasonal patterns of peaks and troughs. It is more reasonable to consider that tastes and technology show their own idiosyncratic seasonal fluctuations, which are conditioned by weather and custom. Therefore, I argue that the "identifying restriction" that fluctuations in real variables are independent of money in the case of seasonal cycles is, if not definite, at least quite reasonable.

The reason money fluctuates similarly to real variables is that the money supply responds endogenously to seasonal fluctuations in real activities. If the money supply did not respond endogenously to seasonal real shocks, then interest rates would show seasonal fluctuations. In fact, the BOJ intentionally responds to real shocks in order to smooth the nominal interest rate.[5] It can be observed that changes in the money supply broadly coincide with changes in high-powered money and BOJ lending rather than with changes in the reserve ratio or the currency/deposit ratio (table 5.4). They all peak in December and are high in March and June, bottoming out in January and February.

Cash moves slightly differently from money. It peaks in December but is also high in July. The high in July coincides with high consumption and confirms that cash is used mostly by consumers rather than by firms. As a digression, it would be interesting to examine the other component of money—bank deposits—as well. As of December 1988 cash amounted to only 31.5 billion yen of M_2 + CD, which totaled 409.3 billion yen. Demand deposits and time deposits were 80.3 and 297.5 billion yen, respectively. Table 5.4 shows the seasonal cycles of the demand and time deposits of individuals and firms. Time deposits do not exhibit any clear seasonal movements, but demand deposits do. Demand deposits of individuals and firms, however, show quite different seasonal patterns. For individuals, they are high in the second and fourth quarters. Evidently they reflect bonus payments (table 5.2). In contrast, the demand deposits of firms peak in the third quarter and reach a trough in the second quarter. This seasonal pattern is broadly consistent with that of production.

Coming back to the main argument, we see that as a result of the BOJ's actions seasonal fluctuations in the nominal interest rate are substantially weakened. Indeed, the spectrum of the call rate does not show any significant seasonality (figure 5.4).

Interest rate smoothing or money supply accommodation would make changes in real output greater than otherwise, which is not a fault of this policy in the case of the seasonal cycle, since seasonal fluctuations of real activities are mostly desirable. As argued above, agents' intertemporal optimization that produces smoothing of consumption or production makes much less sense over the seasonal cycle than over the business cycle or the life cycle of an individual. Tastes and technology, which are usually taken as stable in intertemporal optimization models, fluctuate during the seasonal cycle. As the example of a fall in construction activities during the rainy season shows, seasonal fluctuations in real activities are mostly desirable. Seasonal fluctuations in interest rates, on the other hand, can be a disturbance to the real economy. Miron (1986), for example, argues that in the United States prior to the foundation of the Fed in 1914, seasonal fluctuations in the nominal interest rate often created financial panic, whereas the number of financial panics substantially decreased after 1914 when the Fed started smoothing the nominal inter-

5. In the United States, the Federal Reserve also smooths the nominal interest rate at seasonal frequencies. Indeed, one of the major objectives of the Federal Reserve System since its establishment in 1914 has been to smooth the nominal interest rate. See, for example, Shiller (1980) and Miron (1986).

Table 5.4 **The Deterministic Seasonality of Monetary Aggregates**

	(1) Mean (×10)	(2) S.D. (×10)	(3) (2)/(1)	(4) S.E.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sample
M2 + CD	0.10	0.13	1.30	0.06	−0.04	−0.07	0.18	0.12	0.06	0.18	0.12	0.04	0.10	0.01	0.13	0.39	67.2
					(−3.43)	(−5.45)	(14.66)	(10.21)	(4.57)	(14.77)	(9.71)	(3.44)	(8.56)	(1.23)	(10.99)	(32.46)	~88.1
High-powered money	0.09	0.70	7.78	0.18	−1.42	0.17	0.43	−0.09	−0.29	0.62	−0.12	−0.17	0.13	−0.13	0.35	1.60	69.10
					(−34.40)	(4.07)	(10.13)	(−2.18)	(−6.81)	(14.62)	(−2.93)	(−3.93)	(3.19)	(−3.18)	(8.58)	(38.88)	~88.1
Cash	0.09	0.75	8.33	0.14	−0.94	−0.76	0.40	−0.01	−0.12	0.62	−0.12	−0.17	−0.38	0.07	0.10	2.14	67.2
					(−30.70)	(−24.81)	(12.96)	(−0.40)	(−4.00)	(7.70)	(15.82)	(−2.94)	(−12.48)	(2.13)	(3.29)	(70.01)	~88.1
Reserves	0.12	0.58	4.83	0.54	0.10	−0.29	0.55	0.12	−0.01	0.28	−0.09	0.05	0.44	−0.24	0.14	0.42	67.2
					(0.82)	(−2.45)	(4.72)	(1.06)	(−0.08)	(2.39)	(−0.76)	(0.41)	(3.75)	(−2.04)	(1.18)	(3.58)	~88.1
BOJ's lending	0.08	3.29	41.13	2.72	0.52	−0.16	0.31	−3.55	−1.93	1.55	0.63	−0.27	2.18	−0.56	−1.87	4.16	66.10
					(0.82)	(−0.25)	(0.49)	(−5.69)	(−3.09)	(2.48)	(1.01)	(−0.43)	(3.50)	(−0.90)	(−3.00)	(6.67)	~87.12

Note: t = values in parentheses.

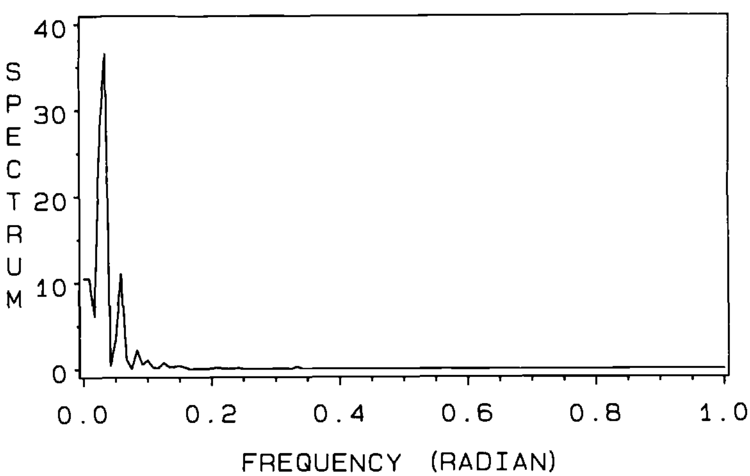


Fig. 5.4 **Spectrum of call rate**

est rate at seasonal frequencies. This is a standard argument for seasonal nominal interest smoothing.

In terms of the model in section 5.1, therefore, the BOJ's behavior at seasonal frequencies corresponds to $d \cong \infty$. The call rate does not fluctuate much, but the money supply does. Then to what shocks does the money supply respond? First, it is also observed here that price movements do not show any significant seasonality (fig. 5.5). Output fluctuates, but price does not. Comparing equations (11) and (12) to (15) and (16), one can conclude that the marginal cost curve is fairly flat ($\gamma = \infty$) and that price shocks are not significant ($\eta = 0$) at seasonal frequencies. As noted above, a comparison of the seasonal cycles of production and shipments also indicates that the marginal cost curve is flat. From equation (17), therefore, it becomes apparent that seasonal changes in the money supply simply reflect portfolio shocks v (such as sharp increases in the demand for cash in December), and real demand shocks u, one for one. There is little exogenous component (ε) in money. Monetarism both old and new, therefore, makes no sense in explaining seasonal cycles.

Barsky and Miron (1989) obtain similar results for the U.S. economy and make the following argument. If it is accepted that the seasonal comovements of money and output reflect the endogeneity of money, does this allow one, by analogy, to draw any inference about similar high correlations associated with the conventional business cycle? Application of the principle of parsimony suggests, they argue, that money is endogenous rather than causal with respect to the business cycle as well as the seasonal cycle. Of course, one might take the position that two different mechanisms are operative in gener-

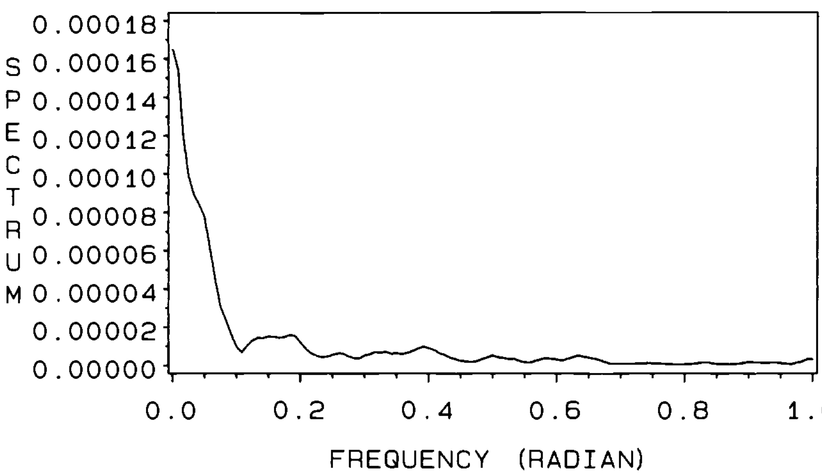


Fig. 5.5 Spectrum of price inflation (WPI)

ating the observed correlations over seasonal and business cycles. Nonetheless, the similar comovement of money and output at the two sets of frequencies is at the very least suggestive of an endogenous money supply.

5.3 Money Supply and the Business Cycle

It was found that in the seasonal cycle the money supply endogenously responds to portfolio and real demand shocks. This section examines the relation between money and output over the business cycle.

A fairly high correlation between the money supply and GNP is observed over the business cycle, though it is not as high as in the seasonal cycle. Monetarists (Friedman and Schwartz 1963) contend that changes in the money supply have been "exogenous" and largely determined by autonomous policy decisions of the central bank. They also find that the velocity of money or the money demand function is stable, and accordingly argue that money is the causal factor in explaining economic activities.

Economists such as Kaldor (1970) argue the story the other way round. The money supply "accommodates itself" to the needs of trade, rising in response to an expansion and vice versa, just as in a seasonal cycle. According to their view, the relative stability in the demand for money is merely a reflection of the instability in its supply: if the supply of money had been kept more stable, the velocity of money would have been more unstable.[6] In short, income causes endogenous changes in money.

The issue has been analyzed using a causality test (Granger 1969; Sims 1972). Sims's original finding that causality running from money to income cannot be rejected was soon discovered to be not robust by Mehra (1978) and reconfirmed by Sims (1980). Extending the original bivariate model to a model that included money, industrial production, WPI, and the short-term nominal interest rate, they found that the exogeneity of money dramatically declines. Subsequent works (Bernanke 1986; Christiano and Ljungvist 1988; Stock and Watson 1989) also show that the results of the test are not quite robust with respect to such technical matters as the treatment of seasonality or the method used to make variables stationary.

The causality test has been applied to Japanese data by a number of economists. A typical result for the Japanese data (see, for example, Suzuki, Kuroda, and Shirakawa 1988) is that the call rate is exogenous, and causality runs from the call rate to money. In the second stage the causality runs from

6. Kaldor (1970), for example, compares the U.S. and Canadian experiences during the Great Depression (Friedman and Schwartz 1963, 352) as evidence for this argument. In Canada there were no bank failures at all during the Great Depression; the contraction in the money supply was much smaller than in the United States—only two-fifths of that in the United States, or 13 against 33%—yet the contraction in nominal GNP was nearly the same. The difference in the change in the money supply was largely offset by differences in the decline in the velocity of money: in the United States it fell by 29%, in Canada by 41%.

money to high-powered money and output. This result is taken by some BOJ officials as being consistent with the view that changes in high-powered money are the result rather than the cause of changes in more broadly defined monetary aggregates such as M_2 + CD, and that the BOJ cannot control the money supply by simply controlling high-powered money. In addition, the finding of causality running from money to income is often taken as evidence in support of the monetarist view that the stability of the money supply necessarily contributes to the stability of output.

Aside from a lack of robustness in the test with respect to the sample period or such technical matters mentioned above, the most serious problem of the causality test is that it can falsely indicate causality in certain cases. For example, suppose that stock prices are determined by the present value of future profits. If expectations of future profits embodied in the price of stock contain more information than is contained in the series of past profits, then the stock price would Granger-cause profits even though the truth is in fact the opposite. Yoshikawa (1989) provides a model that produces spurious causality in the money-output relation. Since the demand for loans depends on the future interest rate as well as on the current interest rate, the quantity of money depends on expectations of future output. One must, therefore, be cautious in interpreting the results of causality tests.

Given these considerations, how does one approach the money-output relationship in the business cycle? Our prior view is that the BOJ often smooths the nominal interest rate over the business cycle just as it does over the seasonal cycle, and therefore the money supply is endogenous during those interest-smoothing periods. There is an important difference between the two cycles, however. In the case of the business cycle, the BOJ does not always smooth the nominal rate, and as a result the money supply often reflects exogenous changes in the BOJ's policy stance (nonzero ε). The basic problem is that there is no simple feedback rule that governs the money supply, but rather one that involves *a shift in regime:* the BOJ often accommodates various shocks to smooth the nominal interest rate, but at other times it does not. This makes it extremely difficult to productively use conventional econometric methods including vector autoregressions (VARs), which "flatten" shifts in regime and see only the averages. Still, it is desirable to identify the circumstances under which the BOJ either smooths the nominal interest rate or actively changes the money supply. As a first step, I have simply plotted the data. By plotting monthly data on money, output, and the nominal interest rate, we can at least identify when the BOJ smoothed the nominal rate, making changes in the money supply largely endogenous as in the seasonal cycle, and we can also determine what kinds of shocks drove the money supply in each period.

In figure 5.6, monthly rates of change in money, output, and inflation are plotted against the level of the nominal interest rate (only a few examples are shown here). The measures of money, output, inflation, and the nominal inter-

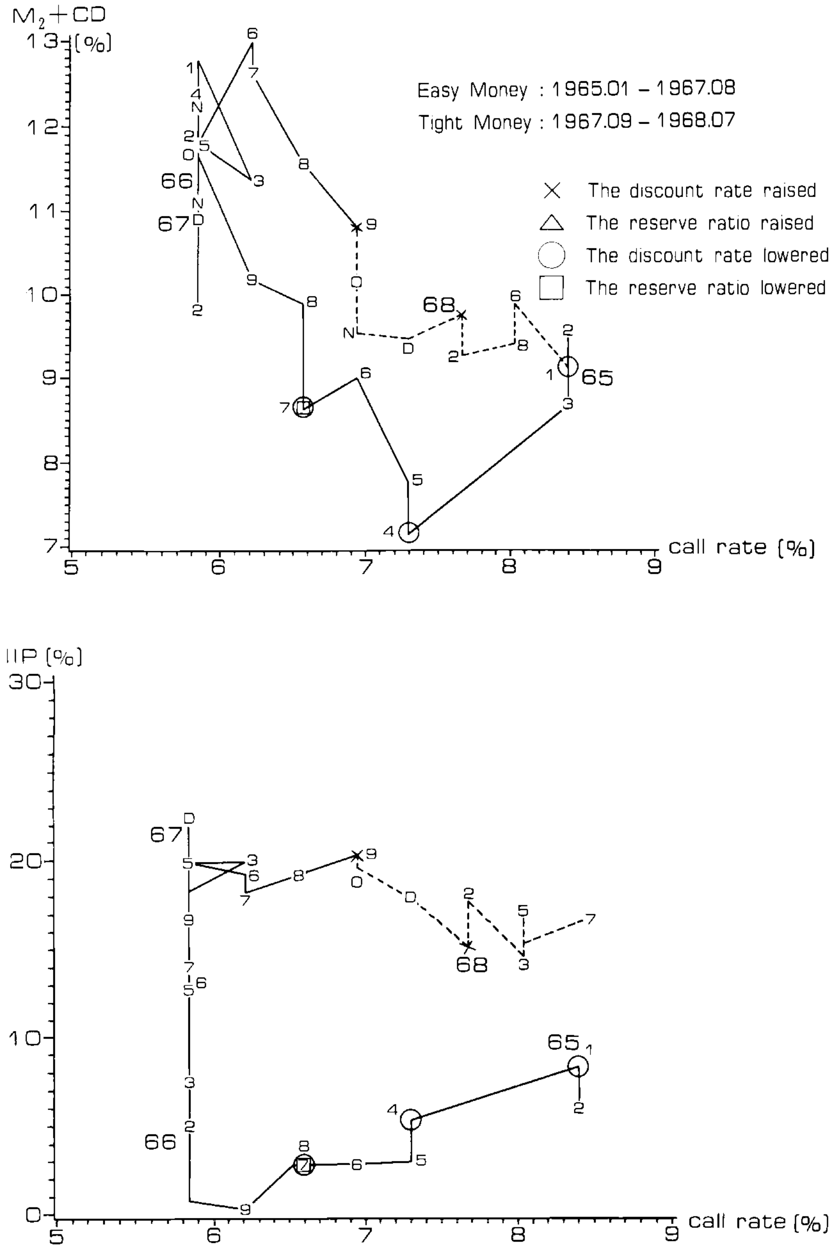
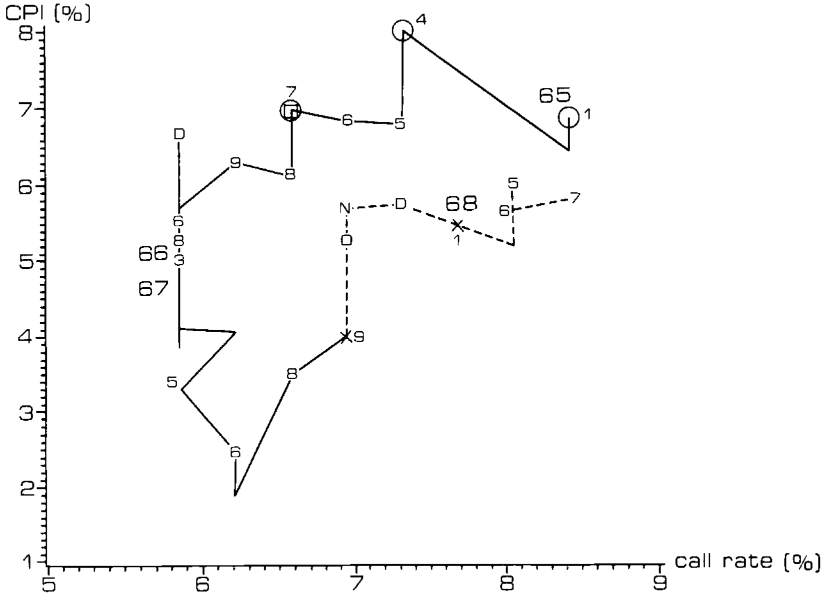


Fig. 5.6 Chronology of monetary policy



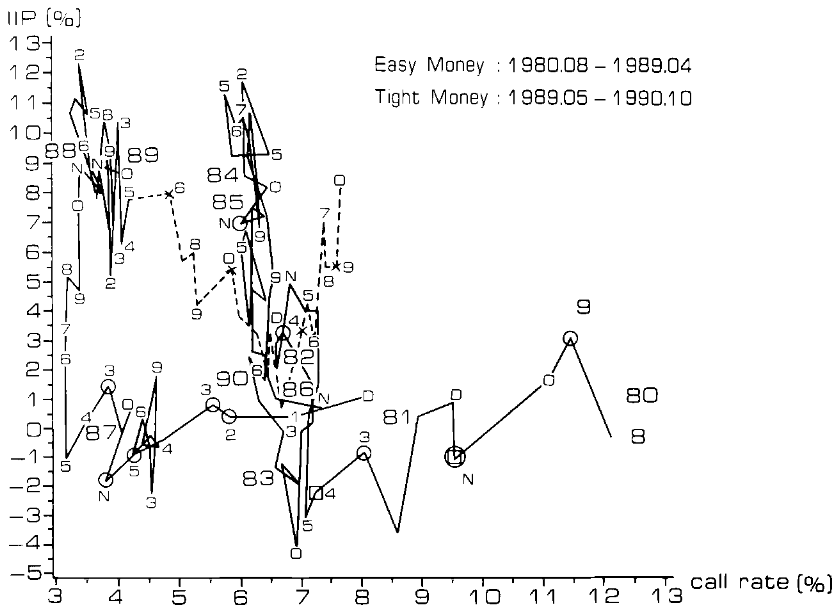


Fig. 5.6 (continued)

est rate are M_2 + CD, IIP compiled by MITI, CPI inflation, and the call rate, respectively. To correct for seasonality, the rate of change of each variable is calculated relative to the same month of the previous year.

Each figure corresponds to a pair of "easy" and "tight" money periods. The beginnings of "easy" and "tight" money periods are identified as the months in which the discount rate was *first* either lowered or raised, respectively. This method of identifying the beginnings and ends of easy and tight money periods is not altogether satisfactory but is used for convenience. With the help of figure 5.6 the chronology of Japanese monetary policy is traced for the thirty-year period from June 1958 to October 1990. This exercise is rather monotonous but essential for the subsequent argument.

June through November 1958 (6 months): At the bottom of the recession, the discount rate was lowered in June 1958. During this period both output and money increased, and the interest rate declined. An easy monetary policy was actively pursued. The stable price level suggests that price shocks were absent and the marginal cost curve was flat ($\gamma = \infty$) in this period.

December 1958 through November 1959 (12 months): Output increased while the interest rate was smoothed. The increase in money during this period mainly reflected output shocks. The stable price suggests the absence of price shocks and flat marginal costs.

December through July 1960 (8 months): The discount rate was raised in December 1959. Output peaked and started to decline, while inflation began to accelerate. The BOJ continued to smooth the interest rate, which implies that the decrease in money during this period mainly reflected the decline in output.

August 1960 though June 1961 (11 months): The discount rate was lowered in August 1960. Output continued to decline, albeit slightly. The interest rate was basically pegged: changes in money during this period therefore mainly reflected output shocks.

July 1961 through September 1962 (15 months): The discount rate was raised in July 1961. Money growth continued to fall during this period. The interest rate was raised, although only slightly—from 8.4 to 8.8%. Output still declined. Inflation accelerated from June to December 1961 and started to decelerate in May 1962. The decrease in money mainly reflected output and price shocks.

October 1962 through April 1963 (7 months): Output hit the trough and started rising. Inflation sharply accelerated but still an easy monetary policy was actively pursued: money increased, and the interest rate was lowered. (Note that the call rate in December 1962 is clearly abnormal, perhaps due to the BOJ's failure to accommodate the seasonal increase in the demand for money.)

May through November 1963 (7 months): Output continued to climb while inflation stayed high. The interest rate was virtually pegged. Changes in money during this period therefore mainly reflected output and price shocks.

December 1963 through June 1964 (7 months): Output stayed high while inflation decreased. A tight monetary policy was actively pursued, which drove the interest rate up.

July through December 1964 (6 months): Output fell while inflation accelerated. The interest rate was pegged. The decrease in money during this period mainly reflected output and price shocks.

January through October 1965 (10 months): The discount rate was lowered in January 1965. Output growth kept decelerated while inflation stayed high. The interest rate was sharply lowered. The increase in money during this period suggests that an easy monetary policy was actively pursued.

November 1965 through May 1967 (19 months): Output kept rising while inflation kept decelerating. The interest rate was pegged. Therefore, changes in money basically reflected output and price shocks.

June 1967 through July 1968 (14 months): Output started to decrease while inflation accelerated. The money supply was actively lowered, raising the interest rate.

August through December 1968 (5 months): Output kept decreasing while inflation also decelerated. The interest rate was actively lowered.

January through June 1969 (6 months): Output began to increase while inflation also accelerated. The interest rate was smoothed.

July through September 1969 (3 months): Both output and inflation stayed high. The growth rate of the money supply was kept stable, allowing the interest rate to rise. In September the discount rate was also raised.

October 1969 through September 1970 (12 months): The interest rate was basically pegged. During the first six months (October 1969 through March 1970), output stayed high and inflation sharply accelerated. Afterward (April 1970 through September 1970), output fell, and inflation also decelerated. Changes in money during this period basically reflected output and price shocks.

October 1970 through July 1972 (22 months): During this period, the interest rate was sharply lowered by allowing the money supply to grow. Until January 1972 output fell, but it hit its trough at December 1971, and a recovery began. Inflation continued to decelerate.

August through December 1972 (5 months): The interest rate was pegged. Output kept growing while inflation was stable at the 5% level.

January 1973 through October 1974 (22 months): The interest rate was sharply raised from below 5% to above 12% by reducing the money supply: inflation accelerated from 6% (January 1973) to the unprecedented level of 26% (February 1974) and finally started to decelerate (October 1974). Output stayed high for most of 1973, then sharply declined from 14% (November 1973) to −11% (October 1974).

November 1974 through March 1975 (5 months): The interest rate was basically pegged. Inflation kept decelerating from 25% to 14%. Output also decelerated from −13% to −18%.

April 1975 through January 1976 (10 months): The interest rate was actively lowered by increasing the money supply. During this period inflation decelerated from 13% to 9%, while output was steadily rising from −14% to 6%.

February 1976 through February 1977 (13 months): The interest rate was basically pegged. Output stayed high at the level of 12% and then started decelerating in November 1976, while inflation also stayed high at 9%. Changes in the money supply reflected output shocks.

March 1977 through March 1978 (13 months): The interest rate was actively lowered from 7% to 4.5%. Output continued to fall, while inflation started decelerating from 9.5% to 5%.

April 1978 through March 1979 (12 months): The interest rate was basically pegged. During this period, output stayed high at 7% while inflation continued to decelerate from 5% to below 3%.

April 1979 through July 1980 (16 months): The interest rate was actively raised from 5% to 12.5% by reducing the money supply. Output was fairly stable around 10% and started to decelerate in April 1980. On the other hand, inflation was stable during the first six months of this period, then accelerated from 4% (October 1979) to 7.5% (February 1980) and stayed at that level afterward.

August 1980 through April 1981 (9 months): The interest rate was actively lowered from 12% to 5% by increasing the money supply. Output continued to decline below zero while inflation decelerated from 8% to 5%.

May 1981 through December 1985 (56 months): The interest rate was kept stable at around 6–7%. Output first recovered from −4% (May 1981) to 5% (November 1981) but then declined from 5% (November 1981) to −5% (October 1982). Afterward (November 1982 through October 1984) it rose from −5% to 12% and declined again from 10% (October 1984) to zero (December 1985). In the same period, inflation continued to decline from 5% (May 1981) to 2% (November 1982) and remained at about that level afterward. The growth of the money supply changed irregularly, reflecting output and price shocks.

January 1986 through April 1987 (16 months): The interest rate was actively lowered. The yen sharply appreciated in real terms after the Plaza Accord in September 1985, and the subsequent decline in exports caused a recession in 1986. Output growth continued to decline below zero. The bottom of this recession occurred in December 1986. Inflation declined, due partly to the sharp appreciation of the yen.

May 1987 through March 1989 (23 months): The interest rate was basically pegged at 3%. Output growth recovered from −1% (May 1987) to 11% (March 1988) and stayed high afterward. Throughout this period inflation was very stable. Changes in the money supply therefore mainly reflected output shocks.

April 1989 through October 1990 (19 months): The interest rate was actively raised. Output growth declined from 7% (May 1989) to zero (March 1990) but recovered to 8% (October 1990) again. Inflation was stable at 3% during this period.

These findings are summarized as follows.

First of all, in 195 out of 389 months in the sample period from June 1958 to October 1990, the interest rate was either pegged or tightly smoothed. During those periods in which the interest rate was substantially smoothed, money, output, and inflation all widely fluctuated. It is very unlikely that real output and inflation respond within a month to exogenous changes in the money supply in such a way as to keep the interest rate unchanged. In contrast, it is known from the study of the seasonal cycle that the BOJ can accommodate output, price, and portfolio shocks to wipe out monthly movements in the interest rate. The conclusion, therefore, is that in about half of the thirty-year period, changes in the money supply were endogenous and simply reflected output, inflation and/or portfolio shocks just as it does over the seasonal cycle. This fact alone implies that monetarism, both new and old, is very misleading in interpreting the observed changes in money supply and therefore in explaining the business cycle.

This fact also means that monetary models that emphasize nominal rigidities due to temporary wage and price stickiness (Taylor 1989; Fischer 1977) are likewise untenable to the extent that they take exogenous money supply shocks to be the major impulses behind economic fluctuations. The literature on monetary models with nominal rigidities, however, which is sometimes referred to as "Keynesian," flourishes. In theory, attempts to explain nominal price rigidities are clearly motivated by the premise that exogenous money supply shocks are the major disturbances to the economy. Empirical works also abound. Blanchard and Quah (1989), for example, assume the existence of a "demand shock" that has no permanent effect on real variables in their VAR analysis. They use this assumption as an identifying restriction and then interpret "demand shocks" as money supply innovations. Taylor (1989) also assumes that money supply shocks are the major disturbances in the economy, and he emphasizes differences in price/wage flexibility (specifically, the synchronized wage setting known as *Shunto*) as the key factor in explaining the difference in output variability between Japan and the United States. He argues that, thanks to the Shunto, nominal wages are much more flexible in Japan than in the United States, and therefore that nominal money supply shocks do not translate into real shocks, thereby making real output in Japan more stable than is the case in the United States.

A brief review of the postwar record of monetary policy in Japan reveals, however, that the interest rate was very often (half the period) either pegged or substantially smoothed, suggesting therefore that money supply innovations during those periods simply reflect output, price, and portfolio shocks. The fact that changes in output fluctuate considerably during periods of interest smoothing suggests the importance of real shocks in explaining the business cycle. Whether these real shocks are the supply (productivity) shocks emphasized by the real business cycle theorists or the real demand shocks emphasized by the Keynesians is, of course, another issue. Yoshikawa and Ohtake (1987) argue that for the postwar business cycle in Japan, real demand shocks were the major disturbance.

The BOJ's ability to peg or smooth the interest rate from month to month over the business cycle as well as the seasonal cycle necessarily implies that changes in the interest rate reflect the BOJ's policy stance. This is the case whether the BOJ actively changes the interest rate in the absence of other shocks or allows the interest rate to change when the shocks do not originate in the actions of the BOJ. Bernanke and Blinder (1992) also attempt to show that changes in the federal funds rate reflect the Federal Reserve's policy stance, by estimating the interest elasticity of the reserve supply function. The point of their estimation is to find a proper instrument to identify the supply function. I make a similar argument by showing that the call rate was very often pegged or tightly smoothed from month to month by the BOJ.

When the interest rate changes consistently and substantially between months, it reflects the BOJ's policy stance. In this sample, in 96 out of 389 months, the interest rate was raised, whereas it was lowered in 98 months. The question is whether there is any systematic feedback rule guiding the BOJ's choice either to smooth or to change the interest rate. Since the data contain many zeros or close to zero values for the rate of change of the interest rate, one would have to resort to an estimation method involving probit to take into account a regime shift in monetary policy. In what follows, however, as a preliminary exercise a VAR is used simply to explore the policy reaction function of the BOJ.

For the United States, Papell (1989) argues that a rule that stabilizes the rate of growth of nominal GNP provides a good description of monetary policy since 1973. Bernanke and Blinder (1992) also estimate a VAR with three variables and show that the federal funds rate responds positively to an inflation shock and negatively to an unemployment shock (during the pre–October 1979 period). This result is broadly consistent with Papell (1989). In the United States, monetary policy appears to have been conducted as a standard stabilization policy.[7]

In Japan the case is not as simple. A previous review of the records, for example, shows that in the period from October 1962 to April 1963, the interest rate was successively lowered while output was rising and inflation was rapidly accelerating to 9%. During this period (particularly March and April 1963), the BOJ explicitly stated that the purpose of the reduction of the discount rate was not stabilization, but rather to strengthen the international com-

7. Examination of Federal Reserve records (Romer and Romer 1989) also confirms that during the postwar era the Federal Reserve appears to have made deliberate decisions to sacrifice real output to lower inflation (in October 1947, September 1955, December 1968, April 1974, August 1978, and October 1979).

petitiveness of Japanese industry by encouraging investment (BOJ 1986). Anticipating the liberalization of capital import regulations in April 1964 when Japan became a member of OECD, policymakers as well as business people in those days regarded international competitiveness as one of the most important policy targets.

In the 1980s the interest rate was substantially lowered between December 1985 and May 1986. Although 1986 was a recession year, it is widely believed that these reductions in the interest rate were aimed mainly at assisting the smooth appreciation of the yen, which the G5 countries agreed upon at the Plaza in September 1985. These examples and my previous discussion both suggest that the BOJ's policy objective is not simply stabilized output, but rather multivalued.

Within the confines of stabilization, the nominal interest rate smoothing often pursued by the BOJ complicates matters. Consider for example the following feedback rule:

$$M_t = -\alpha Y_t - \beta P_t + \varepsilon_t. \tag{23}$$

If the authority attempts to stabilize Y and P, we would expect α and β in (23) to be positive. As mentioned above, this seems to be the kind of rule that the Federal Reserve pursues. When the BOJ smooths the interest rate, however, α and β are negative in (23). Since the BOJ does in fact attempt to stabilize the interest rate at times, even the signs of α and β are time-varying in the BOJ's policy reaction function.

How can we characterize the BOJ's policy reaction governing nominal interest rate smoothing? To answer this question, I confine the discussion to real output Y. Let the "natural," "potential," "non-inflation-accelerating," or "full-employment" output be denoted by Y^*. The BOJ seems to pursue the following rules: raise the interest rate if $Y_t > Y_t^* - \varepsilon$; smooth or peg the interest rate if $Y_t^* - \varepsilon \geqq Y_t \geqq Y_t^* - \delta$; lower the interest rate if $Y_t^* - \delta > Y_t$ $(\delta > \varepsilon > 0)$.

The important point is that Y_t^* cannot be found by mechanical methods such as estimating a time trend. Indeed, it would not be an exaggeration to say that one of the major tasks of the BOJ is to grasp current Y^* as soon and as accurately as possible. No monetary authority would attempt to curb economic growth simply because output exceeded its trend line. Rather, growth would be always welcomed and accommodated, just as are seasonal cycles, provided that it did not fuel inflation or conflict with other important policy objectives such as exchange rate or balance of payment targets. The point is that Y_t^* cannot be measured accurately enough using past data to make it feasible for monetary policy to be described as a stable, time-invariant feedback rule. Given this caveat, I will nevertheless check the response functions of the call rate based on VARs.

For this purpose, I first estimated a four-variable VAR with the call rate, the rate of change in IIP, CPI inflation, and a net export variable. The last variable is defined as nominal net exports divided by CPI $\times$ IIP. The whole sample period is July 1958 through November 1990, but I also estimated VARs for two subsample periods: July 1958 through December 1972 and January 1973 through November 1990. In table 5.5 the impulse response functions of the call rate to shocks to other variables are shown (see column 1).

The results look like plausible response functions. Output shocks drive up the call rate, with the peak effect coming after fifteen months and then decaying very slowly. Inflation shocks also drive up the call rate in a very similar fashion for the January 1973 through November 1990 period, but push it in the opposite direction for the July 1958 through December 1972 period. Judging from this result, we can conclude that the anti-inflation stance of the BOJ was much stronger in the post–oil shock period than in the 1950s and 1960s. Finally, for the entire period the call rate responds negatively to an increase in the trade balance. The response of the call rate to net export shocks is more substantial than its response to output and inflation shocks, and the peak effect comes after twenty months. In Japan the trade balance or current account has always been one of the main targets of monetary policy. Put differently, Japan's "potential" output has been effectively constrained by the supply of raw materials, which constitute the bulk of Japan's imports.

Irrespective of its objectives, when the BOJ changes its policy stance, how does this affect the economy? Table 5.5 shows that innovations in the call rate very strongly drive down output, with the peak effect coming after twelve to fifteen months. Since it has already been observed that innovations in the call rate mainly reflect changes in the BOJ's policy stance, one can conclude that monetary policy does affect real output.[8] Accordingly, it is possible to reject the real business cycle theorist's view, which holds that money is always nothing but a mirror image of real shocks and plays no role in the business cycle (King and Plosser 1984; Plosser 1990). This point can also be confirmed, though more casually, just by looking at figure 5.6. Inflation also negatively responds to call rate shocks, but its response is much weaker than the response of output, and the lags are longer.

By focusing on the periods of interest rate smoothing, I have argued that real shocks are important in the business cycle. When the BOJ changes its policy stance, however, it also affects the real economy.

5.4 The Transmission of Monetary Policy

Monetary policy affects the real economy. What is the transmission mechanism of monetary policy? As a preliminary step to answering this question, table 5.6 summarizes, for the postwar business cycle, the extent to which

8. Romer and Romer (1989) put a dummy variable (which identifies the six months when the Federal Reserve made the decision to seek to induce a recession in order to reduce inflation) into the univariate autoregressive equation for industrial production. They found that this dummy variable has a significantly negative effect on industrial production. The dummy variable constructed from Federal Reserve records, however, does not indicate the length of the shocks caused by the Fed, nor does it differentiate the shocks by size. I believe that changes in the call rate identify the timing and size of changes in the BOJ's policy stance.

Table 5.5 Responses to One Standard Deviation Shock

Entry	Call	IIP	CPI	NEX
		1958:7–1990:11		
		Call		
1	.451915	−.251948E-01	−.261513E-01	.348897
2	.390639	−.174553	.463459E-01	−.306428
3	.403578	−.277046	.127254	.115980E-01
4	.472020	−.494240	.199149	.463057E-01
5	.446735	−.508574	.227798	.705311E-01
6	.432520	−.671324	.222736	−.188166
7	.410158	−.719435	.214346	.539650E-01
8	.386531	−.714655	.190505	.399531E-01
9	.340379	−.769521	.162276	−.485095E-01
10	.302258	−.744029	.134719	.656681E-01
11	.263490	−.711218	.983827E-01	.569025E-01
12	.219125	−.675445	.577705E-01	.564377E-01
13	.179454	−.610880	.207843E-01	.842084E-01
14	.141253	−.541397	−.164786E-01	.102610
15	.104908	−.465697	−.523441E-01	.107114
16	.713187E-01	−.382622	−.843619E-01	.117829
17	.414448E-01	−.298199	−.113807	.131045
18	.146865E-01	−.213365	−.140072	.133669
19	−.892036E-02	−.130393	−.162467	.138640
20	−.289494E-01	−.509359E-01	−.181221	.142830
21	−.458361E-01	.239390E-01	−.196503	.143427
22	−.597504E-01	.925754E-01	−.208267	.143235
23	−.707750E-01	.154704	−.216755	.142219
24	−.791732E-01	.209643	−.222275	.139862
		IIP		
1	.000000	1.93870	−.404968	−.174424
2	−.719107E-03	1.45175	−.361983	.276811E-01
3	−.741255E-02	1.49619	−.325161	.271821E-03
4	.182094E-01	1.95114	−.316685	−.110917
5	−.165459E-01	1.74494	−.273859	−.115514
6	.311224E-02	1.84962	−.275887	−.849986E-01
7	.167063E-01	1.80767	−.252514	−.122911
8	.936477E-02	1.70544	−.225727	−.123965
9	.253457E-01	1.65916	−.203541	−.146173
10	.313907E-01	1.53202	−.174542	−.114822
11	.378390E-01	1.42451	−.152298	−.140559
12	.463838E-01	1.30670	−.129983	−.146584
13	.527668E-01	1.17971	−.107660	−.122549
14	.593096E-01	1.06187	−.891609E-01	−.139172
15	.640610E-01	.939334	−.711475E-01	−.131411
16	.683418E-01	.826103	−.549967E-01	−.122894
17	.716155E-01	.718813	−.416513E-01	−.123838
18	.734911E-01	.617120	−.297332E-01	−.116448
19	.746518E-01	.526084	−.197923E-01	−.110994
20	.748184E-01	.442428	−.118207E-01	−.105699
21	.740112E-01	.367823	−.535052E-02	−.995787E-01
22	.725173E-01	.302483	−.460963E-03	−.937104E-01

(continued)

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
23	.703327E-01	.245195	.305770E-02	−.875551E-01
24	.675603E-01	.196399	.539831E-02	−.818328E-01
		CPI		
1	.000000	.000000	.807994	−.301015E-01
2	.246178E-01	−.220914	.900214	−.471669E-01
3	.446420E-01	−.142202	.901251	−.128321
4	.599440E-01	−.144987	.885858	−.239186
5	.109790	−.255200	.840905	−.128907
6	.134779	−.317590	.861784	−.192851
7	.146244	−.471135	.864394	−.215257
8	.164498	−.606159	.858800	−.187376
9	.176348	−.720153	.845387	−.195476
10	.183705	−.861891	.823085	−.208762
11	.189032	−.973177	.802277	−.193269
12	.191293	−1.07546	.778606	−.180609
13	.189401	−1.16999	.752247	−.179483
14	.185650	−1.24075	.724205	−.166131
15	.180028	−1.29809	.693791	−.153202
16	.172312	−1.33788	.661660	−.144332
17	.163337	−1.36066	.628850	−.132507
18	.153265	−1.36894	.595539	−.120042
19	.142446	−1.36246	.561908	−.109881
20	.131103	−1.34368	.528513	−.995305E-01
21	.119580	−1.31367	.495576	−.893083E-01
22	.108109	−1.27409	.463344	−.805144E-01
23	'.968169E-01	−1.22684	.432149	−.722240E-01
24	.859424E-01	−1.17324	.402165	−.646859E-01
		Net Exports		
1	.000000	.000000	.000000	2.02431
2	−.587840E-01	.124346E-01	.878078E-02	.233568
3	−.861485E-01	−.168360	−.160674E-01	.649400
4	−.474438E-01	−.213482	−.489064E-01	1.00044
5	−.818597E-01	−.227968	−.120922	.546051
6	−.108454	−.358756	−.146262	.677360
7	−.123530	−.369464	−.152667	.759102
8	−.142656	−.413756	−.187364	.677630
9	−.168890	−.464972	−.212614	.645373
10	−.186441	−.449452	−.238842	.687676
11	−.201860	−.456929	−.267572	.664819
12	−.220897	−.444802	−.290309	.643405
13	−.234655	−.417372	−.310508	.646648
14	−.246967	−.389299	−.329377	.637699
15	−.257960	−.349251	−346223	.620754
16	−.266657	−.307440	−.360011	.610413
17	−.273219	−.261140	−.371428	−.601013
18	−.277966	−.212757	−.380533	.584513
19	−.281153	−.165172	−.386955	.571008

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
20	−.282385	−.117048	−.391156	.557342
21	−.282140	−.710436E-01	−.393295	.541400
22	−.280552	−.275637E-01	−.393374	.525994
23	−.277602	−.132165E-01	−.391630	.510394
24	−.273552	.502881E-01	−.388265	.494504
		1958:7–1972:12		
		Call		
1	.463816	.154725	−.129125	.268250
2	.235975	.887188E-01	−.617366E-01	−.169161
3	.265744	−.356279E-01	.353317E-01	.512376E-02
4	.341445	−.190919	.708389E-01	.625894E-01
5	.255041	.947892E-01	.430471E-01	−.209170E-01
6	.223765	−.778355E-01	.306688E-02	−.834157E-01
7	.217228	−.152236	.450199E-01	−.294483E-01
8	.193465	−.143778	.307972E-01	−.254329E-01
9	.144985	−.290790	.356738E-01	−.756735E-01
10	.138428	−.349881	.630513E-01	−.534878E-01
11	.123604	−.399172	.622603E-01	−.455309E-01
12	.948564E-01	−.456257	.627437E-01	−.491060E-01
13	.869052E-01	−.504200	.687061E-01	−.473857E-01
14	.747465E-01	−.522382	.682926E-01	−.378897E-01
15	.606252E-01	−.531811	.634109E-01	−.300621E-01
16	.526266E-01	−.552265	.628454E-01	−.259016E-01
17	.448870E-01	−.545410	.609817E-01	−.195882E-01
18	.362380E-01	−.532505	.561452E-01	−.137695E-01
19	.297233E-01	−.523928	.537104E-01	−.740348E-02
20	.241575E-01	−.502043	.505111E-01	−.348843E-02
21	.176786E-01	−.476048	.462929E-01	−.377441E-03
22	.123580E-01	−.450362	.429800E-01	.394644E-02
23	.786032E-02	−.420751	.396008E-01	.670167E-02
24	.294365E-02	−.389142	.359865E-01	.819396E-02
		IIP		
1	.000000	2.02244	−.514355	−.134834
2	.393852E-01	1.60244	−.394727	−.857447E-01
3	.504268E-01	1.34394	−.329176	−.439390E-03
4	.962156E-01	1.76283	−.306749	−.137799
5	.726187E-01	1.50776	−.207829	−.119309
6	.119329	1.60323	−.179729	−.849393E-01
7	.130386	1.57640	−.169717	−.130615
8	.119192	1.47825	−.145454	−.143366
9	.141387	1.45684	−.137533	−.138143
10	.148468	1.32492	−.114989	−.131499
11	.148927	1.21368	−.101715	−.141715
12	.160013	1.08473	−.823503E-01	−.143263
13	.165089	.942478	−.625884E-01	−.131534
14	.168117	.816103	−.511506E-01	−.130465
15	.170653	.671366	−.361767E-01	−.127861
16	.171983	.543799	−.238889E-01	−.119909

(continued)

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
17	.171271	.420757	−.151552E-01	−.113035
18	.168861	.295410	−.517689E-02	−.106245
19	.165839	.185203	.301902E-02	−.994921E-01
20	.160963	.816758E-01	.100145E-01	−.917810E-01
21	.155003	−.144939E-01	.165168E-01	−.837865E-01
22	.148399	−.995036E-01	.219774E-01	−.767762E-01
23	.140504	−.174712	.265715E-01	−.696628E-01
24	.132090	−.240101	.303423E-01	−.623115E-01
		CPI		
1	.000000	.000000	.727932	.692156E-01
2	−.611066E-01	−.210813	.726385	−.523411E-01
3	−.644215E-01	.144553	.632892	−.583901E-01
4	−.385368E-01	.174354	.569543	−.495216E-01
5	−.703329E-01	.169784	.448898	−.978552E-01
6	−.828531E-01	.138884	.406792	−.899858E-01
7	−.501309E-01	−.104655	.401509	−.504198E-01
8	−.446885E-01	−.203637	.368807	−.530313E-01
9	−.349783E-01	−.353044	.351953	−.555566E-01
10	−.167156E-01	−.529760	.339718	−.263476E-01
11	−.597528E-02	−.605113	.311745	−.126225E-01
12	−.398661E-02	−.715755	.284744	−.760553E-02
13	.154712E-02	−.801617	.262863	.866628E-02
14	.481747E-02	−.855074	.238337	.219776E-01
15	.980013E-03	−.913187	.216745	.305345E-01
16	−.157717E-02	−.949302	.198593	.388319E-01
17	−.570577E-02	−.969120	.181533	.468921E-01
18	−.133162E-01	−.975717	.164844	.532465E-01
19	−.205402E-01	−.969565	.149742	.576458E-01
20	−.284744E-01	−.950769	.135803	.614965E-01
21	−.372512E-01	−.918928	.121944	.644094E-01
22	−.455415E-01	−.880119	.109314	.664468E-01
23	−.533962E-01	−.832504	.976385E-01	.676738E-01
24	−.608669E-01	−.777076	.863228E-01	.680235E-01
		Net Exports		
1	.000000	.000000	.000000	1.11223
2	−.497889E-01	−.965139E-01	.396278E-01	.213031
3	−.743544E-01	−.229250	−.204372E-01	.342844
4	−.406194E-01	−.183668	−.194451E-01	.470098
5	−.928896E-01	−.462482	−.320531E-01	.441305
6	−.133481	−.616518	−.527506E-02	.275186
7	−.181845	−.494707	−.531743E-02	.242348
8	−.187594	−.584694	−.962022E-02	.325647
9	−.229062	−.600060	−.237193E-01	.242996
10	−.251499	−.525763	−.265802E-01	.187954
11	−.265562	−.480013	−.318457E-01	.201723
12	−.271219	−.389776	−.402269E-01	.205579
13	−.277078	−.321000	−.484172E-01	.169139

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
14	−.279292	−.204199	−.534016E-01	.152805
15	−.270581	−.848766E-01	−.616230E-01	.157815
16	−.263603	.165947E-01	−.687443E-01	.146958
17	−.254542	.135710	−.754149E-01	.128885
18	−.241697	.247423	−.806925E-01	.120610
19	−.227779	.350651	−.854246E-01	.115726
20	−.213229	.444307	−.896696E-01	.103038
21	−.198507	.528040	−.919035E-01	.906959E-01
22	−.182631	.603152	−.935124E-01	.824911E-01
23	−.166812	.663012	−.943535E-01	.732438E-01
24	−.151451	.711039	−.940334E-01	.623556E-01
		1973:1–1990:11		
		Call		
1	.345314	−.521271E-01	.358766E-02	.643173
2	.430163	−.244549	.764083E-01	−.483027
3	.438019	−.327619	.115689	.655225E-01
4	.441549	−.331405	.144017	−.762214E-01
5	.422529	−.606613	.170416	.262974
6	.417857	−.708228	.191912	−.300318
7	.405033	−.751015	.181749	−.101941
8	.392066	−.833962	.140724	.109706
9	.347660	−.781982	.972191E-01	−.810666E-01
10	.307137	−.808896	.656081E-01	.176427
11	.267147	−.775428	.284819E-01	.155407
12	.222534	−.704136	−.247099E-01	.139488
13	.180585	−.659767	−.770748E-01	.211247
14	.138194	−.557412	−.134020	.245367
15	.955394E-01	−.457188	−.189025	.270406
16	.522549E-01	−.359419	−.237836	.297365
17	.127891E-01	−.245657	−.284997	.327480
18	−.247366E-01	−.135112	−.329287	.335237
19	−.596628E-01	−.254738E-01	−.370063	.349588
20	−.906605E-01	.847574E-01	−.406071	.362119
21	−.118816	.188853	−.436915	.371074
22	−.143685	.286277	−.462200	.373520
23	−.165011	.376025	−.481849	.376195
24	−.182709	.456068	−.496425	.376888
		IIP		
1	.000000	1.57782	−.257672	−.124713
2	−.668887E-02	.834421	−.204889	.709747E-01
3	−.992714E-02	1.01760	−.104790	.867949E-01
4	.648149E-02	1.27487	−.175380E-01	−.450686E-01
5	−.351863E-01	.947907	.393420E-01	−.133210
6	−.218546E-01	.940310	.727841E-01	−.212827E-01
7	−.505374E-02	.832118	.131935	−.201965E-02
8	−.349703E-03	.651661	.175440	−.156930E-01

(continued)

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
9	.114719E-01	.554080	.223555	−.626642E-01
10	.217078E-01	.365298	.270992	.114335
11	.313481E-01	.217277	.303804	.201918E-01
12	.391063E-01	.798225E-01	.332629	.987168E-02
13	.511784E-01	−.848074E-01	.354301	.990174E-01
14	.591249E-01	−.190821	.364297	.366230E-01
15	.637336E-01	−.307999	.370328	.644456E-01
16	.676416E-01	−.410498	.371557	.831050E-01
17	.689509E-01	−.478718	.364303	.683073E-01
18	.680475E-01	−.546494	.352609	.731334E-01
19	.656954E-01	−.589107	.335643	.730029E-01
20	.619555E-01	−.612374	.313867	.715058E-01
21	.560879E-01	−.624883	.289447	.681586E-01
22	.491835E-01	−.619441	.262670	.654898E-01
23	.414553E-01	−.601935	.234396	.624247E-01
24	.328702E-01	−.573943	.205206	.565270E-01
		CPI		
1	.000000	.000000	.807020	−.410476E-01
2	.673291E-01	−.821613E-01	.915074	−.631172E-01
3	.111601	−.260953	.944603	−.796559E-01
4	.105739	−.235262	.908378	−.363744
5	.192335	−.353933	.874586	−.138283
6	.232553	−.395178	.906294	−.192817
7	.246533	−.574410	.950325	−.282032
8	.252260	−.703436	.988558	−.304969
9	.258885	−.863333	1.00479	−.142415
10	.262989	−.999266	1.00073	−.358269
11	.268271	−1.10463	.988139	−.296260
12	.275344	−1.20465	.969256	−.224240
13	.270114	−1.25324	.941028	−.289692
14	.262668	−1.31378	.913144	−.234901
15	.254426	−1.34649	.880573	−.225515
16	.244270	−1.34943	.838561	−.243400
17	.232683	−1.34761	.794052	−.238564
18	.220316	−1.31887	.746325	−.225739
19	.206566	−1.27434	.697249	−.226662
20	.191098	−1.22232	.649195	−.225056
21	.176012	−1.15732	.601707	−.220878
22	.161031	−1.08407	.555039	−.223167
23	.146327	−1.00607	.509976	−.224709
24	.132492	−.923065	.467457	−.225515
		Net Exports		
1	.000000	.000000	.000000	2.32720
2	−.865343E-01	.711964E-01	−.139190E-01	.311834
3	−.135694	−.752655E-01	−.308229E-01	.701730
4	−.883904E-01	−.207102	−.580918E-01	1.23770
5	−.115579	−.504608E-01	−.139423	.414948

Table 5.5 (continued)

Entry	Call	IIP	CPI	NEX
6	−.145850	−.145090	−.181230	.756236
7	−.168843	−.144832	−.191985	.939649
8	−.199989	−.739442E-01	−.230280	.767357
9	−.230690	−.112180	−.256277	.682070
10	−.247004	−.698565E-01	−.292984	.774259
11	−.259240	.586466E-02	−.341853	.707556
12	−.280053	.566298E-01	−.381175	.659603
13	−.293665	.123205	−.411597	.696789
14	−.305525	.201987	−.439251	.656171
15	−.317145	.267430	−.464475	.611368
16	−.323959	.337496	−.485212	.583736
17	−.327311	.410010	−.503360	.565395
18	−.329195	.476209	−.516911	.522976
19	−.329002	.537379	−.524176	.493730
20	−.325686	.591070	−.526417	.472400
21	−.320595	.638540	−.524594	.433319
22	−.313327	.676171	−.518447	.403288
23	−.303681	.705494	−.508323	.376830
24	−.292434	.727257	−.494887	.346518

different demand components have accounted for different shares of the change in GNP.

Since the Japanese economy has been growing rapidly, almost all variables increase in absolute terms even in recessions. I therefore first calculated the change in each variable measured from trough to peak in case of a recovery, and from peak to trough in case of a growth recession. I then subtracted the latter from the former to obtain the difference. Table 5.6 reports the relative contribution of each demand component, for each postwar cycle, to this cyclical difference in the change in real GNP. Friedman (1990) presents a similar but slightly different table for postwar U.S. recessions. For the sake of comparison, I present results for the United States based on the method described above (table 5.7).

In Japan throughout the whole period, the relative contribution of fixed investment has been the greatest of all the demand components: 60% of GNP on average. In contrast, in the United States fixed investment accounts for only 25% on average of the change in real GNP. The relative contribution of inventory and housing investments is greater in the United States than in Japan. Changes in housing investment in Japan are not really systematic over the business cycle. On the other hand, until the mid-1960s, inventory investment had a large impact on Japanese business cycle: a 60–70% contribution. A substantial portion of the inventory investment was, however, raw materials—which were also imports. Therefore, the contribution of inventory investment and imports almost canceled each other. As a result, fixed investment retained

Table 5.6 **The Relative Contribution of Demand Components to the Business Cycle, Japan**

Peak	Trough	Peak	GNP	II	D	IH	IF	C
			%					
5702	5802	6104	100	60.955	39.045	2.8816	56.7851	47.9378
6104	6204	6404	100	71.822	78.178	14.9896	46.1396	45.3235
6404	6504	7003	100	5.270	94.730	1.6540	62.5451	35.8547
7003	7104	7304	100	−10.643	110.643	27.2298	7.9559	90.6800
7304	7501	7701	100	6.754	93.246	41.2309	29.2053	37.8202
7701	7704	8001	100	30.916	69.084	−9.1070	81.1159	74.5326
8001	8301	8502	100	22.322	77.678	1.3227	73.6131	8.9868
8502	8604	9003	100	12.840	87.160	11.8504	67.5603	35.8865
			Average %					
			100	15.7818	84.218	16.6272	58.237	45.0169

Peak	Trough	Peak	CD	CND	NEX	EX	IM	G
5702	5802	6104	.	.	−62.257	7.492	−69.75	−6.302
6104	6204	6404	.	.	−45.338	6.863	−52.20	−32.937
6404	6504	7003	.	.	−11.176	10.953	−22.13	5.851
7003	7104	7304	8.8544	81.8256	−82.482	−5.144	−77.34	−2.741
7304	7501	7701	15.4472	22.3729	−21.105	2.321	−23.43	6.095
7701	7704	8001	44.6072	29.9255	2.901	60.069	−57.17	−80.357
8001	8301	8502	14.0854	−5.0986	10.281	63.956	−53.67	−16.525
8502	8604	9003	10.6049	26.5199	−5.124	87.435	−92.56	−23.013
			Average %					
			18.0807	35.8718	−24.065	27.780	−51.845	−11.598

Table 5.7 **The Relative Contribution of Demand Components to the Business Cycle, United States**

Peak	Trough	Peak	GNP	II	D	IH	IF	C
			%					
5703	5801	6001	100	34.0739	65.9261	8.5508	17.0499	27.1248
6001	6004	6903	100	52.5561	47.4439	15.7570	15.9706	33.2836
6903	7002	7304	100	28.2595	71.7405	24.4541	21.9450	13.9530
7304	7501	8001	100	31.5844	68.4156	21.5106	25.4131	35.2068
8001	8002	8103	100	8.6601	91.3399	31.0866	31.4134	53.9011
8103	8203	9003	100	19.7589	80.2411	13.2042	27.2770	25.5607
			Average %					
			100	24.2747	75.7253	20.7552	25.1305	35.4643

Peak	Trough	Peak	CD	CND	NEX	EX	IM	G
5703	5801	6001	7.7241	19.4007	15.397	15.9907	−0.465	−2.2991
6001	6004	6903	7.8344	25.4492	−18.225	0.5729	−18.679	0.6577
6903	7002	7304	11.9637	1.9893	−7.534	4.5817	−12.116	18.9436
7304	7501	8001	13.8456	21.3612	−12.426	10.7646	−23.191	−1.2044
8001	8002	8103	34.1299	19.7712	−18.791	5.5147	−24.306	−6.4134
8103	8203	9003	10.8982	14.6625	9.814	27.3771	−17.463	4.2434
			Average %					
			17.8298	17.6345	−6.059	11.4677	−17.496	0.36471

its importance. As a long-term trend, the role of inventory investment in the business cycle seems to have diminished in both Japan and the United States.

Net exports have been countercyclical in Japan's business cycle except for the years 1977–85, in which economic growth was export-led. In particular, imports have been very countercyclical: the fraction of output was −52% on average, compared to −17% in the United States. Until very recently, the bulk of Japanese imports consisted of raw materials and therefore moved very mechanically in parallel with the level of aggregate economic activity.

The contribution of consumption to GNP seems to be in large part similar in the two countries, although the contribution of nondurables is substantially higher in Japan. As for government expenditures, we find them countercyclical for Japan (−12% of GNP on average) but neutral (0.4%) for the United States.

In sum, the major differences between Japan and the United States lie in the facts that fixed investment plays a much larger role in the business cycle in Japan than in the United States, and that net exports and government expenditures are much more countercyclical in Japan. These findings help us identify the important components in the Japanese business cycle. Yet it remains to be seen how they are related to monetary policy. To see these relations, I ran a set of bivariate VARs using the call rate and each component of expenditures. (All the variables except for inventory investment are log differenced. Inventory investment is differenced.) One can see from figures 5.7–5.12 that investment and imports are the components that respond substantially to innovations in the call rate. There are lags of two to three quarters before changes in the call rate have an impact on these variables.

Summing up the findings in this section, I conclude that monetary policy, represented by changes in the call rate, exerts substantial effects on real output in Japan mainly through its effect on fixed investment and imports. Since imports were almost identical to inventory investment in the 1950s and 1960s,

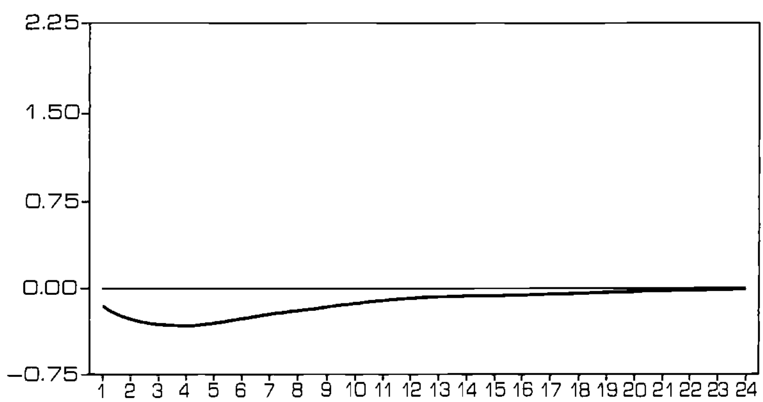


Fig. 5.7 Responses of consumption

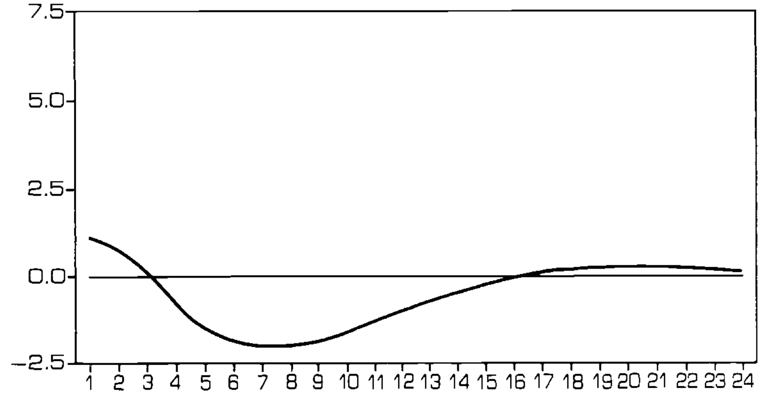


Fig. 5.8 Responses of fixed investment

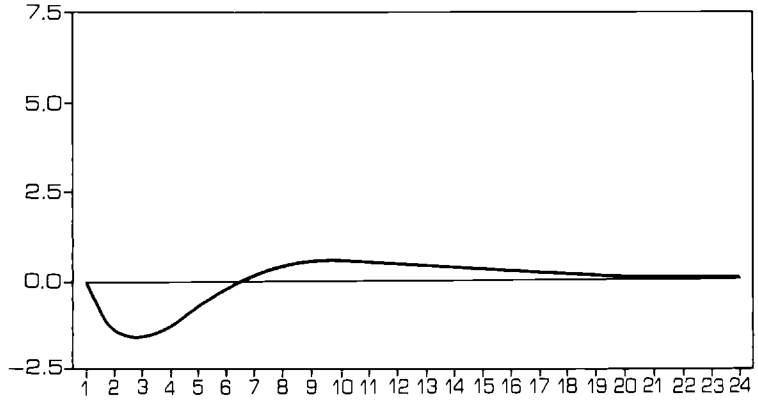


Fig. 5.9 Responses of housing investment

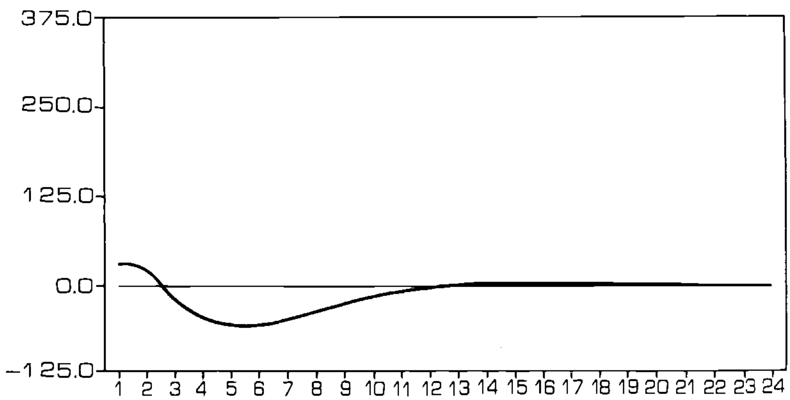


Fig. 5.10 Responses of inventory investment

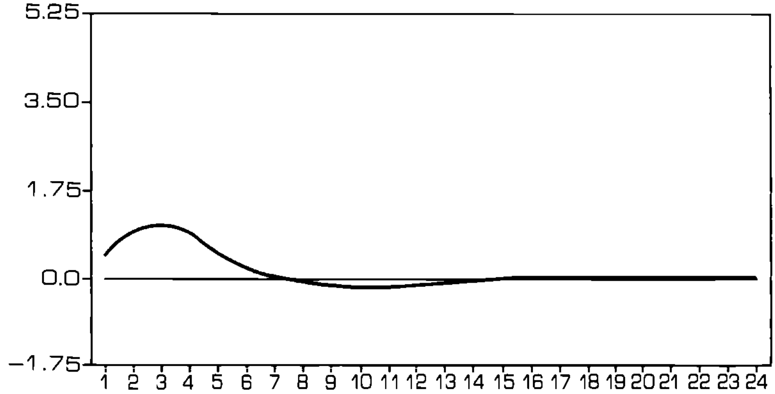


Fig. 5.11 Responses of exports

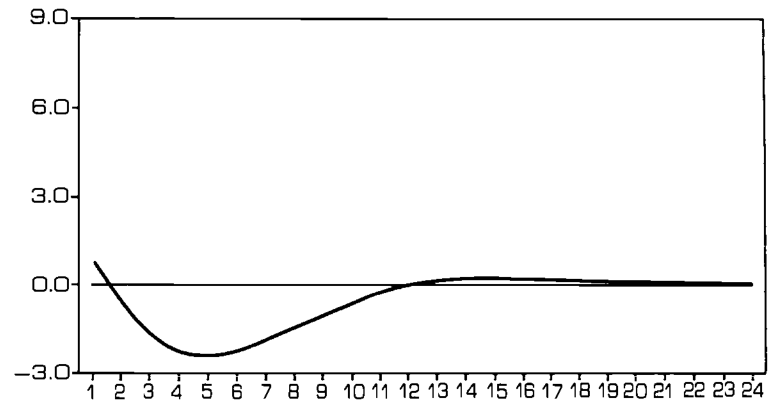


Fig. 5.12 Responses of imports

one can also say that inventory investment was a major channel of monetary policy in those days.

5.5 Conclusion

Economists often assume an exogenous money supply in both theoretical and empirical works. In this chapter, I show that this assumption is highly misleading. Over the seasonal cycle, changes in the money supply are actually nothing but mirror images of the changes in real output and/or portfolio preferences. This is because the BOJ either pegs or smooths the nominal interest rate. The same observation also applies to the business cycle as well—even in the 1980s—and leads us to reject an array of monetary models of the business cycle such as monetarism both new and old, and monetary models with nominal rigidities. To the extent that the money supply responds endogenously to real output through interest rate smoothing, it is not at all surprising that nominal money and real output are highly correlated. From this viewpoint, we find that the distinction between anticipated and unanticipated changes in the money supply (Barro 1977) is not very important.

There is an important difference between the seasonal cycle and business cycles, however. The BOJ does not always accommodate output, price, and portfolio shocks, instead allowing the interest rate to change, and at times it even actively changes the interest rate during the business cycle ("dynamic operations"). The BOJ's policy response function therefore involves a kind of regime shift between interest smoothing and dynamic operations. My simple VAR analysis suggests, however, that the trade balance has always been the main target of monetary policy. In the 1950s and 1960s, the anti-inflation stance of the BOJ seems to have been much weaker than during the post–oil shock period.

When the BOJ changes its policy stance, moreover, it affects real output. Accordingly, I reject the real business cycle theorist's view, which holds that money shocks are always nothing but the mirror image of real shocks and that money therefore plays no role in the business cycle. The analysis in section 5.4 suggests that monetary policy has substantial impacts on real output, mainly through fixed investment and imports in Japan. One remaining task is to pin down the impact of changes in the interest rate on fixed investment. It is well known that the interest elasticity of investment is typically estimated to be small or even insignificant. One possible explanation to this puzzle is that monetary policy directly affects output through working capital, but at the same time investment varies through changes in anticipations of future sales rather than financial costs. This problem awaits further investigation.

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