The Effects of Intervention in an Efficiency Wage Model with Price and Exchange Rate Expectations

Hiroya Akiba

No.9605

School of Political Science & Economics
Waseda University
Tokyo, Japan

First draft: November, 1995
This draft: July, 1996

Journal of Economic Literature

Classification Number

F31 Exchange Rates: Foreign Exchange Intervention

F41 Open Economy Macroeconomics

Keywords: Intervention, Efficiency wage, Real exchange rate

Paper prepared for presentation at
The Seventh Annual Convention of The Congress of Political Economists (COPE)
University of Pretoria and Kruger Park, South Africa
August 12 - 16, 1996

The Effects of Intervention in an Efficiency Wage Model with Price and Exchange Rate Expectations

by

Hiroya Akiba
School of Political Science & Economics
Waseda University
Tokyo, Japan

First draft: November, 1995
This draft: July, 1996

ABSTRACT

This paper examines the effects of non-sterilized intervention within an efficiency wage model. It is proven here that non-sterilized intervention will not affect the realized real output in a medium-run model where expectations of the exchange rate and the price level are formed endogenously within the model. An analysis of the sensitivity of the effects of non-sterilized intervention on the nominal exchange rate and the price level is also discussed. As illustrated, the relative effectiveness of anticipated fiscal policy is somewhat reduced, while that of monetary policy is ineffective under non-sterilized intervention operation.

Address correspondence to:
Hiroya Akiba, School of Political Science & Economics
Waseda University, 1-6-1 Nishi-Waseda, Shinjuku-ward
Tokyo 169-50, Japan
Phone: 81-3-3203-4141, ext.3458
81-5286-1767
FAX: 81-3-3204-8957
81-3-3203-4151-4143
E-mail: "akiba@mn.waseda.ac.jp"

The Effects of Intervention in an Efficiency Wage Model with Price and Exchange Rate Expectations*

I . Introduction

The purposes of this article are to investigate the effects of macroeconomic policies in a small open economy and to examine the robustness of the real exchange rate sensitivity of aggregate supply in a small country model. The consideration of the latter issue is actually a continuation of the past work of the present author (Akiba (1995)), who specified the aggregate supply function to be negatively dependent on the real exchange rate. The aggregate supply function employed by Akiba (1995) was a mere application of prior studies, i.e. Devereux and Purvis (1990) and Lai (1993). However, invoking the efficiency wage hypothesis (e.g., Mankiw (1990)), Akiba (1995) derived the following remarkable results; (1) monetary policy under flexible exchange rates is totally ineffective in changing output, which was the same conclusion reached by Lai (1993). Furthermore, (2) fiscal policy under flexible exchange rates has a more than one-hundred percent crowding-out effect, the possibility of which was pointed out by Devereux and Purvis (1990). According to Akiba (1995), such a perverse effect of fiscal policy is possible because, although the nominal exchange rate appreciates, the real exchange rate actually depreciates in the model. This real depreciation is what causes expansionary fiscal policy to have such perverse effects through the aggregate supply function.[1] This analysis could be compared to the traditional results of the Mundell (1963) proposition (e.g., Marston (1985)). The first result of the ineffectiveness of monetary policy shown by Lai (1993) and Akiba (1995) invalidates the Mundell proposition, while the second result of a perverse effect of fiscal policy by Akiba (1995) is more pessimistic than the one predicted by the original proposition.

Macroeconomic policies considered here are simple, but traditional, fiscal and monetary policies. While the fiscal policy follows a standard specification, the monetary policy makes the assumption that the monetary authorities adjust the money supply in response to movements of the exchange rate, as those movements contain information about this period's shock. This assumption actually implies that the authorities have a monetary feedback rule. To be more specific, the feedback rule implies that the authorities adopt non-sterilized intervention (Turnovsky (1983,84), Lane (1989, 1990), Lane and Gros (1994)).

It has been almost unanimously agreed upon that non-sterilized intervention can affect the exchange rate and other nominal variables. However, it seems to the present author that the following two problems have been left unanswered, and therefore need close examination. First of all, the extent of the effect of non-sterilized intervention on the exchange rate, on other nominal variables (e.g., the price level), and sometimes even on its direction of change, has never been clearly discussed within a consistent open economy model in the literature. Secondly, while it is clear that the main purpose of intervention is to adjust and to control the exchange rate and other nominal variables in the short-run, it is unclear whether its long-run target is the stabilization of real output within a consistent open economy model. If so, non-sterilized intervention should be regarded as one of the policy instruments of stabilization in the long-run. However, as far as the author knows, the long-run effects of non-sterilized intervention on real output have seldom been examined within a consistent model in the literature. By focusing on these problems, this article hopes to offer some insight into the long-run effects of intervention by extending and generalizing the interesting analysis examined by Devereux and Purvis (1990), Lai (1993), and Akiba (1995).

It is rigorously proved that the previous results, i.e., "while an anticipated expansionary monetary policy is totally ineffective, that of fiscal policy is pervasive for its effect on domestic output," obtained by Akiba ((1995), pp.14-5), are carried over in this model. An expansionary fiscal policy's contractionary effect on output is also caused by the real exchange rate depreciation, although the nominal exchange rate may appreciate as well. Furthermore, it is also proved that non-sterilized intervention has nothing to do with real output in this medium-run model. Therefore, anticipated non-sterilized intervention policy does not serve as effective stabilization policy in the medium-run. Only an unanticipated shock of either the aggregate demand or supply, or government expenditure is shown to exert unambiguous effects on output.

The structure of the paper is as follows: In the next section, the model is presented. One of the key ingredients of the model, the aggregate supply function, is discussed in some detail in section Ⅲ. Solutions of the model under an additional assumption of rationality are obtained in section Ⅳ. Section Ⅴ examines the effects of macroeconomic policies in the medium-run, followed by an analysis of the effects of non-sterilized intervention in section Ⅵ. Concluding comments are presented in section Ⅶ.

Ⅱ. The Model

Our stochastic version of a small open economy with assumptions of perfect capital mobility and zero sterilization under flexible exchange rates is contained in equations (1)-(5). The model was adopted, with necessary modification, from a linearized model utilized in the literature (e.g., Akiba (1993a,b, 94)).

(1) $y^d_t = a_0 + a_1(x_t - p_t) - a_2[i_t - (p_{t+1}^e - p_t)] + a_3 g_t + u_t$ $\qquad a_i > 0$

(2) $m_t - p_t = b_0 + b_1 y_t - b_2 i_t + v_t$ $\qquad b_i > 0$

(3) $i_t = i_t^* + (x_{t+1}^e - x_t)$

(4) $y^s_t = c_0 + c_1(p_t - x_t) + w_t$ $\qquad c_i > 0$

(5) $z^e_{t+j} = \underset{t-1}{E}[z_{t+j} \mid \Omega_{t-1}]$ $\qquad j \geqq 0, \quad z = p, x$

where variables are defined in log; y^s=the aggregate supply, y^d=the aggregate demand, p=the domestic price level, i=the nominal rate of interest, x=the spot exchange rate (expressed as units of home currency per unit of foreign currency), g=real net government expenditure on goods and services, and m=the nominal stock of money. An asterisk denotes the foreign counterpart (of i). Ω_{t-1} denotes a set of observations on variables dated t-1 and earlier. u_t, v_t, and w_t are all assumed to be i.i.d. error terms obeying:

$$\underset{t-1}{E}\,[k_{t+j} \mid \Omega_{t-1}] = 0, \qquad k=u,v, \text{ and } w$$

and having finite variances.

Equation (1) is the aggregate demand for domestic products. It is inversely related to the relative price of domestic to foreign output, $p_t - x_t - p^*_t$, which is the inverse of the real exchange rate, $x_t + p^*_t - p_t$. Here, the foreign price level is assumed to be constant, and, without loss of generality, it is set to one so that its value in log is zero. The function is also negatively related to the real interest rate, but positively related to net government expenditures. The error term u_t, which is assumed to incorporate both domestic and foreign (through international trade) shocks, makes the aggregate demand schedule shift randomly.

Equation (2) is a simple, but standard, portfolio schedule. The real stock of money is equal to the real demand for money, and the latter is assumed to depend positively on the real output, but negatively on the nominal rate of interest.

Equation (3) is nothing but the definition of the uncovered interest rate parity condition. Perfect substitutability between domestic and foreign one-period bonds is assumed, so that they differ with respect to currency denomination only. An additional assumption of the strong version of perfect capital mobility implies that the equilibrium nominal rate of interest can differ from the exogenous i^*_t only by the expected rate of depreciation (or appreciation). The domestic bond market is omitted because of Walras's law. It should be mentioned that, for the sake of simplicity and ease of calculation, all wealth effects are assumed to be hidden in the domestic bond market.

Equation (4) specifies the aggregate supply function. It is postulated to depend positively on the relative price of domestic to foreign output, p_t-x_t-p^*_t, which is the inverse of the (linearized) real exchange rate. Equation (4) is essentially the same aggregate supply function as the one specified by Devereux-Purvis (1990) and Lai (1993), except for the disturbance term. The implication of this specification needs some elaboration, and will therefore be further examined in the next section.

Equations (1)-(4) determine the equilibrium values of p_t, x_t, i_t, and y_t as a function of the time paths of exogenous and predetermined variables, the random errors u_t, v_t, and w_t, and the expectations. To close the model, we impose rationality so that the expectations appearing in the system of equations (1)-(5) are linear least squares forecasts conditional on Ω_{t-1}.[2]

Ⅲ The Aggregate Supply Function

The dependence of the aggregate supply function on the real exchange rate (equation (4)) is one of the key ingredients in this article, and therefore needs further clarification as to its economic implications. It seems to the author that at least two alternative theories exist concerning the specification of equation (4).

Devereux and Purvis (1990) argued that, while "the demand for labour depends negatively upon the product real wage,⋯ the supply of labour depends positively upon the consumption-based real wage" (p.1203). They define the latter real wage as the nominal wage deflated by "the CPI-based consumption basket"(p.1202), which is nothing but the weighted average of domestic and foreign price levels. From these demand and supply of labor functions, they pointed out the possibility that "a real appreciation ⋯ allows for a simultaneous fall in the product real wage and rise in the consumption-based real wage" (p.1203). This implies that the aggregate supply may possibly be an increasing function of p-x (i.e., decreasing in the real exchange rate).[3]

Lai (1993), on the other hand, derived rigorously that the aggregate supply is a function of p, p^*, and x, and proved that $\partial y^s/\partial p=-\partial y^s/\partial x=-\partial y^s/\partial p^*$ in the efficiency wage model (Lai (1993), 322-325). Then, it is a simple procedure to specify the aggregate supply as a decreasing function of the real exchange rate, as shown in equation (4).

To the best of the author's knowledge, these are the two alternative theories that explain why the aggregate supply function is decreasing in the real exchange rate. In this article, I would like to side with Lai (1993) because of the following reasons. (1) As I have mentioned above, the aggregate supply is not necessarily a decreasing function, but may well be an increasing function of the real exchange rate in the Devereux and Purvis model. (2) But it is always a decreasing function of the real exchange rate in the Lai (1993) model. (3) More importantly, however, the main purpose of this article is to focus on the effects of monetary and fiscal policies in order to stimulate a small open economy. This assumes the presence of some unemployment in the economy, which is better treated and explained in the efficiency wage model. [4]

Thus, equation (4) can be interpreted as a straightforward application of Lai's (1993) result (equation (17), p.325). Actually, equation (4) directly results from his assumption of the consumer's price index defined as $g \equiv axp^*+(1-a)p$, where a is the fraction of expenditure spent on import. This is similar to "the CPI-based consumption basket" referred to by Devereux and Purvis (1990). Utilizing the definition of g and the familiar 'Solow condition' in the efficiency wage literature (e.g., Akerlof and Yellen (1986), p.3), Lai derived an expression of the aggregate supply function which is essentially the same as equation (4).

The efficiency wage hypothesis is succinctly summarized in Lai (1993). p.322. As surveyed by Mankiw ((1990), p.1658), the efficiency wage hypothesis has been an alternative, but "probably the most popular" (p.1658), theory of real rigidities in new Keynesian models.[5] It seems to the author that the efficiency wage hypothesis assumes a causality relationship between wages and productivity.[6] For example, Mankiw ((1990), p.1658) wrote that "firms do not reduce wages in the face of persistent unemployment because to do so would reduce productivity." Mankiw offers at least three reasons for this assumption (p.1658).

The first explanation is sociological in that "lower-paid workers are less loyal to the firm." The second "explanation based on adverse selection is that a lower wage reduces the average quality of the work force because only the best workers quit." The third, and "the most popular, explanation for efficiency wage is 'shirking.' Because firms monitor effort imperfectly, workers sometimes shirk their responsibilities and risk getting fired; a lower wage reduces the cost of getting fired and thus raises the amount of shirking." Thus, Mankiw summarizes, "In all of these efficiency wage theories, the impact of wages on productivity diminishes the incentive for a firm to cut wages in response to an excess supply of labor."[7]

Thus, although it may be possible to interpret that equation (4) embodies the Devereux-Purvis argument, it seems to the author that it can be better understood under the efficiency wage hypothesis proposed by Lai (1993) to best serve to our present purpose.

Ⅳ Solution of the Model

I order to determine the equilibrium paths of p, x, and y, solve equations (1)-(4) for the values of p_t and x_t that clear the output and asset markets. These semi-reduced forms are:[8]

(6) $p_t=\gamma_0+\gamma_1 p^e_{t+1}+\gamma_2 x^e_{t+1}+\gamma_3 g_t+\gamma_4 m_t+\gamma_5 u_t+\gamma_6 v_t+\gamma_7 w_t$

where:[9]

$a_3\gamma_1=a_2\gamma_3=a_2a_3\gamma_5,\quad \gamma_2=-[b_2(a_1+c_1)+a_2b_1c_1]/D$

$\gamma_5=(b_1c_1-b_2)/D,\quad \gamma_4=-\gamma_6=-(a_1+a_2+c_1)/D,$

$\gamma_7=[b_2+b_1(a_1+a_2)]/D$, $D\equiv-(1+b_2)(a_1+a_2+c_1)$

(7) $x_t=\delta_0+\delta_1 p^e_{t+1}+\delta_2 x^e_{t+1}+\delta_3 g_t+\delta_4 m_t+\delta_5 u_t+\delta_6 v_t+\delta_7 w_t$

where:[10]

$a_3\delta_1=a_2\delta_3=a_2a_3\delta_5$, $\delta_2=-[b_2(a_1+a_2+c_1)+a_2(1+b_1c_1)]/D$

$\delta_5=(1+b_1c_1)/D$, $\delta_4=-\delta_6=-(a_1+a_2+c_1)/D$,

$\delta_7=[b_1(a_1+a_2)-1]/D$,

These are the semi-reduced forms in that they contain expectations of the future price level and the future spot exchange rate. In order to derive the reduced forms, rational expectations are assumed in this article so as to close the model. [11,12]

To obtain an explicit solution for y_t, together with p_t and x_t, it is necessary to specify the process generating the exogenous variables in the model, m_t and g_t.[13] It is assumed that they are generated by:

(8) $\Delta g_t = g + \theta_t$

(9) $\Delta m_t = k(x_t - x_{t-1}) + \xi_t = k\Delta x_t + \xi_t$ $(k<0)$

where both θ_t and ξ_t are i.i.d. error terms with zero means and finite variances. According to (8), a change in real government expenditure follows a random walk process with a drift g. In the following analysis, however, g is further assumed to be zero for simplicity's sake. Equation (9) signifies (non-sterilized) intervention by the central bank. Similar types of bilateral foreign exchange market intervention have been specified and utilized in the literature, e.g. Turnovsky (1983, 84), Lane (1989, 1990) and Lane and Gros (1994).

The monetary feedback rule of equation (9) means that the monetary authority adjusts to increase (decrease) the money supply when the exchange rate appreciates (depreciates) in the short-run. This feedback rule is justified because, in the short-run, a change in money supply will exert a positive impact on the exchange rate, i.e. $1>\delta_4>0$. For example, if the exchange rate appreciates from period t-1 to period t ($\Delta x_t<0$), the central bank increases the current money supply ($\Delta m_t > 0$) because the intervention parameter k is assumed to be negative. The resulting increase in money supply in period t will cause the exchange rate to depreciate, as δ_4 is positive, and smoothing out the exchange rate movements (leaning against the wind).

In solving the model, the author uses a familiar method of undetermined coefficients, with the details relegated to the Appendix section. Neglecting the constant terms, the explicit solutions for the domestic price level, the nominal exchange rate, and the output are:

$$(10\text{-}1)\quad p_t = \left[\frac{a_3(1+b_2)A}{B} - \frac{a_3}{a_2}\right]g_{t-1} + m_{t-1} - \left(\frac{CA}{c_1B}\right) y_{t-1} + \left[1 - \frac{(1+b_2)k}{b_2}\right]p_{t-1} - x_{t-1} + \left(\frac{ED}{C}\right)u_t + Dv_t - D\,\xi_t + \left(\frac{D}{C}\right)[b_2 + b_1(a_1+a_2) - k]w_t + \left(\frac{a_3ED}{C}\right)\theta_t$$

$$(10\text{-}2)\quad x_t = \left[\frac{a_3(1+b_2)A}{B}\right]g_{t-1} + m_{t-1} - \left(\frac{CA}{c_1B}\right)y_{t-1} + \left[1 - \frac{(1+b_2)k}{b_2}\right]p_{t-1} - x_{t-1} + \left[\frac{(1+b_1c_1)D}{C}\right]u_t + Dv_t - D\,\xi_t + \left[\frac{\{b_1(a_1+a_2)-1\}D}{C}\right]w_t + \left[\frac{a_3(1+b_1c_1)D}{C}\right]\theta_t$$

$$(10\text{-}3)\quad y_t = \left(\frac{-a_3c_1}{a_2}\right)g_{t-1} + \left(\frac{1}{C}\right)[c_1u_t + (a_1+a_2)w_t + a_3c_1\,\theta_t]$$

where $A \equiv (1+b_2)k + (1+b_1c_1-b_2)$, $B \equiv a_2 - b_2(a_1+c_1)$, $C \equiv a_1+a_2+c_1 > 0$, $D \equiv 1/[k-(1+b_2)] < 0$, and $E \equiv k + b_1c_1 - b_2$.

V The Effects of Macroeconomic Policies under Flexible Exchange Rates

This section examines the effects of macroeconomic policies on the endogenous variables of the model. The primary concern here is to analyze the effects on y_t and to determine if the so-called Mundell proposition, under flexible exchange rates, is robust when the expectations formation of prices and exchange rates is made explicit.

If B<0 (see Akiba (1995)),[14] an additional assumption of A being positive is sufficient to observe standard Keynesian effects from (10), i.e., $\partial p_t/\partial m_{t-1} = \partial x_t/\partial m_{t-1} = 1$, $\partial p_t/\partial g_{t-1} < 0$, and $\partial x_t/\partial g_{t-1} < 0$. However, without invoking such assumptions about the signs of A and B, one can deduce even more striking results. From equation (4), it is now straightforward to obtain $\partial y_t/\partial k_{t-1} = c_1(\partial p_t/\partial k_{t-1} - \partial x_t/\partial k_{t-1})$ where k=g and m, and therefore

(11) $\partial y_t/\partial g_{t-1} = -a_3c_1/a_2 < 0$

(12) $\partial y_t/\partial m_{t-1} = 0$

Equations (11) and (12) mean that, under a flexible exchange rate regime with perfect capital mobility, an expansionary government expenditure policy actually brings about a contractionary impact on domestic output. On the other hand, an expansionary monetary policy is totally ineffective in stimulating the domestic output. Thus, the solution (10) reproduces exactly the same conclusions (11) and (12) obtained in a similar model, e.g., Akiba (1995). The perverse effect of expansionary fiscal policy on domestic output, (11), was discussed in some detail in Akiba (1995), where it was shown that the reason for it lies in a real depreciation with a concurrent nominal appreciation of the exchange rate after an expansionary fiscal policy. In other words, as shown in (10), $\partial x_t/\partial g_{t-1}<0$ and $\partial p_t/\partial g_{t-1}<0$, but the latter is numerically greater than the former in absolute value. This actually means that the real depreciation, i.e., $\partial(x_t-p_t)/\partial g_{t-1} > 0$. An intuitive explanation behind this is that, after an expansionary fiscal policy, both the nominal exchange rate and the price level will fall. The latter fall means, in turn, an increase in the real interest rate, given expectations. It is this increase in the real interest rate that has an additional discouraging effect on domestic price level, and thus the fall in p is greater than that of x, leading to the real depreciation.[15]

It should be emphasized that, although a contractionary result of expansionary fiscal policy like the one obtained here sounds like a theoretical curiosity, Akiba (1995) argued that this is not necessarily the case. A brief discussion for some reasons for it was stated in Akiba (1995), for both a closed economy case (Myatt and Scarth (1995)) and an open economy case(Ahtiala (1989), Sauernheimer (1987), Sarantis (1986), Akiba (1993a, 94), Devereux and Purvis (1990), and Lai (1993)). Since the perverse effect of expansionary fiscal policy was discussed there in greater detail, it will not be pursued here any further.

VI The Effects of Intervention

This section considers the effects of the non-sterilized intervention policy embodied in equation (9). It has been widely recognized that, for non-sterilized intervention like the one considered here, "[T]here is virtually unanimous agreement among economists that non-sterilized intervention can affect the exchange rate, …. It does so by changing the stock of base money and thus changing broader monetary aggregates, interest rates, real demands for goods and assets, and market expectations" (Edison (1993), p.8).[16] It seems to the present author, however, that there has been neither serious discussion nor agreement within a consistent open economy model with endogenous expectations concerning at least the following two points: How domestic output is affected by non-sterilized intervention, and how exogenous variables are affected by such intervention, thus in turn affecting endogenous variables (i.e., the sensitivity analysis), within a consistent open economy model with endogenous expectations. This section attempts to address these questions by using the efficiency wage hypothesis within our version of an open economy.[17]

Equation (10-3) answers the first of these questions. The solution of domestic output in our medium-run model clearly exemplifies that y_t in no way depends on non-sterilized intervention. In fact, neglecting the constant term and the i.i.d. disturbance terms for the time being, the simultaneous difference equation system of (8) and (10-3) yields the following long-run solution:

$$(13) \qquad E[y_t] = (a_3 c_1/C) \sum_{i=0}^{\infty} (a_2/C)^i E[g_{t+i}]$$

Thus, although non-sterilized intervention can affect other endogenous variables of our model as can be observed in (10-1) and (10-2), it will never have any long-run effect on domestic output. It should be mentioned that this rather strong proposition, rigorously proved within our model, does not depend on our assumption of the efficiency wage hypothesis.

It can also be observed from (10-3) that the sum of an unanticipated unit change in the aggregate demand (u_t) and that in the aggregate supply (w_t) will add up to one, i.e. $(1/C)(c_1+a_1+a_2)=1$. This actually means that a unit change in y_t consists of both unanticipated changes in the aggregate demand and aggregate supply. As a_3 is the Keynesian government expenditure multiplier that is typically greater than unity, an unanticipated change in government expenditures (θ_t) is shown to exert an even stronger stimulating effect on output than that of the aggregate demand (u_t).

Effects of non-sterilized intervention on the other endogenous variables, i.e., p_t and x_t, should also be noted, because of the following reasons. First of all, they have not been explicitly considered, as far as the author knows, in a consistent open economy model with endogenous expectations. Consequently, the effects of it through exogenous or predetermined variables (i.e., the sensitivity analysis of non-sterilized intervention) on those endogenous variables have seldom been closely analyzed within a consistent open economy model.

From equation (10-1) and (10-2), both p_t and x_t are affected by non-sterilized intervention through g_{t-1}, y_{t-1}, and p_{t-1} indirectly, and the i.i.d. disturbance terms directly. The effects of a change in the non-sterilized intervention parameter k, which is assumed negative, on p_t and x_t through g_{t-1}, y_{t-1}, and p_{t-1} are summarized in Table 1.

Table 1, $\partial p_t/\partial k = \partial x_t/\partial k$

g_{t-1}	y_{t-1}	p_{t-1}
$a_3(1+b_2)^2/B < 0$	$-(1+b_2)C/c_1B > 0$	$-(1+b_2)/b_2 < 0$

Note: $B \equiv a_2-b_2(a_1+c_1) < 0$ (Akiba (1995))

$C \equiv a_1+a_2+c_1 > 0$

Thus, the sensitivity with respect to a change in k on p_t and x_t through the predetermined variables is made explicit. For example, an increase in g_{t-1} will lead to a fall in both x_t (appreciation) and p_t, but the fall is alleviated somewhat $[a_3(1+b_2)^2/B]$ by a marginal increase in k (non-sterilized intervention).

The effects of a change in k on p_t and x_t through the i.i.d. disturbances or shocks are slightly ambiguous in nature because of their unanticipated characteristics, except v_t for the money demand and ξ_t for the money supply. It can be easily shown that, for v_t, $\partial p_t/\partial k = \partial x_t/\partial k = -1/[k-(1+b_2)]^2 < 0$, but for ξ_t, $\partial p_t/\partial k = \partial x_t/\partial k = 1/[k-(1+b_2)]^2 > 0$. This means that a fall (rise) in both p_t and x_t after the shock of an increase in the demand for (supply of) money is alleviated by non-sterilized intervention (a unit increase in k) of exactly the same magnitude, but, of course, in the opposite direction.

VII Concluding Comments

This paper constructs a small open economy with an aggregate supply function which is sensitive to the real exchange rate. Utilizing the model, the effects of fiscal and monetary policies were examined under an additional assumption of rationality.

There are at least two alternative theories, as far as the author knows, for the aggregate supply function which is decreasing with respect to the real exchange rate. On the one hand, it is derived from closer examination of the demand for and the supply of labor, while on the other hand, it is deduced from the efficiency wage hypothesis. Our aggregate supply function is formulated with an implicit justification of the efficiency wage hypothesis because of favorable characteristics explained at some length in section Ⅲ.

Under the assumption of rationality with respect to expectations for the price level and the nominal exchange rate, our analysis resulted in some pessimistic conclusions. That is, it was explicitly shown that, while an anticipated expansionary monetary policy is totally ineffective, fiscal policy perversly effects domestic output. An expansionary fiscal policy's contractionary effect on output was examined in some detail in section Ⅴ, where it was explained that the contractionary effect occurs when the real exchange rate depreciates under rationality. In other words, although the nominal exchange rate may appreciate, a fall in the price level (and the expectations of this) more than offsets the appreciation and leads to a depreciation of the real exchange rate.[18] It is this depreciation that gives rise to the conclusion that opposes Lai's.

Our analysis also proved rigorously that, although non-sterilized intervention affects nominal variables (p_t and x_t), it will never affect the real variable y_t in our medium-run model. Thus, non-sterilized intervention was shown to be a totally ineffective policy instrument for stabilization in the medium-run, once expectations are explicitly taken into consideration in an open economy. Our analysis also clearly indicated how non-sterilized intervention affects nominal variables through predetermined or exogenous variables in the model.

Based on this analysis, one can draw some policy implication. First of all, it is necessary to further examine the aggregate supply function that has been overlooked in the traditional Mundell-Fleming model because the model places stronger emphasis on the demand side (IS-LM). Secondly, non-sterilized intervention should be regarded as a short-run policy instrument to control nominal variables only. Although it will never affect real output in the medium-run, its effectiveness on short-run control over nominal variables implies some welfare gain in an open economy. Such welfare implications remain to be clarified.

FOOTNOTES

* I have benefited from the productive comments made by David Allan, Kashi Nath Tiwari, Subaruna K. Samanta, Jose A. Mendez, and Paul Pecorino during the early stages on this research. The usual disclaimer applies with respect to all remaining errors.

1. Myatt and Scarth (1995) also refer to the possibility of a perverse response to fiscal policy in a closed economy when there exist direct aggregate supply-side effects of interest rates.

2. For notational simplicity, we use the notation $\underset{t-1}{E}[z_{t+j}]$, $j \geqq 0$, to refer to $\underset{t-1}{E}[z_{t+j} \mid \Omega_{t-1}]$. See Kaminsky (1993) for a recent evidence of rationality in the foreign exchange market.

3. In the Devereux and Purvis model, however, it can be shown that the aggregate supply function is likely to be a decreasing function of p-x when the consumption-based real wage rises by a real appreciation, if β_1 (the share of foreign consumption goods in the CPI) is relatively large.

4. This does not necessarily preclude an interesting possibility suggested by Devereux and Purvis (1990).

5. Solow (1979) wrote that the nominal wage is "sticky" rather than "rigid", because the wage is allowed to move (p.79).

6. This may be criticized as an argument for an unobservable relationship when the following three reasons are considered. For further reference, Nickell (1991) provides a recent survey of the efficiency wage literature.

7. See also Stiglitz (1986), Miyamoto (1991) and Yellen (1984) for the efficiency wage hypothesis. Another reason for assuming the efficiency wage hypothesis behind equation (4) is that it provides "a convincing explanation of the kind of wage rigidity that is associated with cyclical unemployment," as pointed out by Stiglitz ((1986), p.154). He also summarizes five different explanations of the wage-productivity relationship as the basis for the efficiency wage hypothesis (pp.182-7). As Yellen (1984, p.200) pointed out, the hypothesis explains a phenomenon of involuntary unemployment as well as four different labor market phenomena, including the dual labor market (Bulow and Summers (1986)).

8. To obtain the semi-reduced form, i^*_t is set to i^* (constant). Alternatively, i^*_t could be assumed to be $\Delta i^*_t = i^* + s^*_t$, where s^*_t is an i.i.d. error term.

9. It can be shown that $\gamma_0 = \{a_0(b_1c_1-b_2)+b_0(a_2+a_1+c_1)+c_0(b_2+a_1b_1+a_2b_1)-(b_2c_1+a_1b_2+a_2b_1c_1)i^*\}/D$. Because $D<0$, the coefficients γ_2, and γ_4 are positive, γ_6 and γ_7 are negative, and γ_1, γ_3, and γ_5 are indeterminate.

10. It can also be shown that $\delta_0 = \{c_0[(a_1+a_2)b_1-1]+b_0(a_1+a_2+c_1)+a_0(1+b_1c_1)-[b_2(a_1+a_2+c_1)+a_2(1+b_1c_1)]i^*\}/D$. The sign of $\delta_1, \delta_3, \delta_5$, and δ_6 is negative, that of δ_2 and δ_4 is positive, and that of δ_7 is indeterminate.

11. The following points should be noted with respect to the semi-reduced forms, (6) and (7). First, p_t and x_t are jointly determined variables depending on the same sets of underlying variables, although their dynamic time paths need not be identical. Second, both p_t and x_t depend on the time paths, current and expected, of exogenous variables. This can be easily verified by the method of repeated substitution to show that the rational expectations version of our small open economy model with the efficiency wage hypothesis embodies

the main features of the asset market approach to exchange rate determination.

12. Using (6) and (7), the semi-reduced form of y_t is given by:

$$y_t = \eta_0 + a_2\eta(p^e_{t+1} - x^e_{t+1}) + a_3\eta g_t + \eta u_t - \eta w_t$$

where η_0 is the aggregate constant term and η is defined by $-c_1(1+b_2)/D > 0$. It should be noted that y_t is not affected by m_t.

13. Note that i^*_t was assumed to be constant, i^*, in the last section.

14. The assumption of $B<0$ is equivalent to $a_1+c_1>a_2/b_2$. Thus, it actually means that the effect of real depreciation on the excess demand for goods and services (a_1+c_1) is greater than the effect of a change in it on y_t relative to m_t-p_t, (a_2/b_2).

15. The real exchange rate q_t is:

$$q_t \equiv x_t - p_t = \left(\frac{a_3}{a_2}\right)g_{t-1} - \left(\frac{CA}{a_2c_1}\right)y_{t-1} - \left(\frac{1}{C}\right)u_t + \left(\frac{1}{C}\right)w_t + \left(\frac{a_3}{C}\right)\theta_t$$

Thus, neglecting the i.i.d. error terms, $\partial q_t/\partial g_{t-1} = a_3/a_2 > 0$. See also Penati (1983) for possibilities of a depreciation of the long-run real exchange rate following an expansionary fiscal policy.

16. For surveys of the effects of foreign exchange intervention, refer to Genberg (1982), and Almekinders and Eijffinger (1991). For a mainly theoretical analysis, see Bond and Mitchell (1982), Kenen (1984), Henderson (1984), Turnovsky (1983,84), Lane (1989, 90) and Lane and Gros (1994). For a primarily empirical examination, see, e.g., Obstfeld (1990), Dominguez and Frankel (1990, 93a,b,c), and Lewis (1995). For a general explanation of the effectiveness of foreign exchange intervention, see a survey by Taylor (1995). While the effects of sterilized intervention have been examined primarily from

an empirical point of view, those of non-sterilized intervention have been analyzed for primarily from a theoretical point of view.

17. Turnovsky (1983,84) considered the effects of non-sterilized intervention, but it was incomplete in the sense that the model did not impose the equilibrium condition for the domestic goods and services market. Thus, it was not clear whether the model was really "open" in goods and services transaction. The assurance of the PPP condition is not enough to guarantee that the domestic goods and services market is in equilibrium with international trade. Henderson (1984) considered only the short-run effects of non-sterilized intervention with static expectations within a two-country model.

18. This seems to contradict a short-run empirical "regularity" by Mussa (1986), p.131 (see also Mark (1990)). However, because our model is medium-run, such a regularity has been open to doubt, as pointed out by Saidi and Swowoda (1983). The so-called Meese-Rogoff message suggests that the short-term movement of the nominal exchange rate is approximated by a random walk process. Jung (1985) confirmed the random walk hypothesis for the real exchange rates for France, Germany, the United Kingdom, and the United States. However, Koedijk and Schotman (1990) found a significant mean reversion component in the movement of real exchange rates for the United States, the United Kingdom, Germany and Japan.

APPENDIX

This section develops and briefly sketches some of the algebra underlying the results in section IV.

To obtain an explicit solution for p_t, x_t, and y_t in terms of exogenous and predetermined variables, we consider writing p_t and x_t as unknown functions of state variables:

(A-1) $p_t=\pi_p+\pi_{10}g_{t-1}+\pi_{11}m_{t-1}+\pi_{12}y_{t-1}+\pi_{13}p_{t-1}+\pi_{14}x_{t-1}$

$+\pi_{15}u_t+\pi_{16}v_t+\pi_{17}w_t+\pi_{18}\theta_t+\pi_{19}\xi_t$

(A-2) $x_t=\pi_x+\pi_{20}g_{t-1}+\pi_{21}m_{t-1}+\pi_{22}y_{t-1}+\pi_{23}p_{t-1}+\pi_{24}x_{t-1}$

$+\pi_{25}u_t+\pi_{26}v_t+\pi_{27}w_t+\pi_{28}\theta_t+\pi_{29}\xi_t$

This trial solution assumes that the linear structure of the model and the stochastic specification (8) and (9) are not expected to change over time. Given (A-1) and (A-2), it is a simple matter to calculate the expression for $\underset{t-1}{E}[p_{t+1}]$ and $\underset{t-1}{E}[x_{t+1}]$ which appear in the market clearing conditions (6) and (7). If the trial solution in (A-1) and (A-2) is an equilibrium, then substituting from (A-1) and (A-2) for expectations into (6) and (7) must yield identities in the state variables. Neglecting constants, the resulting identities are:

$\pi_{10}=\gamma_1[\pi_{10}+k\pi_{11}\pi_{20}+c_1\pi_{12}(\pi_{10}-\pi_{20})+\pi_{13}\pi_{10}+\pi_{14}\pi_{20}]$

$+\gamma_2[\pi_{20}+k\pi_{20}\pi_{21}+c_1\pi_{22}(\pi_{10}-\pi_{20})+\pi_{23}\pi_{10}+\pi_{24}\pi_{20}]$

$+\gamma_3+\gamma_4k\pi_{20}$

$\pi_{11}=\gamma_1[\pi_{11}(1+k\pi_{21})+c_1\pi_{12}(\pi_{11}-\pi_{21})+\pi_{13}\pi_{11}+\pi_{14}\pi_{21}]$

$+\gamma_2[\pi_{21}(1+k\pi_{21})+c_1\pi_{22}(\pi_{11}-\pi_{21})+\pi_{23}\pi_{11}+\pi_{24}\pi_{21}]$

$+\gamma_4+\gamma_4k\pi_{21}$

$\pi_{12}=\gamma_1[k\pi_{11}\pi_{22}+c_1\pi_{12}(\pi_{12}-\pi_{22})+\pi_{13}\pi_{12}+\pi_{14}\pi_{22}]$

$+\gamma_2[k\pi_{21}\pi_{22}+c_1\pi_{22}(\pi_{12}-\pi_{22})+\pi_{23}\pi_{12}+\pi_{24}\pi_{22}]$

$+\gamma_4k\pi_{22}$

$\pi_{13}=\gamma_1[k\pi_{11}\pi_{23}+c_1\pi_{12}(\pi_{13}-\pi_{23})+\pi_{13}\pi_{13}+\pi_{14}\pi_{23}]$

$+\gamma_2[k\pi_{21}\pi_{23}+c_1\pi_{22}(\pi_{13}-\pi_{23})+\pi_{23}\pi_{13}+\pi_{24}\pi_{23}]$

$+\gamma_4 k\pi_{23}$

$\pi_{14}=\gamma_1[k\pi_{11}(\pi_{24}-1)+c_1\pi_{12}(\pi_{14}-\pi_{24})+\pi_{13}\pi_{14}+\pi_{14}\pi_{24}]$

$+\gamma_2[k\pi_{21}(\pi_{24}-1)+c_1\pi_{22}(\pi_{14}-\pi_{24})+\pi_{23}\pi_{14}+\pi_{24}\pi_{24}]$

$+\gamma_4 k(\pi_{24}-1)$

$\pi_{15}=\gamma_5+\gamma_4 k\pi_{25}$ $\pi_{16}=\gamma_6+\gamma_4 k\pi_{26}$

$\pi_{17}=\gamma_8+\gamma_4 k\pi_{27}$ $\pi_{18}=\gamma_3+\gamma_4 k\pi_{28}$

$\pi_{19}=\gamma_4+\gamma_4 k\pi_{29}$

(A-3)

$\pi_{20}=\delta_1[\pi_{10}+k\pi_{11}\pi_{20}+c_1\pi_{21}(\pi_{10}-\pi_{20})+\pi_{13}\pi_{10}+\pi_{14}\pi_{20}]$

$+\delta_2[\pi_{20}+k\pi_{20}\pi_{21}+c_1\pi_{22}(\pi_{10}-\pi_{20})+\pi_{23}\pi_{10}+\pi_{24}\pi_{20}]$

$+\delta_3+\delta_4 k\pi_{20}$

$\pi_{21}=\delta_1[\pi_{11}(1+k\pi_{21})+c_1\pi_{12}(\pi_{11}-\pi_{21})+\pi_{13}\pi_{11}+\pi_{14}\pi_{21}]$

$+\delta_2[\pi_{21}(1+k\pi_{21})+c_1\pi_{22}(\pi_{11}-\pi_{21})+\pi_{23}\pi_{11}+\pi_{24}\pi_{21}]$

$+\delta_4+\delta_4 k\pi_{21}$

$\pi_{22}=\delta_1[k\pi_{11}\pi_{22}+c_1\pi_{12}(\pi_{12}-\pi_{22})+\pi_{13}\pi_{12}+\pi_{14}\pi_{22}]$

$+\delta_2[k\pi_{21}\pi_{22}+c_1\pi_{22}(\pi_{12}-\pi_{22})+\pi_{23}\pi_{12}+\pi_{24}\pi_{22}]$

$+\delta_4 k\pi_{22}$

$\pi_{23}=\delta_1[k\pi_{11}\pi_{23}+c_1\pi_{12}(\pi_{13}-\pi_{23})+\pi_{13}\pi_{13}+\pi_{14}\pi_{23}]$

$+\delta_2[k\pi_{21}\pi_{23}+c_1\pi_{22}(\pi_{13}-\pi_{23})+\pi_{23}\pi_{13}+\pi_{24}\pi_{23}]$

$+\delta_4 k\pi_{23}$

$\pi_{24}=\delta_1[k\pi_{11}(\pi_{24}-1)+c_1\pi_{12}(\pi_{14}-\pi_{24})+\pi_{13}\pi_{14}+\pi_{14}\pi_{24}]$

$+\delta_2[k\pi_{21}(\pi_{24}-1)+c_1\pi_{22}(\pi_{14}-\pi_{24})+\pi_{23}\pi_{14}+\pi_{24}\pi_{24}]$

$+\delta_4 k(\pi_{24}-1)$

$\pi_{25}=\delta_5+\delta_4 k\pi_{25}$ $\pi_{26}=\delta_6+\delta_4 k\pi_{26}$

$\pi_{27}=\delta_8+\delta_4 k\pi_{27}$ $\pi_{28}=\delta_3+\delta_4 k\pi_{28}$

$\pi_{29}=\delta_4+\delta_4 k\pi_{29}$

Solving (A-3) for π_{ij} ($i=1,2$; $j=1,2,3$) yields:

$$\pi_{10}=\frac{a_3(1+b_2)[(1+b_2)k+1+b_1c_1-b_2]}{a_2-b_2(a_1+c_1)}+\frac{a_3}{a_2}$$

$$\pi_{20} = \frac{a_3(1+b_2)[(1+b_2)k+1+b_1c_1-b_2]}{a_2-b_2(a_1+c_1)}$$

$$\pi_{11} = \pi_{21} = 1$$

$$\pi_{12} = \frac{(a_1+a_2+c_1)[-(1+b_2)a_2k+a_2b_2-b_2(a_1+c_1)-a_2b_1c_1]}{a_2c_1[a_2-b_2(a_1+c_1)]}$$

$$\pi_{22} = \frac{(a_1+a_2+c_1)\ [-(1+b_2)k+b_2-b_1c_1-1]}{c_1[a_2-b_2(a_1+c_1)]}$$

$$\pi_{13} = \pi_{23} = \frac{b_2 -(1+b_2)k}{b_2} \qquad \pi_{14} = \pi_{24} = -1$$

$$\pi_{15} = \frac{k+b_1c_1-b_2}{(a_1+a_2+c_1)[k-(1+b_2)]} \qquad \pi_{25} = \frac{1+b_1c_1}{(a_1+a_2+c_1)[k-(1+b_2)]}$$

$$\pi_{16} = \pi_{26} = \frac{1}{k-(1+b_2)}$$

$$\pi_{17} = \frac{b_2+b_1(a_1+a_2)-k}{(a_1+a_2+c_1)[k-(1+b_2)]} \qquad \pi_{27} = \frac{b_1(a_1+a_2)-1}{(a_1+a_2+c_1)[k-(1+b_2)]}$$

$$\pi_{18} = \frac{a_3\ [k+b_1c_1-b_2]}{(a_1+a_2+c_1)[k-(1+b_2)]} \qquad \pi_{28} = \frac{a_3(1+b_1c_1)}{(a_1+a_2+c_1)[k-(1+b_2)]}$$

$$\pi_{19} = \pi_{29} = \frac{-1}{k-(1+b_2)}$$

Substituting back into (A-1) and (A-2) yields the expressions for p_t and x_t appearing in equations (10-1) and (10-2), respectively. To obtain the solution for output (10-3), we simply substitute the expressions for p_t and x_t obtained in (10-1) and (10-2) into equation (4). However, the coefficient of y_{t-1}, which is $c_1(\pi_{12}-\pi_{22})$, turns out to be $(a_1+a_2+c_1)/a_2 > 1$. This means that the system of solutions is unstable, and therefore the coefficient should be ruled out. As their solutions are unique, it follows that $\pi_{12}=\pi_{22}$. The latter condition actually means that $a_2=b_2(a_1+c_1)$, suggesting an intuitively clear result that $\partial y^d/\partial(m-p)=\partial(y^d-y^s)/\partial x=\partial(y^s-y^d)/\partial p$. In other words, in the medium-run, the impact effect of an expansionary policy on the aggregate demand is equal to that of a nominal depreciation on the excess demand, which in turn is also equal to that of an inflationary effect on the excess supply.

REFERENCES

Ahtiala, Pekka "A Note on Fiscal Policy under Flexible Exchange Rates" *European Economic Review, 33(7),* September 1989: 1481-1486.

Akerlof, George A. and Yellen, Janet L. (eds.) *Efficiency Wage Models of the Labor Market.* Cambridge: Cambridge University Press, 1986.

Akiba, Hiroya (1993a) "Fiscal Policy and Interest-Sensitive Aggregate Supply with Price and Exchange Rate Expectations" *Public Finance, 48(2),* 1993; 111-127.

Akiba, Hiroya (1993b) "Efficacy of Fiscal Policy under Flexible Exchange Rates with Price and Exchange Rate Expectations" *Asian Journal of Economics and Social Studies, 12(3),* July 1993; 181-196.

Akiba, Hiroya "Kasenteki Kakakuzuke to Kaihou Keizai ni okeru Kinyuu · Zaisei Seisaku no Yukousei" (Oligopolistic Pricing and the Efficacy of Monetary and Fiscal Policies in an Open Economy) in Minoru Suzuki et al. (eds.) *Gender Keizai-Shake ni okeru Shomondai.* Tokyo: Toyo Keizai Shinpou Sha, May 1994; 315-336 (in Japanese).

Akiba, Hiroya "Real Exchange Rate Sensitivity of Aggregate Supply and the Mundell Proposition". Pesented at the 1995 annual meetings of WEA and SEA.

Akiba, Hiroya *Kaihou Macro-Keizaigaku.* (Open Economy Macroeconomics) Tokyo: Keisou Shubou, 1996 (in Japanese).

Almekinders, Geert J. and Eijffinger, Sylvester C.W. "Empirical Evidence on

Foreign Exchange Market Intervention: Where Do We Stand ?" *Weltwirtschaftliches Archiv, 127(4),* 1991; 645-677.

Bond, Eric and Mitchell, Douglas "On the Destabilising Effects of Balance of Payments Sterilization" *Australian Economic papers, 21(39),* December 1982; 345-351.

Bulow, Jeremy I. and Summers, Lawrence H. "A Theory of Dual Labor Markets with Application to Industrial Policy, Discrimination, and Keynesian Unemployment" *Journal of Labor Economics, 4(3),* July 1986: 376-414.

Devereux, Michael B. and Purvis, Douglas D. "Fiscal Policy and the Real Exchange Rate" *European Economic Review, 34(6),* September 1990; 1201-1211.

Dominguez, Kathryn M. and Frankel, Jeffrey A. *Does Foreign Exchange Intervention Works ?* Washington, D.C.: Institute of International Economics, 1993.

Dominguez, Kathryn M. and Frankel, Jeffrey A. "Foreign Exchange Intervention: An Empirical Assessment" in Jeffrey A. Frankel *On Exchange Rates.* Cambridge, MA: The MIT Press, 1993; 327-345.

Dominguez, Kathryn M. and Frankel, Jeffrey A. "Does Foreign Exchange Intervention Matter ? Disentangling the Portfolio and Expectations Effects for the Mark" NBER Working Paper No.3299, March 1990.

Dominguez, Kathryn M. and Frankel, Jeffrey A. "Does Foreign Exchange Intervention Matter ? The Portfolio Effect" *American Economic Review,* 83(5), December 193; 1356-1369.

Edison, Hali J. "The Effectiveness of Central-Bank Intervention: A Survey of the Literature After 1982" Special Papers in International Economics, No.18, Princeton University International Finance Section, July, 1993.

Genberg, Hans "Effects of Central Bank Intervention in the Foreign Exchange Market" *International Monetary Fund Staff Papers, 28(3),* September 1981;451-476.

Henderson, Dale W. "Exchange Market Intervention Operations: Their Role in Financial Policy and Their Effects" in John F.O. Bilson et al. (eds.) *Exchange Rate Theory and Practice.* Chicago: Thne University of Chicago Press, 1984; 359-398.

Jung, Georg "Trends and Random Walks of Real Exchange Rates" *Weltwirtschaftliches Archiv, Band 121, Heft 3* , 1985: 427-436.

Kaminsky, Graciela "Is There a Peso Problem ? Evidence from the Dollar/ Pound Exchange Rate, 1976-1987" *American Economic Review, 83(3),* June 1993: 450-472.

Kene, Peter B. "Effects of Intervention and Sterilization in the Short Run and the Long Run" in Richard N. Cooper et al. (eds.) *The Internatioal Monetary Syatem under Flexible Exchange Rates.* Cambridge, MA: Ballinger, 1984; 51-68.

Koedijk, Kees G. and Schotman, Peter "How to Beat the Random Walk: An Empirical Model of Real Exchange Rates" *Journal of International Economics, 29(3/4),* November 1990:311-332.

Lai, Ching-chong "The Mundell Proposition with Efficiency Wages" *European Journal of Political Economy, 9(3)*, August 1993; 321- 331.

Lane, Timothy D. "Foreign Exchange Market Intervetion in Interdependent Economies: A Case for Capricious Policy ?" *Journal of Macroeconomics, 11(4)*, Fall 1989; 513-531.

Lane, Timothy D. "National Sovereignty and International Monetary Order" *Journal of International Economics, 29*, November 1990; 351-368.

Lane, Timothy D. and Gros, Daniel "Symmetry versus Asymmetry in a Fixed Exchange Rate System" *Kredit und Kapital, 27(1)*, 1994; 43-66.

Lewis, Karen K. "Are Foreign Exchange Intervention and Monetary Policy Related, and Does It Really Matter ?" *Journal of Business, 68(2)*, 195; 185-214.

Mankiw, N. Gregory "A Quick Refresher Course in Macroeconomics" *Journal of Economic Literature, 28(4)*, December 1990; 1645-1660.

Mark, Nelson C. "Real and Nominal Exchange Rates in the Long Run: An Empirical Investigation" *Journal of International Economics, 28(1/2)*, February 1990: 115-136.

Marston, Richard C. "Stabilization Policy in Open Economy" Chapter 17 in R.W. Jones and P.B. Kenen (eds.) *Handbook of International Economics*, Vol. II, Amsterdam: North-Holland Publishing Company, 1985; 859-916.

Miyamoto, Mitsuharu *Kigyo to Soshiki no Keizaigaku* (The Economics of the Firm and Organization) Tokyo: Shinsei Sha, 1991 (in Japanese).

Mundell, Robert A. "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates" *Canadian Journal of Economics and Political Science, 29,* November 1963; 475-485.

Mussa, Michael "Nominal Exchange Rate Regimes and the Behavior of Real Exchange Rates: Evidence and Implications" in *Carnegie-Rochester Conference Series on Public Policy, Vol. 25,* 1986: 117-214.

Myatt, Anthony and Scarth, William M. "Can Fiscal Spending Be Contractioary When Interest Rates Have Supply-Side Effects ?" *Journal of Macroeconomics, 17(2),* Spring 1995; 289-301.

Nickell, Stephen "Unemployment: A Survey" Chapter 4 in A.J. Oswald (ed.) *Surveys in Economics,* Vol. 1, Oxford: Basil Blackwell Ltd., 1991; 136-184.

Obstfeld, Maurice "The Effectiveness of Foreign Exchange Intervention: Recent Experience, 1985-1988" in William H. Branson et al. (eds.) *International Policy Coordination and Exchange Rate Fluctuations.* Chicago: The University of Chicago Press, 1990; 197-246.

Penati, Alessandro "Expansionary Fiscal Policy and the Exchange Rate: A Review" *IMF Staff Papers, 30(3),* September 1983; 542-569.

Saidi, Nasser and Swowoda, Alexander "Nominal and Real Exchange Rates: Issues and Some Evidence" in E. Claassen and P. Salin (eds.) *Recent Issues in the Theory of Flexible Exchange Rates.* Amsterdam: North Holland Publishing Co., 1983: 3-27.

Sarantis, Nicolas "The Mundell-Fleming Model with Perfect Capital Mobility and Oligopolistic Pricing" *Journal of Post Keynesian Economics, 9(1),* Fall 1986: 138-148.

Sauernheimer, K. "Interest Rates, Exchange Rates, and Aggregate Supply" *Journal of Macroeconomics, 9(3),* Summer 1987: 451-455.

Solow, Robert M. "Another Possible Source of Wage Stickiness" *Journal of Macroeconomics, 1(1),* Winter 1979; 79-82.

Stiglitz, Joseph E. "Theories of Wage Rigidity" Chapter 4 in James L. Butkiewicz et al. (eds.) *Keynes' Economic Legacy.* New York: Praeger Publishers, 1986; 153-206.

Taylor, Mark P. "The Economics of Exchange Rates" *Journal of Economic Literature, 33(1),* March 1995; 13-47.

Turnovsky, Stephen J. "Exchange Market Intervention Policies in a Small Open Economy" in Jagdeep Bhandari et al. (eds.) *Economic Interdependence and Flexible Exchange Rates.* Cambridge, MA: The MIT Press, 1983; 286-311.

Turnovsky, Stephen J. "Exchange Market Intervention under Alternative Forms of Exogenous Disturbances" *Journal of International Economics, 17,* 1984; 279-297.

Yellen, Janet L. "Efficiency Wage Models of Unemployment" *American Economic Review, 74(2),* May 1984; 200-205.