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1 INTRODUCTION

A small country is confronted with a number of options regarding exchange-rate policy. It may tie its currency to the currency of a large country such as the U.S. dollar, Japanese yen, or German mark; it may tie its currency to a basket of currencies; or it can allow its currency to float. Each of these options has potential benefits and costs that depend on factors such as the shocks facing the economy, the form of wage setting within the economy, or the exchange-rate arrangements between the major countries.

The purpose of this study is to examine these issues in a theoretical framework and then to provide some empirical measure of the implications of alternative regimes for output and inflation. Chapter 2 presents a theoretical three-country model in which one country is small relative to the two large countries. Chapter 3 uses the model to examine the consequences of different assumptions about exchange-rate arrangements and wage setting for the transmission of various real and monetary shocks. It focuses on the impact effects of shocks with sticky prices and then on the long-run effect of shocks with full price adjustment. Chapter 4 describes the MSG2 model of the world economy, a dynamic general-equilibrium model, which is used to determine the magnitudes of the results identified in Chapter 3 and to describe the dynamics of adjustment between the extremes of short-run and long-run adjustment examined in the theoretical model. Chapter 5 reexamines the different assumptions about wage setting and exchange-rate arrangements in the more complicated dynamic model. The theoretical analysis gives the major insights into the implications of alternative regimes but throws up ambiguous results in many cases. The more complete empirical model gives some idea of the sizes of major differences and describes a more complicated adjustment process than is possible in the theoretical model. Chapter 6 summarizes our conclusions.

As in most of this literature, we focus on the performance of exchange-rate regimes in the face of real and monetary disturbances that may originate in the small country or in larger foreign countries. In addition, we examine the importance of wage-setting arrangements, especially as they interact with the exchange-rate regime.

2 A THEORETICAL THREE-COUNTRY MODEL

Consider three countries. One country (A) is small, and the others (B and C) are large and identical.[1] We assume that the small country has no macroeconomic impact on the two large countries and therefore model those countries as if the small country did not exist. This parallels conventional two-country modeling. In addition, we have a model of a small open economy that is strongly affected by what happens in the two large economies.

The model is set out in Table 1. It comprises nine behavioral equations, three for each country. Each country has an equation representing the real demand for goods, an equation representing the real supply of goods, and a money-market equation. Perfect asset substitution is assumed, so there is a single interest rate in equilibrium that is common to all three countries. The demand for money is equal to the supply, and the real demand for goods is equal to the real supply. The model is in log form, except for the interest rate. Definitions of the variables used in the model are in the box on the facing page.

Equations (1) to (3) represent the three countries' real demands for goods. Real demand is a function of foreign output, the country's real exchange rate, and the common interest rate. In addition, each country is exposed to a real disturbance μ. Note again that demands in countries B and C impact on each other and on country A, but demand in A has no impact on B and C.

Equations (4) to (6) are conventional money-demand equations. Real money demand is a positive function of domestic output and a negative function of the interest rate. Each country is also exposed to a money-demand disturbance ϵ.

Equations (7) to (9) are the countries' aggregate supply equations. Aggregate supply is a negative function of the real wage defined in terms of home-produced goods. Nominal wages are either fully indexed to the consumer price index (which includes import prices) or are assumed to be fixed (together with prices). The import price in A is a weighted sum of prices of imports from B and C.

Equation (10) defines the exchange rate between A and C as the residual cross rate. The real effective exchange rate for A is a weighted sum of A's two real bilateral rates, as defined in equation (11). Assuming a floating

[1] The inspiration for this concept comes from an important paper by Marston (1984).

Definitions of Variables Used in Text and Tables

e_b^a	= A's exchange rate rate relative to B's (units of A per unit of B)
e_c^a	= A's exchange rate rate relative to C's (units of A per unit of C)
e_c^b	= B's exchange rate rate relative to C's (units of B per unit of C)
e^f	= A's effective exchange rate
m^i	= money supply in country i, where i = a, b, c
p^f	= import price facing A (in A's currency)
p^i	= price of home output in country i
r	= world interest rate
w^i	= wage rate in country i
y^i	= output in country i
α_1	= $1/(1 - \Omega_1 + \Omega_2)$
β_1	= $1 - \phi_1 - \phi_2$
β_2	= A's exports to B as a share of total exports
β_4	= Marshall-Lerner condition
ϵ^i	= monetary disturbance in country i (a rise in the demand for money)
μ^i	= real disturbance in country i (a rise in real aggregate demand)
ϕ_1	= A's exports to B as a share of GNP
ϕ_2	= A's exports to C as a share of GNP
Ω_1	= marginal propensity to spend out of output
Ω_2	= marginal propensity to import

Note: All variables are defined as logarithms except for the interest rate.

exchange rate, we can substitute equation (10) into equations (1) and (7), which gives nine equations to solve for the nine endogenous variables: y^a, y^b, y^c, p^a, p^b, p^c, e_b^a, e_c^b, and r.

What does a float mean in this context? If disturbances originate in A, the exchange rate between the large countries (e_c^b) will clearly be unchanged; then, from equation (10), $e_c^a = e_b^a$. If disturbances originate in B or C, a new exchange rate e_c^b will be reached. Since e_c^b is exogenous to A, we can use the model to determine e_b^a and e_c^a.

In addition to the floating-exchange-rate regime, we also consider various fixed-exchange-rate regimes. Country A can peg its exchange rate to B ($\Delta e_b^a = 0$), it can peg its exchange rate to C ($\Delta e_c^a = 0$), or it can fix the effective exchange rate ($\Delta e^f = 0$).

TABLE 1

MODEL EQUATIONS

Demand for Goods

(1) $y^a = \alpha_1\phi_1 y^b + \alpha_1\phi_2 y^c - \alpha_5 r + \alpha_6\mu^a$

$- \alpha_1\beta_4(\phi_1+\phi_2)[p^a - \beta_2(e_b^a+p^b) - (1-\beta_2)(p^c + e_c^a)]$

(2) $y^b = \alpha_7 y^c - \alpha_8(p^b - e_c^b - p^c) - \alpha_9 r + \alpha_{10}\mu^b$

(3) $y^c = \alpha_{11} y^b + \alpha_{12}(p^b - e_c^b - p^c) - \alpha_{13} r + \alpha_{14}\mu^c$

Money Markets

(4) $m^a = \alpha_{15} y^a - \alpha_{16} r + p^a + \epsilon^a$

(5) $m^b = \alpha_{17} y^b - \alpha_{18} r + p^b + \epsilon^b$

(6) $m^c = \alpha_{19} y^c - \alpha_{20} r + p^c + \epsilon^c$

Aggregate Supply

(7a) $y^a = \alpha_{21}\ (p^a - w^a)$

(7b) $w^a = \beta_1 p^a + (1-\beta_1)p^f$ or $w^a = 0$

(7c) $p^f = \beta_2(p^b + e_b^a) + (1-\beta_2)(p^c + e_c^a)$

(7) $y^a = \alpha_{21}(1-\beta_1)[p^a - \beta_2(p^b + e_b^a) + (1-\beta_2)(p^c + e_c^a)]$

(8a) $y^b = \alpha_{22}\ (p^b - w^b)$

(8b) $w^b = \beta_5 p^b + (1-\beta_5)(p^c + e_c^b)$ or $w^b = 0$

(8) $y^b = \alpha_{22}(1-\beta_5)[p^b - (p^c + e_c^b)]$

(9a) $y^c = \alpha_{23}\ (p^c - w^c)$

(9b) $w^c = \beta_6 p^c + (1-\beta_6)(p^b - e_c^b)$ or $w^c = 0$

(9) $y^c = \alpha_{23}(1-\beta_6)[p^c - (p^b - e_c^b)]$

Exchange-Rate Definition

(10) $e_c^a = e_b^a + e_c^b$

(11) $e^f = \beta_2 e_b^a + (1-\beta_2)e_c^a$

3 ALTERNATIVE SCENARIOS

In this chapter we focus on the interaction between wage setting and the exchange-rate regime in the theoretical model. Two wage assumptions are examined: fixed nominal wages as in the standard Mundell-Fleming model, and flexible nominal wages and prices where wages are assumed to be indexed to the consumer price index. The first assumption is more appropriate for short-run adjustment, the second for long-run adjustment.

We examine the performance of four exchange-rate regimes in the face of six potential disturbances, three real and three monetary. The four exchange-rate regimes facing the small country are:

1. Country A can tie its currency to B's currency.
2. Country A can tie its currency to C's currency.
3. Country A can tie its currency to a basket of B's and C's currencies.
4. Country A can float its currency.

The different assumptions used in the theoretical model are set out in Table 2. In addition to the exchange-rate regimes for the small economy, we also consider three alternative exchange-rate regimes for the world economy. These are global floating and two types of fixed-rate regimes operating between the large countries. One of the fixed-rate regimes is of the "gold standard" variety, where the two large countries allow their money supplies to respond to balance-of-payments outcomes (in other words, there is no sterilization on the part of either central bank); this implements a well-known proposal by McKinnon (1984) for symmetrical adjustment. The other involves asymmetrical adjustment (a dollar-exchange-standard system). In this case, we suppose that one of the large countries (the United States) automatically sterilizes, while the other country (say Japan) does not sterilize.[1]

Official reserves may be held in three forms: as dollar deposits with the U.S. Federal Reserve System, as dollar deposits with the U.S. commercial banks, and in short-term U.S. government securities. One can readily demonstrate that, in the first case, the cash base in the United States will change in line with developments in the balance of payments, a deficit (surplus) reducing (increasing) the cash base; in the second case, the cash base will not change but the ownership of deposits will normally switch from U.S. residents to foreign central banks, so that the money supply changes only by the amount of the change in the balance of payments without any mul-

[1] On symmetrical and asymmetrical adjustment, see Swoboda (1978).

TABLE 2

ALTERNATIVE ASSUMPTIONS IN THE THEORETICAL MODEL

- Exchange-rate regime:
  - Small economy (A):
    - Peg to B (regime 1)
    - Peg to C (regime 2)
    - Peg to a basket of B and C (regime 3)
    - Float (regime 4)
  - World (B and C):
    - Floating exchange rates
    - McKinnon Rule
    - Dollar standard
- Nominal wages:
  - Small economy:
    - Fixed
    - Indexed to the consumer price index
  - World economy:
    - Fixed
    - Indexed to the consumer price index
- Shocks:
  - Real shock:
    - In A
    - In B
    - In C
  - Monetary shock:
    - In A
    - In B
    - In C

tiplier effects; finally, in the third case, there is no change in the money supply or in the cash base. Most of these reserves are in fact held in the form of securities, so whereas there is virtually automatic sterilization in the United States, in the rest of the world an explicit policy decision has to be made about whether or not to sterilize. Thus there is an asymmetry in this case. We deal with it in the next chapter.

As is common in much of this literature, most of our evaluation of performance in the theoretical model is based on output variability. In principle, of course, governments will also be concerned about variability in prices, the real exchange rate, and real interest rates, but these are not explicitly taken into account in the theoretical analysis (but see Argy, 1986). The empirical chapter will focus more on these other targets.

There are many combinations of assumptions to be examined. For convenience, we take each regime for exchange rates in the world economy as given and then examine the results first under fixed wages and prices and then under flexible wages and prices.

Global Floating

Fixed Wages and Prices

Domestic shocks. First consider disturbances that originate in A. These cases are fairly straightforward because these disturbances have no impact on countries B or C. Foreign output (y^b, y^c), world interest rates, and the exchange rate between the large countries' currencies (e_c^b) are all unchanged (so that the value of A's currency relative to both B and C will be the same, that is, $e_b^a = e_c^a$). Fixing any one of these exchange rates implies that the other must also be fixed. With fixed exchange rates (regimes 1, 2, and 3), the money supply in A is endogenous and we can use equations (1) and (4) to solve for the small country's money supply and output. The solutions are the same for the three fixed-rate regimes. With flexible exchange rates (regime 4), money supply in A is fixed, and we can use equations (1) and (4) to solve for the small country's exchange rate e_b^a ($= e_c^a$) and output. The results are shown in Table 3.

For a monetary disturbance in the small country (ϵ^a), all fixed-rate regimes provide perfect insulation, while a flexible rate affects both output and the exchange rate. For a real disturbance in the small country (μ^a), a flexible rate is a perfect insulator because it adjusts in such a way as to crowd out private expenditure. For example, an increase in expenditure leads to a real appreciation, which reduces spending on tradables by both residents

TABLE 3

SOLUTIONS FOR DISTURBANCES ORIGINATING IN COUNTRY A

	Real	Monetary
Fixed-rate regimes (1, 2, 3)	$\Delta y^a/\Delta\mu^a = \alpha_6$	$\Delta y^a/\Delta\epsilon^a = 0$
Floating-rate regime (4)	$\Delta y^a/\Delta\mu^a = 0$	$\Delta y^a/\Delta\epsilon^a = -1/\alpha_{15}$

and foreigners. This is the well-known Mundell-Fleming result. In contrast, a real disturbance has some effect on output under all fixed-rate regimes.

Foreign shocks. Now consider disturbances that originate in the large countries B or C.[2] For convenience, we assume that B and C are identical in size and the structural coefficients in B and C are identical. We use equations (2), (3), (5), and (6) to solve for the large countries' outputs, the interest rate, and the exchange rate e_c^b. We then turn to the equations for A to find the impacts on the small country under the four exchange-rate regimes. The solutions are given in Table 4.

TABLE 4

SOLUTIONS FOR DISTURBANCES ORIGINATING IN COUNTRIES B AND C

$\Delta y^b/\Delta\mu^b$	$= (\alpha_{10}\alpha_{18})/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$
$\Delta e_c^b/\Delta\mu^b$	$= - \{(\alpha_{10}\alpha_{18}/\alpha_{12})[(1 - \alpha_7) + (\alpha_{13}/\alpha_{18})]\}/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$
$\Delta y^b/\Delta\epsilon^b$	$= - [\alpha_{18}(1 - \alpha_7) + 2\alpha_{13}]/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$ *
$\Delta e_c^b/\Delta\epsilon^b$	$= - (1 + \alpha_7)/2\alpha_{12}$
$\Delta r/\Delta\mu^b$	$= \alpha_{10}/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$
$\Delta y^c/\Delta\mu^b$	$= \alpha_{10}\alpha_{18}/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$
$\Delta r/\Delta\epsilon^b$	$= (1 - \alpha_7)/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$
$\Delta y^c/\Delta\epsilon^b$	$= \alpha_{18}(1 - \alpha_7)/2[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]$ *

* Note that $(\Delta y^b + \Delta y^c)/\Delta\epsilon^b < 0$, as indicated in the text. By assumption: $\alpha_7 = \alpha_{11}$, $\alpha_8 = \alpha_{12}$, $\alpha_9 = \alpha_{13}$, $\alpha_{17} = \alpha_{19} = 1$, $\alpha_{18} = \alpha_{20}$, $\alpha_7 < 1$.

Consider first a monetary disturbance. We have the result

$$\Delta y^b/\Delta\epsilon^b < 0\ ;\ \Delta y^c/\Delta\epsilon^b > 0\ ;\ \Delta y^b/\Delta\epsilon^c > 0\ ;\ \Delta y^c/\Delta\epsilon^c < 0\ .$$

A rise in the demand for money in B lowers output in B but increases output in C. A parallel result holds for a shock in C. We also note that a money-demand shock will on balance lower world output; that is, $(\Delta y^b + \Delta y^c)/\Delta\epsilon^b < 0$. Exchange-rate effects are also straightforward. A money-demand disturbance in B leads to an appreciation of B's currency ($\Delta e_c^b/\Delta\epsilon^b < 0$). A par-

[2] A similar simple two-country model appeared in Mundell (1964).

allel disturbance in C appreciates C's currency ($\Delta e^b_c/\Delta\epsilon^c > 0$). Finally, the interest rate rises in B and C:

$$(\Delta r/\Delta\epsilon^b > 0 \quad \text{and} \quad \Delta r/\Delta\epsilon^c > 0) .$$

We now examine the impact on A under each exchange-rate regime for a money-demand shock originating in B. Parallel results obtain when the shock originates in C. Note that for each of the fixed-rate regimes the money supply in A is endogenous. In each case, A is faced with a fall in B's output, a rise in C's output, and a higher world interest rate.

In the first case, where A pegs to B's currency, we have $e^a_c = e^b_c$ (since $\Delta e^a_b = 0$). Now substitute the solutions for $e^b_c (= e^a_c)$, y^b, y^c, and r into equation (1) to obtain a solution for y^a. A's currency appreciates relative to C's. On balance, A's output falls because of the higher interest rate and the fall in demand in B (unless C is a much closer trading partner than B).

In the case where A pegs to C's currency, the major difference from fixing to B's currency is that A's currency will depreciate relative to B's. Thus the outcome is less deflationary than when A pegged to B, but it is difficult to determine *a priori* whether A's output rises or falls in absolute terms.

In the case of a fixed effective exchange rate ($\Delta e^f = 0$), equation (11) yields

$$e^a_b = -(1 - \beta_2)e^a_c/\beta_2 .$$

Substituting this into equation (10), we have

$$e^a_c = \beta_2 e^b_c \quad \text{and} \quad e^a_b = -(1 - \beta_2)e^b_c .$$

Country A again faces the same outcomes for foreign outputs (y^b, y^c) and the world interest rate, but B's currency appreciates relative to C's, hence A's currency depreciates relative to B's and appreciates relative to C's. Thus we can drop exchange rates altogether from equation (1).[3] Pegging the effective exchange rate falls somewhere between pegging to either B's or C's currency. As in the case of pegging to B's currency, A's output falls, provided C is not a dominant trading partner.

To sum up, then, for the three fixed-rate regimes, the first is the most deflationary, the second the least deflationary, the third gives an intermediate result.

Under a floating exchange rate, the solution for output is readily obtained directly from A's money-market equation. With m^a and p^a fixed by assumption, we have

$$\Delta y^a/\Delta r = \alpha'_{16}/\alpha_{15}$$

[3] The exchange-rate term is $\alpha_1 b_4(h_1 + h_2)\,[b_2 e^a_b + (1 - b_2)e^a_c]$, where the bracketed expression is of course the effective rate (equation 11).

or from Table 4, using the solution for r,

$$\Delta y^a/\Delta\epsilon^b = \alpha_{16}(1 - \alpha_7)/(2\alpha_{15}[\alpha_{18}(1 - \alpha_7) + \alpha_{13}]) .$$

A higher world interest rate must raise output in A. We can now solve for e^a_b from equation (1), recalling that e^b_c, y^a, y^b, y^c, and r are predetermined, and e^a_c can then be solved out from equation (10). It is easy to demonstrate that A's currency is most likely to depreciate relative to B's.

We now consider a real disturbance originating in B. Again, we first solve the model for countries B and C. We know B's currency appreciates relative to C's, output increases in both B and C, and the interest rate rises in B and C (see Table 4).[4]

If A pegs its currency to B (option 1), there will be countervailing forces at work: on the one hand, the increases in output in B and C will put upward pressure on A's output; on the other hand, A's appreciation relative to C and the rise in interest rates will tend to exert downward pressure on output in A.

If A pegs its currency to C (option 2), there will be a depreciation relative to B. The only deflationary force at work will be through the interest-rate effect.

If A pegs its currency to a basket of B's and C's currencies (option 3), the effective rate will be unchanged, and the exchange-rate effect will be neutralized. We now have positive output effects from B and C traded against a higher world interest rate.

If A floats (option 4), we can again read the solution directly from the equilibrium condition in A's money market. It shows directly that output must rise in A. The effect on the exchange rate between A and B (e^a_b) is ambiguous because the increase in output may raise or lower A's interest rate relative to world levels, producing an appreciation or a depreciation of A's currency. If A's currency appreciates relative to B's, it will unambiguously appreciate relative to C's. If A's currency depreciates relative to B's, it may also depreciate relative to C's.

Flexible Wages and Prices

We now turn to the full model, which allows wages and prices to be flexible. Nevertheless, we assume that real wages, as defined in the aggregate supply equations, are fixed, so that all aggregate supply equations become functions of real effective exchange rates. Again we focus on real and monetary shocks. The analysis here may be viewed as encompassing a somewhat longer time horizon than in the model with fixed wages and prices.

[4] Output increases in the same proportion in B and C (see Table 4). The reason can be read directly from the two money-market equations. With $\Delta m^b = \Delta m^c = 0$, $r^b = r^c$, and with identical structural coefficients, the increase in output must be the same.

The outcomes for the independent two-country model are as in Argy and Salop (1983). Two results are important.

First, a monetary disturbance originating in either of the large countries will have a neutral real outcome: interest rates and output do not change, prices change in proportion to the monetary disturbance, and the currency also adjusts in proportion. Each country is totally unaffected by the other country's monetary disturbance because the currency moves in the opposite direction, exactly neutralizing the price change in the country where the shock originates.

Second, a real disturbance will have a beggar-thy-neighbor effect. Given that each aggregate supply is a function of the real exchange rate, an increase in output in one large country must reduce output in the other. Thus, an increase in expenditure in B increases B's output, but this occurs at C's expense.

Domestic shocks. Consider the case where disturbances originate in the small country. Its interest rate cannot change because a monetary shock has neutral effects. With fixed exchange rates there is monetary accommodation, but with flexible exchange rates there are proportionate changes in prices and exchange rates.

A real shock in the small country generates identical real (positive) effects under all exchange-rate regimes. The reason is that the only difference between the flexible- and fixed-rate regimes lies in the amount of money generated. Recall that with flexible exchange rates the money supply is exogenous, but it is endogenous under the fixed-rate regimes. Since money is neutral, real outcomes are the same. The same real appreciation will be associated with the increase in output under both fixed and floating rates. Under fixed rates, prices rise to produce the requisite appreciation of the real exchange rate. Under flexible rates, the nominal rate appreciates by more than prices fall.[5]

In summary, the exchange-rate regime has no real effects when wages and prices are flexible. There are still consequences for inflation, however, and we examine these next.

Foreign shocks. Consider the effects on country A of a monetary disturbance in B (ϵ^b). B's currency appreciates in proportion, prices in B fall in proportion, and interest rates and output are unchanged. In C the real exchange rate, output, prices, and the interest rate are all unchanged. In A the interest rate is unchanged. If A pegs to B (option 1), then from equation (1) for aggregate demand (with y^b, y^c, r, e^a_b, and p^c all fixed) we have

$$y^a = -\alpha_1\beta_4(\phi_1 + \phi_2)\,[p^a - \beta_2 p^b - (1 - \beta_2)e^a_c]\,,$$

and from equation (7) for aggregate supply we have

[5] The latter result is easily obtained from equation (4).

$$y^a = \alpha_{21}(\phi_1 + \phi_2)[p^a - \beta_2 p^b - (1 - \beta_2)e_c^a] .$$

The bracketed expression in each case is the real effective exchange rate. The first result shows that for output to increase the real effective exchange rate must depreciate; the second result shows that for output to increase the real effective exchange rate must appreciate. It follows therefore that output and the real effective exchange rate cannot change.

We know that

$$\Delta p^a - \beta_2 \Delta p^b - (1 - \beta_2)\Delta e_c^a = 0 ,$$

and that

$$\Delta p^b = - \Delta \epsilon^b \quad \text{and} \quad \Delta e_c^a = - \Delta \epsilon^b .$$

Rearranging, we obtain

$$\Delta p^a + \beta_2 \Delta \epsilon^b + (1 - \beta_2)\Delta \epsilon^b = 0 \quad \text{or} \quad \Delta pa/\Delta \epsilon^b = - 1 .$$

Prices in A will fall in the same proportion as prices in B, so that A imports deflation from B. This is what we would expect when A pegs to B's currency. At the same time, A's currency will appreciate relative to C's, which exactly offsets the now relatively lower price level in A. A's interest rate will remain unchanged.

If A pegs to C's currency (option 2), A absorbs B's monetary disturbance in exactly the same way as B does. A's currency depreciates relative to B's to counter B's lower price level. All other variables remain unchanged.

If A pegs to a basket of B and C currencies (option 3), then by parallel reasoning output in A will be unchanged. A's currency now depreciates relative to B's but appreciates relative to C's. At the same time, prices fall in A but by less than in B.[6]

Finally, if A floats its currency (option 4), output will again be unchanged (by parallel reasoning). From equation (4) it can be seen that A's prices will be unchanged, while its currency will depreciate relative to B's in proportion to the monetary disturbance in B. It follows from this that A's exchange rate relative to C will be unchanged.

The main conclusion to be drawn from this analysis is that A can shelter its price level from monetary disturbances originating in either B or C by allowing its exchange rate to float or by pegging to the country that does not experience the shock. Otherwise, it has to import some inflation whether it pegs directly to the currency of the country experiencing the monetary shock or adopts a fixed effective exchange rate. (The price effect is smaller, however, with a fixed effective rate.)

Consider next a real disturbance originating in B. Output increases in B

[6] From equation (7), $p^a/u_2 b = - b_2$.

and falls in C; B's currency appreciates, and C's currency depreciates. The world interest rate rises. Prices in C rise relative to prices in B.

For each policy regime, A is now confronted with all of these changes from abroad. To get a feel for what is happening here, consider a special case. Suppose $\Delta y^b = -\Delta y^c$ and that A's trade weights with B and C are the same; then the change in output abroad does not directly affect A. From equation (1), aggregate demand in A is

$$y^a = -\alpha_1\beta_4(\phi_1 + \phi_2)\lambda^f - \alpha_5 r\,, \qquad (12)$$

where $\lambda^f = p^a - \beta_2(e^a_b + p^b) - (1 - \beta_2)(p^c + e^a_c)$, which is (minus) the real effective rate. From equation (7), aggregate supply in A is

$$y^a = \alpha_{21}(1 - \beta_1)\lambda^f\,, \qquad (13)$$

where $1 - \beta_1 = \phi_1 + \phi_2$.

Equating demand with supply and knowing that the world interest rate must rise, it follows that output in A must fall. At the same time, the real effective exchange rate must depreciate. These outcomes are independent of the exchange-rate regime.

In summary, we have found that in a world of flexible prices and wages, the exchange-rate regime does not influence the real effects of any shock. Even in the case of a real shock in either of the large countries, which causes an output loss in A, the size of the loss is independent of the exchange-rate regime. However, there are different inflationary consequences. A fixed exchange rate for a domestic monetary shock and a floating exchange rate for a foreign monetary shock (or pegging to a country not experiencing the shock) will completely offset the price effects of the shock.

The Dynamics of Adjustment

The analysis so far has been static, concentrating on the effect of shocks when goods prices are sticky (the short run) and the alternative extreme where all prices are fully flexible (the long run). The next obvious step is to deal with the dynamics of adjustment between these two extremes and to deal explicitly with the formation of expectations. It must be emphasized, however, that in general dynamics are not well captured in theoretical models. Such models tend to specify extremely simple paths of adjustment that are chosen arbitrarily for analytical convenience (see Dornbusch, 1976, and Buiter, 1986). Rather than follow this path, we feel that it is probably best to leave such dynamics to simulations of dynamic econometric models, as indeed we do in the last chapter. Nonetheless, it is worth considering briefly the possible modifications to the analysis that some simple dynamics would make. This helps us understand the more complex dynamics of the empirical model.

In dealing with dynamics, it is convenient to think in terms of several potential phases of adjustment. For monetary disturbances, there is a first phase when only financial markets adjust. This phase is absent for real disturbances. If wages and prices are sticky, we can identify a second phase of adjustment in which the real economy adjusts, while wage and price changes remain relatively modest. Finally, there is a third phase in which wages and prices fully adjust; at the same time, portfolio balance is restored and wealth effects work themselves off (see Branson and Buiter, 1983, and Allen and Kenen, 1980).

In a crude way, we have already accommodated the second and third phases by taking the polar cases of zero and full wage indexation (our own model of course ignores portfolio and wealth effects). Consider, then, the first phase and suppose there is a money-demand shock originating in country B. In this phase, only interest rates and exchange rates are assumed to adjust, as in Dornbusch's famous model. But it is no longer appropriate to assume that interest rates are the same in B and C, because interest rates can differ across countries, provided the difference is offset by expected changes in exchange rates.

Under a floating exchange rate, the monetary disturbance in B raises the interest rate in B. At the same time, there is a rational expectation that B's currency will ultimately appreciate in the same proportion. C's interest rate cannot change, because its money, output, and prices are all unchanged. As in Dornbusch's model, B's currency must initially overshoot, appreciating by more than it will in the long run. If A's currency is pegged to B's, there is a "one shot" outflow of capital into B, raising A's interest rate to B's level. A's currency will then overshoot vis-à-vis C's. If, however, A's currency was pegged to C's, A's interest rate would not change. Further elaboration of the dynamics of adjustment can be found in Chapter 5.

A Symmetrical Fixed-Exchange-Rate Regime (McKinnon Rule)

We now consider what happens if B and C stabilize their bilateral rate (e.g., along the lines of target-zone proposals).[7] We proceed as if B and C adopted an extreme version of stabilization and actually pegged their bilateral rate. Our primary interest is in evaluating how this affects A.

The small country still has a choice to make, but its options are now more limited. It can either peg to the two (pegged) currencies or float independently. The effects on A of disturbances originating in A have already been discussed under global floating. These results will not change. We therefore focus on the impacts on A of disturbances originating in B or C under floating and fixed rates for A's currency.

[7] On the target-zone proposal, see Williamson (1983) and Frenkel and Goldstein (1986).

As in previous chapters, we deal with the two polar cases of fixed wages and prices and of full wage indexation.

Fixed Wages and Prices

First, analyze the effects of a monetary and a real disturbance originating in B.

For ease of exposition we rewrite the model with one important addition. Again assume identical structural coefficients in B and C:

$$y^b = \alpha_7 y^c - \alpha_9 r + \alpha_{10}\mu^b \quad (2a)$$

$$y^c = \alpha_7 y^b - \alpha_9 r \quad (3a)$$

$$m^b = \alpha_{17} y^b - \alpha_{18} r + \epsilon^b \quad (5a)$$

$$m^c = \alpha_{17} y^c - \alpha_{18} r \quad (6a)$$

$$m^b = -m^c . \quad (14)$$

Equations (2a) to (6a) reproduce a simpler version of the model. Equation (14) shows that any increase in money in B must be exactly offset by a decrease in money in C. Domestic assets of the two central banks are assumed fixed.

The model in this form has five equations that we solve for y^b, y^c, r, m^b, and m^c. Table 5 shows the solutions for output in B and C. Table 6 shows the direction of change in variables for two disturbances and the exchange-rate regimes.

TABLE 5

SOLUTIONS FOR MONETARY AND REAL DISTURBANCES IN COUNTRY B

Δy^b	$= \alpha_{10}(2\alpha_{18} + \alpha_9\alpha_{17})\Delta\mu^b/(1 + \alpha_7)\gamma - \alpha_9\Delta\epsilon^b/\gamma$
Δy^c	$= \alpha_{10}(2\alpha_7\alpha_{18} - \alpha_9\alpha_{17})\Delta\mu^b/(1 + \alpha_7)\gamma - \alpha_9\Delta\epsilon^b/\gamma$
γ	$= 2[\alpha_{18}(1 - \alpha_7) + \alpha_9\alpha_{17}]$

The results are fairly straightforward. A money-demand disturbance in B lowers output in B and C equally and raises the world interest rate. The money supply rises in B but falls in C as capital flows from C to B. Output in C falls because B's demand for C's exports falls. A real disturbance in B raises output in B and raises the world interest rate. Again, capital flows from C, which expands the money supply in B but contracts it in C. The effect on C's output is ambiguous, because the stronger foreign demand is offset by the higher interest rate. If expenditure is interest insensitive in C, output will expand in C.

TABLE 6

DIRECTION OF CHANGE IN VARIABLES FOR MONETARY AND REAL DISTURBANCES ORIGINATING IN COUNTRY B

	Impact on				
Disturbance	y^b	y^c	r	m^b	m^c
ϵ^b	↓	↓	↑	↑	↓
μ^b	↑	?	↑	↑	↓

	Impact on		
	y^a	m^a	e_b^a
ϵ^b (fixed rate)	↓	↓	–
ϵ^b (floating rate)	↑	–	↑
μ^b (fixed rate)	?	↓	–
μ^b (floating rate)	↑	–	↑

How are these effects transmitted to A? Consider first the monetary disturbance in B. Suppose A pegs its currency to those of B and C. Then in A we have

$$y^a = \alpha_1\phi_1 y^b + \alpha_1\phi_2 y^c - \alpha_2 r + \alpha_1\beta_4(\phi_1 + \phi_2)e_b^a \tag{15}$$

$$m^a = \alpha_{15}y^a - \alpha_{16}r\ . \tag{16}$$

With e_b^a fixed, these two equations determine output and the money supply in A, with y^b, y^c, and r all predetermined as above. With foreign outputs lower and the interest rate higher, output in A must be lower too. With r higher and y^a lower, moreover, A's money supply must fall.

What happens if A floats its currency and keeps its money supply fixed? Equations (15) and (16) now determine A's output and exchange rate. It is readily seen from equation (16) that output in A must rise. Furthermore, we see from equation (15) that with outputs in B and C lower, r higher, and A's output higher, A's currency must depreciate. In other words, there must be a depreciation that more than compensates for the output-reducing effects of lower outputs in B and C and a higher world interest rate.

Now consider a real disturbance in B. If A adopts a fixed exchange rate, the effect on A's output is ambiguous. Output abroad must increase, so with similar weights attaching to B and C ($\phi_1 = \phi_2$) there is upward pressure on A's output. But the higher world interest rate puts downward pressure on A's output, so the net effect is ambiguous. This also means that the net impact on A's money supply is ambiguous.

Suppose A's currency floats. With the money supply fixed, it can be seen from equation (16) that A's output must increase. What happens to A's currency? We have

$$e_b^a = y^a/k - \alpha_1\phi_1 y^b/k - \alpha_1\phi_2 y^c/k + \alpha_2 r/k, \tag{17}$$

where $k = \alpha_1\beta_4(\phi_1 + \phi_2)$. Therefore, the outcome is ambiguous. If the increase in output raises A's interest rate above the world level, A's currency will appreciate.

In summary, under a global McKinnon rule an increase in the demand for money in either of the large countries is negatively transmitted to A under a fixed exchange rate and positively transmitted to A under a floating rate. A real shock in the large countries is positively transmitted to A under a floating rate but has ambiguous effects under a fixed rate.

Flexible Wages and Prices

Consider first a monetary disturbance in B. In this model, prices in B and C will decrease in the same proportion. At the same time, their outputs and the interest rate will be unchanged. Capital will flow out of C into B. This result is the classical two-country gold-standard case.

To understand what is happening here we rewrite the appropriate equations for B and C, substituting the real exchange rate e^r for $(p^c - p^b)$:

$$y^b = \alpha_7 y^c + \alpha_8 e^r - \alpha_9 r + \alpha_{10}\mu^b \tag{18}$$

$$y^c = \alpha_{11} y^b - \alpha_{12} e^r - \alpha_{13} r \tag{19}$$

$$y^b = -\alpha_{22}(1 - b_5)e^r \tag{20}$$

$$y^c = \alpha_{23}(1 - b_6)e^r . \tag{21}$$

These four equations determine e^r, y^b, y^c and r. Since ϵ^b does not appear in any of these equations, all these variables are unaffected by that disturbance. Using equations (14), (5), and (6) we have

$$\Delta p^b + \Delta\epsilon^b = -\Delta p^c \quad \text{and thus} \quad (\Delta p^b + \Delta p^c)/\Delta\epsilon^b = -1 .$$

Given that e^r ($= p^c - p^b$) is unchanged, the result outlined above will hold. It is worth noting that prices in each country fall by less than in proportion to the monetary shock. The reason is that some of the shock in B is accommodated by a capital inflow from C.

What will happen in A? Recall that $e_b^a = e_c^a$ and $p^b = p^c$:

$$y^a = \alpha_1\phi_1 y^b + \alpha_1\phi_2 y^c - \alpha_1\beta_4(\phi_1 + \phi_2)[p^a - p^b - e_b^a] - \alpha_4 r \tag{22}$$

$$y^a = \alpha_{21}(1 - \beta_1)[p^a - p^b - e_b^a] \tag{23}$$

$$m^a = \alpha_{15}y^a - \alpha_{16}r + p^a . \tag{24}$$

With a fixed exchange rate, equations (22) and (23) determine y^a and p^a. It is evident from these two equations that $(p^a - p^b)$ and y^a cannot change. So $\Delta p^a = \Delta p^b$. The price in A falls in the same proportion as it does in B and C.

What if A's currency floats? From equation (24) it is evident that p^a is fixed when m^a, y^a, and r are all fixed. Furthermore, from equations (22) and (23), e^r $(= p^b + e_b^a - p^a)$ cannot change. Finally, with p^a fixed, we have $\Delta e_b^a = -\Delta p^b$. In other words, a depreciation of A's currency will protect A from the lower world inflation.

In the case of a real disturbance in B, equations (18) to (21) allow us to solve for e^r, y^b, y^c, and r. It can be shown that $\Delta e^r/\Delta\mu^b < 0$. This implies that there will be a real appreciation of B's currency. From equation (20), B's output will rise. The mirror image is the fall in C's output given by equation (21). This parallels the result for a flexible exchange rate. At the same time, the world interest rate will rise.[8]

What happens in A? Assuming again that $\phi_1 = \phi_2$ and $y^b = -y^c$, we can again use equations (12) and (13) to reach the same result as previously. Country A will experience a real effective depreciation and output will fall. This is again independent of A's exchange-rate regime.

An Asymmetrical Fixed-Exchange-Rate Regime (Dollar Standard)

Fixed Wages and Prices

We repeat the basic equations of the model:

$$y^b = \alpha_7 y^c - \alpha_9 r + \alpha_{10}\mu^b \tag{2a}$$

$$y^c = \alpha_7 y^b - \alpha_9 r \tag{3a}$$

$$m^b = \alpha_{17}y^b - \alpha_{18}r + \epsilon^b \tag{5a}$$

$$m^c = \alpha_{17}y^c - \alpha_{18}r . \tag{6a}$$

Because of the asymmetry assumed, it is important to alternate countries insofar as sterilization is concerned.

Consider first the case in which disturbances originate in B and B is also

[8] This can be shown by using the equation $m^b = -m^c$, assuming the same coefficients in B and C, and recalling that $p^b > p^c$ (the real exchange rate falls).

the country that sterilizes. We then have the four equations determining m^c, y^b, y^c, and r, with m^b exogenous by definition. For a monetary disturbance in B, output falls in both B and C, and the interest rate rises. For a real disturbance in B, output rises in B but the effect on C's output is ambiguous, for reasons already mentioned.

Consider next the case in which disturbances originate in B but C is the country that sterilizes. Here, m^c is exogenous while m^b is endogenous. The outcomes are now in sharp contrast to the previous case. Equations (2a), (3a), and (6a) may now be solved independently for y^b, y^c, and r, and the disturbance ϵ^b does not appear in the solutions. Hence, a monetary disturbance in B, with C sterilizing, has no real effects in either B or C, and there will be no change in the interest rate.

It is different, however, with a real disturbance in B. Previously, with C not sterilizing, C's money supply fell while it was fixed in B. Now the money supply in B is allowed to increase while it is not allowed to fall in C. Hence, world output is higher in this asymmetrical case. At the same time, with the deflationary effect suppressed in C, output will increase in both B and C.

What happens in A? Consider the case where B sterilizes. If A pegs its currency, a monetary disturbance in B will also depress output in A; see equation (22). The deflationary impact is stronger than in the previous symmetrical case because, with symmetry, the world money supply is fixed whereas it falls with asymmetry. If A floats and m^a is fixed, output increases. From the money-market equilibrium condition it can be seen that the increase in output is larger in this case because the increase in the world interest rate is larger. The transmission runs from higher world interest rates to a real depreciation, which stimulates output in A.

Suppose C sterilizes and B does not. Country A is clearly now unaffected by the monetary disturbance in B, but the analysis is more complicated for a real disturbance. The effect on A's output is ambiguous because, although output increases in B and C, the world interest rate also increases.

Flexible Wages and Prices

Suppose B sterilizes and C does not. From equations (18) to (21), y^b, y^c, e^r, and $\dot{r}$ will be unchanged. Prices in B and C will fall equally but, importantly, in proportion to the monetary disturbance.

Equation (5) shows this clearly. In B, with m^b, y^b, and r all fixed, $\dot{p}^b$ falls in proportion to ϵ^b. In C, with y^c, ϵ^c, and r fixed, m^c falls in proportion to p^c. If A pegs, it would import the same (larger) drop in the price level. If A floats, it can insulate itself from the (now larger) price shock abroad.

Suppose we have a real disturbance in B. The only difference between this case and the symmetrical case lies in the change in the world money supply. It was fixed before, but now it falls. Since a monetary change has only price effects, all real outcomes remain unchanged. We also have a parallel impact on A. It will experience a real effective depreciation and its output will fall, whatever exchange-rate regime it adopts.

Suppose C sterilizes and B does not. We have already seen that nothing changes. The excess demand for money will be fully accommodated, and A is unaffected.

For a real disturbance, we can apply reasoning similar to the previous case. The world money supply increases, but this affects only the world price level.

4 THE MSG2 MODEL OF THE WORLD ECONOMY

This chapter extends the analysis in the first part of the study by using the MSG2 simulation model of the world economy to quantify the various results found in the theoretical model.

The version of the MSG2 model used here is more fully described in McKibbin (1988).[1] The MSG2 model can be described as a dynamic general-equilibrium model of a multi-region world economy. The regions modeled in the study are the United States, Japan, Australia, the rest of the OECD economies (denoted ROECD), the non–oil-producing developing countries (LDCs), and the oil-exporting countries (OPEC). The model is of moderate size (about three dozen behavioral equations per industrial region). It is distinguished from most other global models in that it solves for a full intertemporal equilibrium in which agents have rational expectations regarding future variables.

The MSG2 model relies heavily on the assumption that economic agents maximize intertemporal objective functions. This idea is very similar to the strategy followed in Computable General Equilibrium (CGE) models, except that the concepts of time and dynamics have fundamental importance in the MSG2 model. The various rigidities that are apparent in macroeconomic data are taken into account by allowing for deviations from fully optimizing behavior. As with any modeling project that purports to describe reality, there is an inevitable tradeoff between theoretical rigor and empirical regularities.

The model has some Keynesian properties, because it assumes slow adjustment of nominal wages in the U.S. and ROECD labor markets. Japan is treated somewhat differently, as mentioned below.

The model is solved in a linearized form to facilitate policy-optimization exercises and especially to use linear-quadratic dynamic game theory and dynamic programing-solution techniques. (In general, quantity variables are linearized around their levels relative to potential GDP, while price variables are linearized in log form.) We have experimented with the full nonlinear model and found that its properties correspond closely to those of the linearized model, particularly in the initial years following a shock. The

[1] In this model, Australia is modeled in a way similar to the United States. The Australian bloc therefore partly ignores the important role that commodities play in determining the Australian real exchange rate (see Blundell-Wignall and Thomas, 1987). This issue is examined more closely in McKibbin and Siegloff (1988).

global stability of the linearized model can readily be confirmed by an analysis of the model's eigenvalues.

In fitting the model to macroeconomic data we adopt a mix of standard CGE calibration techniques and econometric time-series results. In CGE models, the parameters of production and consumption decisions are determined by assuming a particular functional form for utility functions and production functions and using data from an expenditure-share matrix or an input-output table to represent an equilibrium. For example, if utility is assumed to be a Cobb-Douglas nesting of the consumption of different goods, then the parameters of the utility function, and therefore those of the demand functions for different goods, are given by the expenditure shares provided by the data. (In this example, the demand function for each good will have unitary price and income elasticities.) In most cases, the data will determine the parameters of the model, although additional econometric analysis is sometimes required. The question of calibrating the model is discussed further in McKibbin and Sachs (1989).

The model has several attractive features. First, all stock-flow relationships are carefully specified. Budget deficits cumulate into stocks of public debt; current-account deficits cumulate into net foreign investment positions; and physical investment cumulates into the capital stock. Underlying growth of Harrod-neutral productivity *plus* labor-force growth is assumed to be 3 percent per region. Given the long-run properties of the model, the world economy settles down to the 3 percent steady-state growth path following any initial disturbance.

A second attractive feature is that the asset markets are efficient in the sense that asset prices are determined by a combination of intertemporal arbitrage conditions and rational expectations. Under the rational-expectations assumption and with partly forward-looking behavior by households and firms, the model can be used to examine the effects of anticipated future policy changes.

A third attractive feature is the specification of the supply side. There are several noteworthy points. First, input decisions are partly based on intertemporal profit maximization by firms; labor and intermediate inputs are selected to maximize short-run profits, given the stock of capital, which is fixed within each period. The capital stock is adjusted gradually according to a "Tobin's q" model of investment. (Tobin's q is the shadow value of capital and evolves according to a rational-expectations forecast of future post-tax profitability.)

Finally, wage-price dynamics are specified differently for the various industrial regions. Extensive macroeconomic research has demonstrated important differences in the wage-price processes in the United States, Europe, and Japan, and these are incorporated in the model. In particular, the United States and ROECD (including Canada) are characterized by nominal wage rigidities arising from long-term nominal wage contracts. Nominal wages in Japan, by contrast, are renegotiated on an annual, synchronized cycle, with the nominal wage selected for the following year chosen to clear the labor market, given the currently available information about prospective demand and supply. Nominal wages in the ROECD are assumed to be more forward looking than in the United States, though real wages adjust slowly to clear the labor market.

A more detailed derivation of the model can be found in McKibbin and Sachs (1989), with the Australian model described in McKibbin (1988).

Following the theoretical analysis in Chapter 3, three exchange-rate regimes for the world economy are considered. In the first, the major industrial economies allow their exchange rates to float. In the second, they adopt a gold standard à la McKinnon, in which the exchange rates between major regions are fixed and the global money stock is controlled collectively, with responsibility for balance-of-payments adjustment allocated symmetrically between countries. In the third regime, Japan and the ROECD each maintain a fixed exchange rate vis-à-vis the U.S. dollar. Within each regime, we assume that the small economy (Australia) has four options: pegging to the U.S. dollar, pegging to the yen, pegging to a basket consisting of the dollar and the yen, and free floating. In addition, we examine the implications of three assumptions about labor markets in the small economy: wage contracts that set nominal wages one period in advance based on past prices, expectations about future prices, and labor-market conditions; fixed real wages; and market-clearing real wages. This wage-setting assumption implies fixed nominal wages in the short run (for unanticipated shocks) and market-clearing wages in the long run.

In each of the regimes, we examine the implications for output and inflation in Australia of foreign fiscal and monetary shocks and domestic fiscal and monetary shocks. A summary of the numerous alternative assumptions is provided in Table 7.

There are several differences between the analysis with the MSG2 model and that already undertaken with the theoretical model. First, the MSG2 model has more than three regions in the world economy, although the results focus on the United States, Japan, and Australia. Second, when examining different labor-market assumptions in the MSG2 model, we analyze changes in labor-market behavior in Australia but work with unchanging labor-market assumptions for the rest of the world. In the MSG2 model, wages are sticky but prices are flexible market-clearing prices, whereas in Chapter 3 we assumed that both wages and prices were

TABLE 7

ALTERNATIVE ASSUMPTIONS IN THE MSG2 MODEL

World economy:
Floating exchange rates
McKinnon Rule
Dollar standard
Australian economy:
Exchange rate:
Peg to U.S. dollar
Peg to Japanese yen
Peg to a dollar-yen basket
Float
Labor market:
Wage contracts (short-run nominal wage rigidity)
Rigid real wages
Market-clearing real wages
Shocks:
U.S.:
Real
Monetary
Australia:
Real
Monetary

sticky in the short run. (Given the supply side of the model, though, it can be shown that prices could be written as a markup over factor costs. This implies that price adjustment will be sluggish but not constant: the price of imported inputs can vary with the exchange rate and this will quickly feed through into domestic prices.)

5 SIMULATION RESULTS

The simulation results are discussed at two levels. First we examine the standard errors of Australian output and inflation for each exchange-rate and labor-market regime in the face of each shock, over a two-year horizon. This provides a convenient summary of the results. We then examine specific results in detail when that helps to elaborate on the discussion in Chapter 3.

Variance of Targets under Different Regimes

Tables 8 to 10 contain the standard errors of output and inflation in Australia for each regime and each shock over a two-year horizon.[1] Table 8A contains the standard errors of output and Table 8B the standard errors of inflation when the world adheres to floating exchange rates. The first element in each panel is the standard error produced by an exogenous increase in U.S. demand under the assumption that wages in Australia follow a wage contract and the Australian dollar is pegged to the U.S. dollar. In Table 8A, output in Australia has a standard error of 1.14. This compares with 0.41 when the Australian dollar is pegged to the yen, 0.37 when it is pegged to a $U.S.-yen basket, and 0.16 when the Australian dollar floats.

A general point emerges from Table 8A. As in the theoretical model, the exchange-rate regime is irrelevant for the variability of real output when real wages are fixed or are market clearing. In Table 8B, by contrast, price variability depends on the Australian exchange-rate regime.

In the case of nominal-wage stickiness, the floating exchange rate minimizes the output loss for real foreign and real domestic shocks. It is dominated by the fixed-rate regimes for a domestic money shock. One interesting result is that pegging to the basket of currencies minimizes the output effects of the U.S. real shock relative to the other fixed-rate regimes. This pegged-rate regime also dominates the floating-rate regime for a U.S. monetary shock. This may seem surprising, since pegging to the basket is intermediate between pegging to individual currencies. The reason is that this measure of loss is a standard deviation. When pegging to the U.S. dollar, output contracts because monetary policy in Australia tightens to prevent depreciation of the currency. When pegging to the yen, by contrast, output rises because monetary expansion accompanies the shock as Australia acts

[1] We also calculated the same tables over a five-year horizon and found them to be qualitatively similar to the results presented.

TABLE 8

STANDARD ERRORS OF OUTPUT AND INFLATION WHEN THE WORLD ADHERES TO FLOATING EXCHANGE RATES, TWO-YEAR HORIZON

Wage Setting	Australian Exchange-Rate Regime: Peg to $U.S.	Peg to Yen	Peg to $U.S.-Yen Basket	Float
A. OUTPUT				
U.S. real shock:				
Contract	1.14	0.41	0.37	0.16
Fixed rate	0.22	0.22	0.22	0.22
Market-clearing	0.10	0.10	0.10	0.10
U.S. monetary shock:				
Contract	0.16	0.24	0.05	0.12
Fixed rate	0.11	0.11	0.11	0.11
Market-clearing	0.05	0.05	0.05	0.05
Australian real shock:				
Contract	1.94	1.93	1.94	0.79
Fixed rate	1.43	1.43	1.43	1.43
Market-clearing	0.64	0.64	0.64	0.64
Australian monetary shock:				
Contract	0	0	0	0.41
Fixed rate	0	0	0	0
Market-clearing	0	0	0	0
B. INFLATION				
U.S. real shock:				
Contract	0.97	0.59	0.20	0.30
Fixed rate	1.65	0.91	0.41	0.46
Market-clearing	1.71	0.84	0.45	0.39
U.S. monetary shock:				
Contract	0.30	0.13	0.10	0.04
Fixed rate	0.42	0.26	0.14	0.03
Market-clearing	0.38	0.31	0.13	0.08
Australian real shock:				
Contract	0.83	0.82	0.82	0.49
Fixed rate	1.13	1.11	1.12	1.00
Market-clearing	1.63	1.63	1.63	0.44
Australian monetary shock:				
Contract	0	0	0	0.43
Fixed rate	0	0	0	0
Market-clearing	0	0	0	0

to prevent an appreciation of its currency relative to the yen. When pegging to a basket, these two monetary effects tend to cancel, leading to a smaller change in output.

Turning to the results for inflation in Table 8B, the floating exchange rate works well for both U.S. shocks and for a domestic real shock, but again, as shown in Chapter 3, it performs poorly for a domestic monetary shock. The basket peg also dominates the other fixed regimes in the face of foreign shocks. Whether or not the basket peg performs well, however, depends crucially on the weights used to construct the basket. In the current examples, the opposite movements of the two foreign currencies tend to replicate the floating-rate regime.

In summary, in a world of global floating, the results support the standard Mundell-Fleming conclusion that, for domestic real shocks, a floating-rate regime performs well, but a fixed rate exactly offsets a monetary shock. The results are less clear for foreign shocks. The floating rate and basket peg dominate both bilateral pegs. For a U.S. real shock, the floating rate dominates the basket peg in reducing the output loss but leads to greater price variability. This ordering is reversed with a U.S. monetary shock.

As already mentioned, the wage regime has a significant effect on the results. Referring again to Table 8A, market-clearing real wages in Australia minimize the output effects of all shocks. However, the inflation loss is minimized under the wage-contracting system, because nominal wages are rigid in the short run.

Results for the McKinnon Rule are presented in Table 9. Several points emerge. First, the form of the small country's exchange-rate peg does not matter in a fixed-rate world. Second, the floating-rate regime performs better than the fixed-rate regimes in terms of output and inflation variability for all shocks except an Australian monetary shock and performs marginally worse in terms of inflation for a U.S. real shock. Note, however, that the floating rate performs better than the fixed rate for a U.S. money shock. Finally, the hedging opportunity provided by the basket peg in a world of global floating is eliminated in a fixed-rate world.

The results for the asymmetric dollar standard are presented in Table 10 and confirm the advantage of different regimes for different shocks.

An interesting issue is illuminated by the results in Tables 8 to 10—the implications for Australia of a particular shock under various global regimes. When there is a real shock in the United States, for example, and Australia floats, Australia is better off if the whole world is floating. This is because the U.S. shock is not transmitted as strongly to Australia's other trading partners, so that the secondary effects on Australia are dampened. In addition, if the world adopts fixed exchange rates, Australia is better off in the face of U.S. shocks under the McKinnon rule than under the dollar stan-

TABLE 9

STANDARD ERRORS OF OUTPUT AND INFLATION WHEN THE WORLD ADHERES TO THE MCKINNON RULE, TWO-YEAR HORIZON

	Australian Exchange-Rate Regime			
Wage Setting	Peg to $U.S.	Peg to Yen	Peg to $U.S.-Yen Basket	Float
		A. OUTPUT		
U.S. real shock:				
Contract	0.81	0.81	0.81	0.29
Fixed rate	0.64	0.64	0.64	0.64
Market-clearing	0.28	0.28	0.28	0.28
U.S. monetary shock:				
Contract	0.06	0.06	0.06	0.03
Fixed rate	0.01	0.01	0.01	0.01
Market-clearing	0	0	0	0
Australian real shock:				
Contract	1.94	1.94	1.94	0.79
Fixed rate	1.43	1.43	1.43	1.43
Market-clearing	0.64	0.64	0.64	0.64
Australian monetary shock:				
Contract	0	0	0	0.41
Fixed rate	0	0	0	0
Market clearing	0	0	0	0
		B. INFLATION		
U.S. real shock:				
Contract	0.24	0.24	0.24	0.27
Fixed rate	0.58	0.58	0.58	0.55
Market-clearing	0.80	0.80	0.80	0.28
U.S. monetary shock:				
Contract	0.09	0.09	0.09	0.03
Fixed rate	0.11	0.11	0.11	0.06
Market-clearing	0.11	0.11	0.11	0.06
Australian real shock:				
Contract	0.82	0.82	0.82	0.49
Fixed rate	1.12	1.12	1.12	1.00
Market-clearing	1.63	1.63	1.63	0.44
Australian monetary shock:				
Contract	0	0	0	0.43
Fixed rate	0	0	0	0.71
Market-clearing	0	0	0	0.71

TABLE 10

STANDARD ERRORS OF OUTPUT AND INFLATION WHEN THE WORLD ADHERES TO THE DOLLAR STANDARD, TWO-YEAR HORIZON

Wage Setting	Australian Exchange-Rate Regime			
	Peg to $U.S.	Peg to Yen	Peg to $U.S.-Yen Basket	Float
	A. OUTPUT			
U.S. real shock:				
Contract	1.20	1.20	1.20	0.15
Fixed rate	0.59	0.59	0.59	0.59
Market-clearing	0.26	0.26	0.26	0.26
U.S. monetary shock:				
Contract	0.19	0.19	0.19	0.08
Fixed rate	0.02	0.02	0.02	0.02
Market-clearing	0.01	0.01	0.01	0.01
Australian real shock:				
Contract	1.94	1.94	1.94	0.79
Fixed rate	1.43	1.43	1.43	1.43
Market-clearing	0.64	0.64	0.64	0.64
Australian monetary shock:				
Contract	0	0	0	0.41
Fixed rate	0	0	0	0
Market-clearing	0	0	0	0
	B. INFLATION			
U.S. real shock:				
Contract	0.76	0.76	0.76	0.46
Fixed rate	1.07	1.07	1.07	0.95
Market-clearing	1.31	1.31	1.31	0.69
U.S. monetary shock:				
Contract	0.25	0.25	0.25	0.07
Fixed rate	0.32	0.32	0.32	0.16
Market-clearing	0.32	0.32	0.32	0.15
Australian real shock:				
Contract	0.83	0.83	0.83	0.49
Fixed rate	1.12	1.12	1.12	1.00
Market-clearing	1.63	1.63	1.63	0.44
Australian monetary shock:				
Contract	0	0	0	0.43
Fixed rate	0	0	0	0.71
Market-clearing	0	0	0	0.71

dard. If the world floats, then Australia should either float or follow a basket peg. If the world fixes its rates, then Australia should float except in the case of unobserved monetary shocks. (If such shocks can be observed, there is no reason why, under floating rates, monetary policy cannot be used to offset a shock to the domestic demand for money. The advantage of the fixed-exchange-rate regime is that the shock is offset automatically.) For Australian shocks, no matter which regime the rest of the world follows, the effect within Australia is identical.

Dynamics of Adjustment under Different Regimes

These results provide a convenient summary of the ways in which combinations of shocks and regimes affect major target variables. We are also interested in the dynamics of adjustment, however, and in the movements of a wider range of macroeconomic variables.

Tables 11 to 14 show five-year outcomes for major macroeconomic variables under global floating rates. They describe the dynamics of adjustment to the different shocks. (When interpreting these tables, remember that the shocks are a rise in real aggregate demand and a rise in demand for money.)

Table 11 gives results for a real shock in the U.S. economy, simulated here as a permanent rise in real government expenditure equal to 1 percent of GNP, in a world where the major currencies are floating. It presents results for the United States and Japan and then for each exchange-rate and wage regime in Australia. Output and other major real variables are written as deviations from baseline measured as percentages of GNP, whereas inflation rates and interest rates are simple deviations from baseline and the exchange rate is the percentage deviation from baseline. For example, in the first year of the shock, U.S. output was 0.75 percent higher after the shock than it would otherwise have been, and U.S. inflation was 0.23 of a percentage point lower than it would otherwise have been. The shock stimulates the U.S economy and in doing so raises world interest rates and inflation and appreciates the U.S. dollar by 3.59 percent relative to the yen. Output in the United States is eventually crowded out, as rising interest rates reduce consumption and investment and the strong U.S. dollar crowds out exports. The foreign economies are stimulated by the rise in aggregate demand, but this is quickly offset by rising inflation and interest rates. The impact effects of the shock directly follow the results in the theoretical model.

In Australia, the various assumptions about exchange rates and wages have important implications. When the floating- and fixed-rate regimes are compared, Table 11 shows that pegging to the stronger U.S. dollar causes a large fall in Australian output because a monetary contraction accompanies

TABLE 11

WORLD FLOATING EXCHANGE RATES:
RESULTS OF A REAL SHOCK IN THE UNITED STATES

		Year				
		1	2	3	4	5
U.S. economy:						
Output	%GNP	0.75	0.66	0.43	0.24	0.13
Private consumption	%GNP	0.27	0.19	0.01	−0.15	−0.25
Private investment	%GNP	0.16	−0.18	−0.25	−0.30	−0.33
Government consumption	%GNP	1.00	1.00	1.00	1.00	1.00
Exports	%GNP	−0.23	−0.23	−0.24	−0.25	−0.25
Trade balance	%GNP	−0.36	−0.35	−0.33	−0.31	−0.30
Labor demand	%	0.55	0.47	0.15	−0.11	−0.24
Inflation	dev.	−0.23	0.14	0.24	0.20	0.11
Interest rate (short)	dev.	0.91	0.99	1.01	1.02	1.02
Japanese economy:						
Output	%GNP	0.17	−0.16	−0.20	−0.23	−0.26
Private consumption	%GNP	0.01	−0.20	−0.21	−0.22	−0.23
Private investment	%GNP	−0.17	−0.27	−0.28	−0.29	−0.29
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.32	0.27	0.25	0.23	0.22
Trade balance	%GNP	0.33	0.31	0.29	0.28	0.26
Labor demand	%	0.51	−0.00	−0.00	−0.00	−0.00
Inflation	dev.	0.36	0.36	0.05	0.04	0.03
Interest rate (short)	dev.	0.85	0.89	0.92	0.93	0.93
Exchange rate $/yen	% dev.	−3.59	−3.53	−3.44	−3.34	−3.25
Australian economy: Exchange rate floating, wage contracts:						
Output	%GNP	0.20	−0.09	−0.24	−0.27	−0.25
Private consumption	%GNP	0.25	0.04	−0.03	−0.01	0.03
Private investment	%GNP	−0.16	−0.25	−0.30	−0.31	−0.31
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.09	0.04	−0.01	−0.05	−0.07
Trade balance	%GNP	0.11	0.11	0.09	0.06	0.02
Labor demand	%	0.49	0.04	−0.19	−0.21	−0.15
Inflation	dev.	0.30	0.29	0.16	0.05	−0.00
Interest rate (short)	dev.	0.82	0.82	0.83	0.86	0.89
Exchange rate $/aus	% dev.	−2.93	−2.85	−2.68	−2.49	−2.33
Australian economy: Exchange rate pegged to $U.S., wage contracts:						
Output	%GNP	−1.54	−0.49	−0.02	0.06	−0.04
Private consumption	%GNP	−1.02	−0.25	0.14	0.23	0.19
Private investment	%GNP	−0.73	−0.38	−0.22	−0.20	−0.23
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.20	−0.04	0.02	0.00	−0.04
Trade balance	%GNP	0.22	0.13	0.07	0.03	0.01
Labor demand	%	−2.74	−0.61	0.33	0.48	0.29
Inflation	dev.	−1.16	−0.73	−0.20	0.14	0.26
Interest rate (short)	dev.	0.91	0.99	1.01	1.02	1.02
Exchange rate $/aus	% dev.	−0.00	0.00	0.00	−0.00	0.00

(Continued on next page)

TABLE 11 (*Continued*)

		Year				
		1	2	3	4	5
Australian economy: Exchange rate pegged to yen, wage contracts:						
Output	%GNP	0.58	0.02	−0.25	−0.30	−0.28
Private consumption	%GNP	0.53	0.12	−0.04	−0.04	0.00
Private investment	%GNP	−0.03	−0.21	−0.30	−0.32	−0.32
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.16	0.06	−0.01	−0.05	−0.08
Trade balance	%GNP	0.09	0.11	0.09	0.06	0.03
Labor demand	%	1.21	0.23	−0.22	−0.30	−0.23
Inflation	dev.	0.62	0.56	0.33	0.16	0.07
Interest rate (short)	dev.	0.86	0.89	0.92	0.93	0.93
Exchange rate $/aus	% dev.	−3.59	−3.53	−3.44	−3.34	−3.25
Australian economy: Exchange rate floating, flexible wages:						
Output	%GNP	−0.07	−0.12	−0.15	−0.16	−0.17
Private consumption	%GNP	0.05	0.02	0.04	0.07	0.09
Private investment	%GNP	−0.25	−0.26	−0.27	−0.27	−0.28
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.05	0.03	0.00	−0.03	−0.06
Trade balance	%GNP	0.13	0.12	0.08	0.05	0.02
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	0.55	0.07	0.03	0.04	0.02
Interest rate (short)	dev.	0.79	0.80	0.83	0.87	0.90
Exchange rate $/aus	% dev.	−2.96	−2.84	−2.66	−2.47	−2.32
Australian economy: Exchange rate pegged to $U.S., flexible wages:						
Output	%GNP	−0.07	−0.12	−0.15	−0.16	−0.17
Private consumption	%GNP	0.05	0.02	0.04	0.07	0.09
Private investment	%GNP	−0.25	−0.26	−0.27	−0.27	−0.28
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.05	0.03	0.00	−0.03	−0.06
Trade balance	%GNP	0.13	0.12	0.08	0.05	0.02
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	−2.41	0.18	0.22	0.22	0.19
Interest rate (short)	dev.	0.91	0.99	1.01	1.02	1.02
Exchange rate $/aus	% dev.	−0.00	−0.00	0.00	0.00	0.00
Australian economy: Exchange rate pegged to yen, flexible wages:						
Output	%GNP	−0.07	−0.12	−0.15	−0.16	−0.17
Private consumption	%GNP	0.05	0.02	0.04	0.07	0.09
Private investment	%GNP	−0.25	−0.26	−0.27	−0.27	−0.28
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.05	0.03	0.00	−0.03	−0.06
Trade balance	%GNP	0.13	0.12	0.08	0.05	0.02
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	1.18	0.13	0.13	0.12	0.09
Interest rate (short)	dev.	0.85	0.89	0.92	0.93	0.93
Exchange rate $/aus	% dev.	−3.59	−3.53	−3.44	−3.34	−3.25

the exchange-rate constraint. By contrast, pegging to the yen raises output, because a slight monetary expansion stabilizes the currency relative to the yen. As in the theoretical model, the exchange-rate regime does not affect the real outcomes with wage flexibility.

Table 12 gives the results for a permanent rise in the demand for money in the United States under global floating. As in the theoretical model, output falls and interest rates rise. The U.S. dollar appreciates against other currencies, undershooting its long-run value in the short run.[2] The negative effect on world demand from a weaker U.S. economy is almost completely offset by the effect of a stronger U.S. dollar. This result is even stronger with respect to Australia: a floating Australian dollar leads to a rise in Australian output. Interestingly, there is only a small change in the U.S. trade balance, a result consistent with recent experience, when the U.S. dollar depreciated yet there was negligible improvement in the trade imbalances. In Australia, fixing the exchange rate now has the opposite effect from fiscal expansion. The weaker Australian dollar implies a monetary contraction that contracts the Australian economy, reducing both output and inflation. Fixing to the yen leads to the opposite result, with output rising even more than under floating rates. This mirror effect suggests why pegging to a weighted average of the two currencies has almost no effect on output. Note that when wages are flexible, the real effects of the shocks are almost completely eliminated. We do not get the theoretical result of complete offset, because in the MSG model Australia has market-clearing wages while the rest of the world has wage contracting. By contrast, in the theoretical results for fixed real wages, the entire world was assumed to have wage contracting.

Table 13 gives results for a real shock in Australia, also simulated as a permanent rise in real government spending equal to 1 percent of GNP. Results are not presented for the United States or Japan, because the shock has very little effect on these countries.

The stimulus to the Australian economy is much larger under fixed rates (whether pegged to the U.S. dollar or to the yen) than under floating. Under floating, Australian exports are crowded out by the appreciation of the Australian dollar, and higher domestic interest rates crowd out domestic demand. Under fixed rates, monetary policy must ease to stabilize the currency. The result is monetary accommodation for an expansion of demand. The effect of the shock on inflation is much larger. Again, the exchange-rate regime does not have quite so large an effect on real variables as it has under wage contracts. Flexible wages dampen the impact on output of the real domestic shock.

The results for an Australian monetary shock are shown in Table 14. Under a fixed-rate regime, the shock has no effect because the exchange-rate constraint exactly offsets the shock in the money market. Under floating

[2] Note that although wages are sticky in the wage-contracting case, prices are not fixed. In this case, undershooting (rather than overshooting) is possible in a simple Dornbusch-style model.

TABLE 12

WORLD FLOATING EXCHANGE RATES: RESULTS OF A MONETARY SHOCK IN THE UNITED STATES

		Year				
		1	2	3	4	5
U.S. economy:						
Output	%GNP	−0.56	−0.20	0.03	0.12	0.12
Private consumption	%GNP	−0.42	−0.15	0.02	0.09	0.09
Private investment	%GNP	−0.18	−0.06	0.01	0.04	0.04
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.04	−0.01	0.00	0.01	0.01
Trade balance	%GNP	0.04	0.01	0.00	−0.01	−0.01
Labor demand	%	−0.95	−0.29	0.09	0.23	0.21
Inflation	dev.	−0.38	−0.39	−0.26	−0.11	−0.00
Interest rate (short)	dev.	0.09	0.04	−0.01	−0.03	−0.03
Japanese economy:						
Output	%GNP	0.03	−0.01	0.00	0.01	0.01
Private consumption	%GNP	0.04	0.01	0.01	0.00	0.00
Private investment	%GNP	0.00	0.00	0.00	0.00	0.00
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.00	−0.01	−0.01	0.00	0.00
Trade balance	%GNP	−0.01	−0.01	−0.01	0.00	0.00
Labor demand	%	0.08	0.00	0.00	0.00	0.00
Inflation	dev.	0.05	0.01	−0.05	−0.03	−0.01
Interest rate (short)	dev.	0.14	0.09	0.02	−0.03	−0.04
Exchange rate $/yen	% dev.	−0.90	−0.95	−1.00	−1.02	−1.02
Australian economy: Exchange rate floating, wage contracts:						
Output	%GNP	0.15	0.07	−0.02	−0.05	−0.04
Private consumption	%GNP	0.23	0.12	0.01	−0.04	−0.04
Private investment	%GNP	0.01	0.00	−0.01	−0.01	−0.01
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.05	−0.04	−0.02	−0.01	0.00
Trade balance	%GNP	−0.09	−0.06	−0.02	0.00	0.01
Labor demand	%	0.17	0.05	−0.08	−0.10	−0.06
Inflation	dev.	0.02	0.05	0.01	−0.03	−0.04
Interest rate (short)	dev.	0.29	0.22	0.08	−0.02	−0.06
Exchange rate $/aus	% dev.	−0.59	−0.80	−0.98	−1.07	−1.08
Australian economy: Exchange rate pegged to $U.S., wage contracts:						
Output	%GNP	−0.20	−0.10	−0.05	0.00	0.05
Private consumption	%GNP	−0.03	0.00	−0.01	0.00	0.02
Private investment	%GNP	−0.10	−0.06	−0.02	0.01	0.02
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.11	−0.06	−0.03	0.00	0.02
Trade balance	%GNP	−0.07	−0.05	−0.02	0.00	0.00
Labor demand	%	−0.48	−0.25	−0.11	0.03	0.12
Inflation	dev.	−0.28	−0.31	−0.28	−0.20	−0.08
Interest rate (short)	dev.	0.09	0.04	−0.01	−0.03	−0.04
Exchange rate $/aus	% dev.	0.00	0.00	0.00	0.00	0.00

TABLE 12 (*Continued*)

		Year				
		1	2	3	4	5
Australian economy: Exchange rate pegged to yen, wage contracts:						
Output	%GNP	0.33	0.05	−0.09	−0.08	−0.02
Private consumption	%GNP	0.36	0.11	−0.04	−0.06	−0.03
Private investment	%GNP	0.07	−0.01	−0.03	−0.02	0.00
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.02	−0.04	−0.03	−0.01	0.00
Trade balance	%GNP	−0.10	−0.05	−0.02	0.00	0.01
Labor demand	%	0.51	0.01	−0.20	−0.16	−0.03
Inflation	dev.	0.17	0.06	−0.08	−0.13	−0.09
Interest rate (short)	dev.	0.14	0.09	0.02	−0.03	−0.04
Exchange rate $/aus	% dev.	−0.90	−0.95	−1.00	−1.02	−1.02
Australian economy: Exchange rate floating, flexible wages:						
Output	%GNP	0.06	0.04	0.02	0.00	0.00
Private consumption	%GNP	0.16	0.10	0.04	0.00	−0.02
Private investment	%GNP	−0.02	−0.01	0.00	0.00	0.01
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.06	−0.04	−0.02	0.00	0.01
Trade balance	%GNP	−0.08	−0.05	−0.02	0.00	0.01
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	0.11	−0.02	−0.06	−0.04	−0.02
Interest rate (short)	dev.	0.28	0.21	0.08	−0.01	−0.06
Exchange rate $/aus	% dev.	−0.60	−0.80	−0.97	−1.06	−1.08
Australian economy: Exchange rate pegged to $U.S., flexible wages:						
Output	%GNP	0.06	0.04	0.02	0.00	0.00
Private consumption	%GNP	0.16	0.10	0.04	0.00	−0.02
Private investment	%GNP	−0.02	−0.01	0.00	0.00	0.01
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.06	−0.04	−0.02	0.00	0.01
Trade balance	%GNP	−0.08	−0.05	−0.02	0.00	0.01
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	−0.50	−0.21	−0.22	−0.14	−0.04
Interest rate (short)	dev.	0.09	0.04	−0.01	−0.03	−0.04
Exchange rate $/aus	% dev.	0.00	0.00	0.00	0.00	0.00
Australian economy: Exchange rate pegged to yen, flexible wages:						
Output	%GNP	0.06	0.04	0.02	0.00	0.00
Private consumption	%GNP	0.16	0.10	0.04	0.00	−0.02
Private investment	%GNP	−0.02	−0.01	0.00	0.00	0.01
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.06	−0.04	−0.02	0.00	0.01
Trade balance	%GNP	−0.08	−0.05	−0.02	0.00	0.01
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	0.41	−0.17	−0.18	−0.11	−0.03
Interest rate (short)	dev.	0.14	0.09	0.02	−0.03	−0.04
Exchange rate $/aus	% dev.	−0.90	−0.95	−1.00	−1.02	−1.02

TABLE 13

WORLD FLOATING EXCHANGE RATES:
RESULTS OF A REAL SHOCK IN AUSTRALIA FOR THE AUSTRALIAN ECONOMY

		Year				
		1	2	3	4	5
Exchange rate floating, wage contracts:						
Output	%GNP	0.67	0.89	0.83	0.70	0.58
Private consumption	%GNP	0.35	0.48	0.42	0.29	0.18
Private investment	%GNP	0.01	0.08	0.07	0.03	−0.00
Government consumption	%GNP	1.00	1.00	1.00	1.00	1.00
Exports	%GNP	−0.45	−0.39	−0.39	−0.39	−0.40
Trade balance	%GNP	−0.68	−0.68	−0.65	−0.63	−0.60
Labor demand	%	0.05	0.48	0.41	0.18	−0.01
Inflation	dev.	−0.66	−0.19	0.06	0.14	0.12
Interest rate (short)	dev.	0.09	0.12	0.13	0.13	0.12
Exchange rate $/aus	% dev.	2.94	2.88	2.78	2.67	2.57
Exchange rate pegged to $U.S., wage contracts:						
Output	%	2.41	1.30	0.64	0.39	0.37
Private consumption	%GNP	1.62	0.78	0.27	0.06	0.02
Private investment	%GNP	0.58	0.22	0.01	−0.07	−0.07
Government consumption	%GNP	1.00	1.00	1.00	1.00	1.00
Exports	%GNP	−0.15	−0.32	−0.41	−0.44	−0.43
Trade balance	%GNP	−0.79	−0.70	−0.63	−0.60	−0.58
Labor demand	%	3.29	1.15	−0.06	−0.47	−0.44
Inflation	dev.	0.80	0.85	0.48	0.13	−0.06
Interest rate (short)	dev.	0.02	0.02	0.02	0.03	0.03
Exchange rate $/aus	% dev.	−0.00	−0.00	−0.00	−0.00	−0.00
Exchange rate floating, flexible wages:						
Output	%GNP	0.65	0.63	0.61	0.59	0.57
Private consumption	%GNP	0.33	0.29	0.25	0.21	0.17
Private investment	%GNP	−0.00	−0.00	−0.00	−0.01	−0.01
Government consumption	%GNP	1.00	1.00	1.00	1.00	1.00
Exports	%GNP	−0.45	−0.44	−0.43	−0.41	−0.40
Trade balance	%GNP	−0.68	−0.66	−0.64	−0.62	−0.60
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	−0.62	0.03	0.02	0.02	0.02
Interest rate (short)	dev.	0.11	0.11	0.11	0.11	0.12
Exchange rate $/aus	% dev.	2.92	2.84	2.75	2.67	2.58
Exchange rate pegged to $U.S., flexible wages:						
Output	%GNP	0.65	0.63	0.61	0.59	0.57
Private consumption	%GNP	0.33	0.29	0.25	0.21	0.17
Private investment	%GNP	−0.00	−0.00	−0.00	−0.01	−0.01
Government consumption	%GNP	1.00	1.00	1.00	1.00	1.00
Exports	%GNP	−0.45	−0.44	−0.43	−0.41	−0.40
Trade balance	%GNP	−0.68	−0.66	−0.64	−0.62	−0.60
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	2.31	−0.06	−0.07	−0.06	−0.07
Interest rate (short)	dev.	0.02	0.02	0.02	0.03	0.03
Exchange rate $/aus	% dev.	0.00	−0.00	−0.00	−0.00	0.00

TABLE 14

WORLD FLOATING EXCHANGE RATES:
RESULTS OF A MONETARY SHOCK IN AUSTRALIA FOR THE AUSTRALIAN ECONOMY

		Year				
		1	2	3	4	5
Exchange rate floating, wage contracts:						
Output	%GNP	−0.56	−0.16	0.04	0.10	0.07
Private consumption	%GNP	−0.41	−0.12	0.03	0.07	0.06
Private investment	%GNP	−0.18	−0.05	0.01	0.03	0.02
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	−0.09	−0.03	0.01	0.01	0.01
Trade balance	%GNP	0.03	0.01	0.00	−0.01	−0.01
Labor demand	%	−1.03	−0.27	0.12	0.21	0.16
Inflation	dev.	−0.47	−0.38	−0.20	−0.05	0.02
Interest rate (short)	dev.	−0.06	−0.02	0.00	0.01	0.01
Exchange rate $/aus	% dev.	0.94	0.99	1.02	1.02	1.02
Exchange rate pegged to $U.S., wage contracts:						
Output	%GNP	0.00	0.00	0.00	0.00	0.00
Private consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Private investment	%GNP	0.00	0.00	0.00	0.00	0.00
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.00	0.00	0.00	0.00	0.00
Trade balance	%GNP	0.00	0.00	0.00	0.00	0.00
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	0.00	0.00	0.00	0.00	0.00
Interest rate (short)	dev.	0.00	0.00	0.00	0.00	0.00
Exchange rate $/aus	% dev.	0.00	0.00	0.00	0.00	0.00
Exchange rate floating, flexible wages:						
Output	%GNP	0.00	0.00	0.00	0.00	0.00
Private consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Private investment	%GNP	0.00	0.00	0.00	0.00	0.00
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.00	0.00	0.00	0.00	0.00
Trade balance	%GNP	0.00	0.00	0.00	0.00	0.00
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	−1.00	0.00	0.00	0.00	0.00
Interest rate (short)	dev.	0.00	0.00	0.00	0.00	0.00
Exchange rate $/aus	% dev.	1.00	1.00	1.00	1.00	1.00
Exchange rate pegged to $U.S., flexible wages:						
Output	%GNP	0.00	0.00	0.00	0.00	0.00
Private consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Private investment	%GNP	0.00	0.00	0.00	0.00	0.00
Government consumption	%GNP	0.00	0.00	0.00	0.00	0.00
Exports	%GNP	0.00	0.00	0.00	0.00	0.00
Trade balance	%GNP	0.00	0.00	0.00	0.00	0.00
Labor demand	%	0.00	0.00	0.00	0.00	0.00
Inflation	dev.	0.00	0.00	0.00	0.00	0.00
Interest rate (short)	dev.	0.00	0.00	0.00	0.00	0.00
Exchange rate $/aus	% dev.	0.00	0.00	0.00	0.00	0.00

rates with wage flexibility, there is a once-off appreciation that completely offsets the shock. With wage contracts, output falls as real interest rates rise. Eventually, the effect of the shock dissipates as wages adjust and long-run neutrality is reached.

Further detailed results for shocks under both the McKinnon Rule and the dollar standard can be found in Argy, McKibbin, and Siegloff (1988).

6 CONCLUSION

This study has examined the issues facing a small country in choosing an appropriate exchange-rate regime. It has drawn insights from a relatively simple theoretical three-country model, and it has placed some empirical magnitudes on the consequences of a variety of shocks on a small economy under different exchange-rate regimes and labor-market assumptions. The floating-rate regime performs well for Australia, representing the small country, under every assumption about the international monetary system and the type of shock except for a shock to the Australian demand for money. In that case, the various fixed-rate regimes perform better than the floating-rate regime. This comparison is not strictly fair, however, because, with discretionary monetary policy and money-demand shocks that are observed by the monetary authorities, a floating rate can perform as well as fixed rates. Fixed rates are most efficacious when the shock is not observed.

The other major finding is that, when choosing among fixed-rate regimes, the small country is better off pegging to a basket of currencies. This is especially true in the case of foreign shocks in a world of globally floating exchange rates. Our results also suggest that the weights in the basket should be biased toward the currency of the economy that is less likely to be subject to major shocks.

REFERENCES

Allen, Polly Reynolds, and Peter B. Kenen, *Asset Markets, Exchange Rates, and Economic Integration: A Synthesis*, New York, Cambridge University Press, 1980.

Argy, Victor, "Exchange Rate Policy for a Small Economy," University of Stockholm, Institute for International Economic Studies, Seminar Paper No. 369, October 1986.

Argy, Victor, Warwick McKibbin, and Eric Siegloff, "Exchange Rate Regimes for a Small Economy in a Multi-Country World," Macquarie University Centre for Studies in Money, Banking and Finance, Working Paper No. 8852B, March 1988.

Argy, Victor, and Joan Salop, "Price and Output Effects of Monetary and Fiscal Expansion in a Two-Country World under Flexible Exchange Rates," Oxford Economic Papers No. 35, 1983, pp. 228-246.

Blundell-Wignall, Adrian, and Marilyn Thomas, "Deviations from Purchasing Power Parity: The Australian Case," Reserve Bank of Australia Research Discussion Paper No. 8711, 1987.

Branson, William H., and Willem Buiter, "Monetary and Fiscal Policy with Flexible Rates," in J. Bhandari and B. Putnam, eds., *Economic Inter-dependence with Flexible Exchange Rates*, Cambridge, Mass., MIT Press, 1983.

Buiter, Willem, "Macroeconomic Policy Design in an Interdependent World Economy—An Analysis of Three Contingencies," *IMF Staff Papers*, 33 (September 1986), pp. 541-582.

Dornbusch, Rudiger, "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, 84 (December 1976), pp. 1161-1176.

Frenkel, Jacob A., and Morris Goldstein, "A Guide to Target Zones," *IMF Staff Papers*, 33 (December 1986), pp. 633-673.

McKibbin, Warwick J., "Policy Analysis with the MSG2 Model," *Australian Economic Papers* Supplement (June 1988), pp. 126-150.

McKibbin, Warwick J., and Jeffrey D. Sachs, *The McKibbin-Sachs Global (MSG2) Model*, Washington, Brookings Institution Discussion Paper in International Economics No. 78, August 1989.

McKibbin, Warwick J., and Eric Siegloff, "The Australian Economy from a Global Perspective," paper presented at the Australasian Meetings of the Econometrics Society, Canberra, August 1988.

McKinnon, Ronald I., "An International Standard for Monetary Stabilization," Policy Analyses in International Economics No. 8, Washington, Institute for International Economics, 1984.

Marston, Richard C., "Exchange Rate Unions as an Alternative to Flexible Rates: The Effects of Real and Monetary Disturbances," in John F. O. Bilson and Richard C. Marston, eds., *Exchange Rate Theory and Practice*, Cambridge, Mass., National Bureau of Economic Research, 1984.

Mundell, Robert A., "A Reply: Capital Mobility and Size," *Canadian Journal of Economics and Political Science*, 30 (August 1964), pp. 421-431.

Swoboda, Alexander K., "Gold, Euro-Dollars and the World Money Stock under Fixed Exchange Rates," *American Economic Review*, 68 (September 1978), pp. 625-642.

Williamson, John, *The Exchange Rate System*, Washington, Institute for International Economics, Policy Analyses in International Economics No. 5, September 1983.

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