Stochastic Disturbances and Exchange Rates

Walter Enders  
*Iowa State University*

Harvey E. Lapan  
*Iowa State University*, hlapan@iastate.edu

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Stochastic Disturbances and Exchange Rates

Abstract
One of the central issues in the ongoing debate concerning fixed versus flexible exchange rates is the comparative stabilizing properties of monetary changes as opposed to exchange rate changes. Fixed and flexible exchange rate regimes have been differentiated according to the ability of the private sector of an economy to alter the nominal value of its domestic money supply via the balance of payments. A disturbance which would lead a nation to experience a balance of payments deficit (surplus) in a fixed rate regime would lead to a depreciation (appreciation) of that nation's currency in a flexible exchange rate regime. In order to determine whether monetary or exchange rate changes--and, as a consequence, fixed or flexible exchange rates--best stabilize an economy from a given disturbance, it is necessary to consider the source of the disturbance, the nature of the economic system in question, and the variable(s) to be stabilized.

Disciplines
Economic Theory | Macroeconomics | Other Economics

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STOCHASTIC DISTURBANCES AND EXCHANGE RATES

Walter Enders and Harvey E. Lapan, Iowa State University

One of the central issues in the ongoing debate concerning fixed versus flexible exchange rates is the comparative stabilizing properties of monetary changes as opposed to exchange rate changes. Fixed and flexible exchange rate regimes have been differentiated according to the ability of the private sector of an economy to alter the nominal value of its domestic money supply via the balance of payments. A disturbance which would lead a nation to experience a balance of payments deficit (surplus) in a fixed rate regime would lead to a depreciation (appreciation) of that nation's currency in a flexible exchange rate regime. In order to determine whether monetary or exchange rate changes— and, as a consequence, fixed or flexible exchange rates—best stabilize an economy from a given disturbance, it is necessary to consider the source of the disturbance, the nature of the economic system in question, and the variable(s) to be stabilized.

The literature concerning the relative merits of fixed versus flexible exchange rates is a voluminous one. Some of the principle conclusions in this literature are that flexible exchange rates more effectively insulate a country from external price disturbances but that fixed exchange rates more effectively stabilize an economy from internal disturbances. Fischer (1977) develops a monetary model of the balance of payments which formally analyzes the effects of internal and external disturbances. Since his findings are consistent with the prevailing literature, we shall discuss in some detail his model and major conclusions.

I. FISCHER'S MODEL

Fischer considers the case of a small open economy in which prices are perfectly flexible and capital is immobile. Further, the country in question produces a single good which is traded. Fischer finds that a flexible exchange rate will isolate a small country from external disturbances since a change in the foreign price level will produce a change in the domestic currency price of foreign exchange. The domestic price level, then, is invariant to the external disturbance. Since a flexible exchange rate precludes any change in the domestic money supply, real and nominal consumption are invariant to the external disturbance. In a fixed exchange rate regime, however, an increase (decrease) in the foreign price level will act to increase (decrease) the domestic price level and to produce a balance of payments surplus (deficit). The change in both the domestic price level and the money supply will act to alter real consumption.

If there are real capital disturbances, fixed exchange rates best stabilize the domestic economy. Under a flexible exchange rate regime in the absence of capital movements, the trade balance and the difference between output and consumption must both be zero. Any change in domestic output must be fully realized in real consumption changes. With a flexible exchange rate, increases (decreases) in domestic production will cause domestic prices to decrease (increase). In a fixed exchange rate regime, the domestic price level is invariant to output changes. Because the marginal propensity to consume is less than unity, an increase (decrease) in real output will cause a balance of trade surplus (deficit). The deficit or surplus allows the change in consumption to be less (in absolute value) than output changes. Consequently, in Fischer's model, the variability of both prices and real consumption is greater if the exchange rate is flexible.

If disturbances are monetary in nature, fixed exchange rates lead to a greater variability in domestic consumption but eliminate the variability in the domestic price level. The choice between fixed and flexible exchange rates will depend upon preferences concerning price versus consumption variability.

Fischer's results are crucially dependent upon the assumption of capital immobility and the assumption that the country in question produces only a single commodity. The assumption that capital is immobile means that a flexible exchange rate forces both the balance of trade and payments to equal zero. The flexible exchange rate regime, as postulated by Fischer, prevents domestic from accumulating (disaccumulating) claims on foreigners when there is a random increase (decrease) in output. As such, the intertemporal transfer of consumption becomes impossible under a flexible exchange rate regime. Consequently, a small economy with flexible exchange rates is effectively a closed economy, and Fischer's results concerning the relative merits of alternative exchange rate regimes in stabilizing real consumption follow from this assumption. The assumption that the country in question produces a single good which is traded necessarily means that the domestic price level is tied to the world price level. Flexible exchange rates will obviously lead to a smaller variation in the domestic price level than will flexible rates for any disturbance other than a change in the foreign price level. Two logical extensions of Fischer's work are: 1) consideration of the role of non-traded goods, and 2) consideration of the role of capital mobility.

The introduction of non-traded goods into Fischer's model does more than simply break the link between the domestic and the foreign price level. Internal and external disturbances will produce a change in the relative price of non-traded versus traded goods. Relative price changes will affect resource allocation patterns so that large random variations in relative prices can lead to (ex post) unwarranted resource adjustments. While stabilizing the domestic price level and the real value of consumption are
among the goals of an economy, relative price stability and efficient use of resources are also important goals. The stability of relative prices clearly cannot be analyzed in Fischer's one commodity world. Furthermore, as argued by McKinnon (1963), the presence of non-traded goods will affect the choice between fixed versus flexible exchange rates if policy makers desire to stabilize the absolute price level. McKinnon demonstrates that as an economy becomes more open (measured in terms of the ratio of traded goods to non-traded goods), the less effective are flexible exchange rates in achieving internal price level stability. The point is that in order to ascertain the effects of fixed versus flexible exchange rates on both absolute and relative prices, non-traded goods need to be considered.

II. NON-TRADED GOODS AND CAPITAL MOBILITY

The discussion below is based upon the monetarist's model of the Balance of Payments; this model is presented in Dornbusch (1973), Fischer (1977), and Lapan and Enders (1978), among others. Our analysis in this part closely follows that presented by Fischer, except that we consider the role of (i) capital mobility, and (ii) non-traded goods in determining the relative efficacy of each exchange regime. We first consider a small economy, producing a single good, in which domestics hold both domestic and foreign currency denominated assets. Let:

\[ (1) \quad Y = A(Y, W, P) + BT \]

where:
- \( Y \) = gross national product (income)
- \( A \) = consumption + investment + government purchases = absorption
- \( BT \) = balance of goods and services
- \( W \) = balance of trade
- \( P \) = domestic price level

and:
- \( 0 < \frac{\Delta A}{\Delta Y} < 1 \)
- \( \Delta A = \text{marginal propensity to absorb} \)

(\( \text{MPA} \))

\[ (2) \quad P = eP^* \]

where:
- \( e \) = price of foreign currency
- \( P^* \) = foreign price level.

Further, \( G = T = 0 \) so that \( BT \) equals the change in domestic wealth (\( \Delta W \)).

Consider an internal disturbance which acts to temporarily increase \( Y \) by one unit over its long run value (in the next and all subsequent periods, \( Y \) resumes its initial value). In a fixed exchange regime, absorption would increase by the MPA, and the domestic price level would be unchanged (i.e., \( e = \bar{e} \) and \( P = \bar{P} \)). Since the MPA is less than unity, the increase in \( \Delta A \) would be less than the increase in \( Y \); the economy would experience a balance of trade surplus. The balance of trade surplus—reflecting an increase in domestic wealth—would leave domestics holding more assets than they did before the initial disturbance. In future periods (when \( Y \) resumes its initial value), this additional wealth would lead to additional expenditures on foreign and domestic goods. Fixed exchange rates, then, allow domestics to transfer the transitory increase in \( Y \) into future absorption.

Under flexible exchange rates, the same initial increase in \( Y \) would produce an initial change in \( A \) equal to the MPA. If domestics only held domestics assets, BT would equal zero and \( W \) would be fixed. The domestic price level would have to fall to such an extent that the total change in \( A \) (through the changes in \( Y \) and \( W/P \)) was equal to the change in \( Y \). This is essentially Fischer's result. With domestics holding foreign assets, however, BT need not equal zero. As in fixed rates, the change in \( A \) could be less than the change in \( Y \). The point is that there is no a priori way of determining which exchange regime best acts to reduce the variance of consumption.

It should also be clear that one cannot a priori determine which exchange regime best minimizes the effects of external disturbances. In the event of a transitory increase in \( P^* \), \( A \) will fall if the exchange rate is fixed. This follows as (for a given change in \( P \)) the change in \( P \) will be proportional to the change in \( P^* \). The increase in \( P \) acts to reduce \( W/P \) and absorption. If the exchange rate were flexible and domestics only held domestic wealth, the increase in \( P^* \) would be fully offset by a proportionate reduction in \( e \). When domestics, however, hold foreign currency denominated assets, the reduction in \( e \) will act to reduce domestic wealth. The point is that the external disturbance alters domestic consumption (\( \Delta A \)) regardless of whether \( e \) is fixed or flexible. In order to determine which effect is greater it is necessary to know the structural parameters of the system.

We now consider the role of non traded goods. In adding a non-traded good to the analysis, it should be clear that equation 2 only applies to the traded good. For simplicity we now assume that domestics only hold domestic currency denominated assets and that the marginal propensities to consume the two goods (traded and non-traded) are unity.

In response to a transitory 1/2 unit increase in the production of each good, A will again increase by the MPA if the exchange rate is fixed. The country will experience a balance of trade surplus and a resulting increase in domestic wealth. As in the previous case (capital mobility) A will asymptotically approach its original level. Note, however, that the transitory change in \( Y \) will act to produce a relative price change. Fixed exchange rates act to fix the domestic price of the traded good. The increase(s) in \( A \) will increase the absolute and relative price of the non-traded good. Thus, a transitory increase in income will cause lasting relative price changes and consequently an unwarranted reallocation of resources. With flexible rates, however, the domestic price of the traded good is not tied to the world price. Further, the increase in \( A \) will only last one period. As such, the "pressure" for resource movements between sectors is smaller under flexible exchange rates than in a fixed exchange rate regime.
III. CONCLUSIONS

This paper outlined a model which could be used to analyze the effects of random internal and external disturbances. It was shown that when capital is mobile it cannot be determined a priori whether fixed or flexible rates best stabilize the value of consumption (absorption). In considering the case of non-traded goods (in which capital was immobile) it was argued that fixed rates would best stabilize the value of consumption. However, the fixed exchange rate acted to translate transitory changes into "lasting" relative price movements. As such fixed rates could lead to costly resource reallocation.

FOOTNOTES

1. See Laffer (1973), Friedman (1953), or Johnson (1969) concerning this method of differentiating fixed and flexible exchange rates.
2. This point is developed by Musa (1977).
3. For some of the major contributions to this literature see chapter 3 of Stern (1973) and works cited therein.
4. Fischer also considers a two country world but the results of the "Single Small Country Model" are quite similar to the results in a "Two Country World." For ease of exposition, we present his results for a single small country.
5. In the Fischer model, government purchases and investment are identically equal to zero. Thus, consumption plus the trade balance equals income.
6. See Corden (1977) and Dornbusch (1973), Jones and Corden (1976) and, Lapan and Enders (1978) for discussion concerning the role of non-traded goods in the adjustment process.
7. If \( G = I = 0, Y = C + BT \) where \( C \) is consumption. Since \( Y - C = \text{saving} = BT \), the balance of trade is equal to the change in wealth (saving).
8. It is also the case that temporary external disturbance produce "lasting" relative price movements under fixed rates but no relative price movements under flexible rates.

REFERENCES

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