

A MODEL OF EXTERNAL AND INTERNAL
PRICE EQUILIBRIUM IN SOUTH VIETNAM

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I. INTRODUCTION

The purpose of this paper is to show how, in the absence of flexible monetary and fiscal policies, U.S. dollar aid combined with an appropriate exchange rate policy may be used to control inflation in an economic model of the South Vietnamese economy. The model is a grossly simplified representation of reality, yet it contains the features relevant to an analysis of the real world problem. The assumptions and relations of the model appear in Section II, the analysis of its behavior in Section III, and the conclusions in Section IV.

II. SPECIFICATION OF THE MODEL

The most important assumptions of the model are as follows: Domestic production is constant. There are no exports, regardless of the level of the exchange rate. The domestic price level is determined through a purely classical mechanism by the size of the money stock. There is a real government deficit that cannot be reduced by monetary or fiscal policy.

The equations of the model appear below and the symbols used are defined in Table 1:

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Table 1

DEFINITIONS OF SYMBOLS

- p = price of domestic output
- Q = domestic output
- v = velocity of money
- M = stock of money
- t = time
- a = ratio of monetary stock to reserves
- D = government deficit in terms of domestic currency
- d = the fraction of domestic output plus imports at current prices accounted for by the government deficit
- r = exchange rate (piasters per dollar)
- \bar{m} = level of U.S. dollars supplied
- m^d = demand for foreign exchange
- m = actual amount of foreign exchange used

$$(1) \quad r m + p Q = v M, \quad Q \text{ and } v \text{ constant}$$

$$(2) \quad \frac{dM}{dt} = a (D - r m), \quad a \text{ constant}$$

$$(3) \quad m^d = f \left(\frac{p}{r}, p_0 Q + r_0 m \right); \quad p_0, r_0 \text{ constant}; \quad f_1 > 0, f_2 > 0^1$$

$$(4) \quad D = d (p Q + r m)$$

Equation (1) is the classical price-money relation. It says that the level of money income is proportional to the size of the money stock, the velocity of money being constant.² Equation (2) states that the rate of increase of the money stock is a multiple of the difference between bank reserves created by the deficit and those liquidated by expenditures on imports (purchases of foreign exchange). The size of the expansionary multiplier, a , depends upon the fraction of money held as demand deposits, the commercial bank reserve ratio, and the marginal propensity of banks to acquire excess reserves. If these three factors are constant, a is constant. Since we are assuming that money policy is "inflexible," it seems appropriate to treat a as a constant, but this is not critical to the results. Equation (3) states that the amount of foreign exchange demanded is a decreasing function of the price of imports expressed in terms of domestic currency and an increasing function of the level of real income measured at base year prices. Equation (4) states that the government deficit is an exogenously given fraction of domestic production plus imports at current prices.

¹ $f_1 \equiv df/d(p/r)$ and $f_2 \equiv df/d(p_0 Q + r_0 m)$.

² This assumption could be relaxed with no significant alteration of the results.

III. THE BEHAVIOR OF THE MODEL

Suppose that the United States makes available to South Vietnam a flow of \bar{m} dollars per unit time for the purchase of imports. No other foreign exchange is available. If it is also assumed that the South Vietnamese government pursues a policy of continuously adjusting the exchange rate to balance the demand and supply of dollars, then Equation (3) can be written

$$(3') \quad \bar{m} = f\left(\frac{P}{r}, p_0, Q + r_0 \bar{m}\right).$$

We shall assume that this equation may be solved for $\left(\frac{P}{r}\right)$ in terms of the constants, p_0 , Q , and r_0 , which may be suppressed, and \bar{m} and that the solution given by equation (3'') is monotonic as indicated.²

$$(3'') \quad \frac{P}{r} = \rho(\bar{m}), \quad \rho'(\cdot) > 0$$

Equation (3'') implies that there is a unique price ratio which will equilibrate the foreign exchange market given a particular supply of dollars and that if the supply of dollars falls (rises), domestic prices must fall (rise) and/or the exchange rate must rise (fall) in order to restore equilibrium. It is assumed here that when the domestic price level changes, the government adjusts the exchange rate in such a way that the balance of payments remains in equilibrium. This implies that devaluation will occur at the same relative rate as inflation, e.g., if prices rise by ten percent, the price of dollars in terms of piasters rises by ten percent, provided that the supply of dollars, \bar{m} , is constant.

² $dp/d\bar{m} > 0$ if and only if $f_2 < 1$, that is, if and only if a one dollar increase in real income leads to less than a one dollar increase in the demand for imports, prices held constant. This is almost certainly true.

Using Equation (1) to eliminate M , equation (4) to eliminate D , and equation (3'') to eliminate r , the behavior of the economy may be summarized by a single nonlinear differential equation in p :

$$(5) \quad \frac{dp}{dt} = a v \left[d - \frac{\bar{m}/\rho(\bar{m})}{\bar{m}/\rho(\bar{m}) + Q} \right] p$$

This equation reveals that there exists a point of simultaneous domestic and balance of payments equilibrium for a given level of foreign exchange supplied, only if the import function, $\rho(\bar{m})$, is such that there exists an m^* for which

$$\frac{\rho(m^*)}{m^*} = \frac{1-d}{d} Q^{-1}$$

This condition requires that the fiscal deficit be exactly matched by the value of imports in terms of domestic currency. But notice that the equilibrium level of imports, m^* , is independent of the price level, p . If equilibrium exists, it is determined entirely by the nature of the import function, $\rho(m)$, and by the values of d and Q . But whether equilibrium exists or not, it is of interest to know how changes in \bar{m} may affect the process of inflation. This matter can be resolved by means of Equation (5). From that equation it can be seen that the percentage rate of inflation is proportional to

$$d - \frac{\bar{m}/\rho(\bar{m})}{\bar{m}/\rho(\bar{m}) + Q}$$

The qualitative effect of a change in \bar{m} will be given by the size of the derivative of this expression with respect to \bar{m} , and will be greater or less than zero according as

$$\frac{\rho(\bar{m})}{\rho'(\bar{m}) \bar{m}} > 1$$

The expression on the left hand side of this inequation is simply the "total" price elasticity of demand for imports.³

If the elasticity of demand is greater than unity, inflation may be stopped or at least slowed by an increase in the supply of foreign exchange accompanied by a one shot revaluation. If the inflationary gap is not fully offset, inflation will continue at a lower rate and continuous devaluations will be required to maintain external equilibrium. If the elasticity is less than unity, counterinflationary policy will require a decrease in the level of dollars supplied and an accompanying devaluation. If the inflationary gap is not entirely closed, further devaluations must accompany domestic price increases. If the elasticity of demand changes from greater than to less than unity, or vice versa, other results occur; the deflationary impact of import purchases will reach a local (and/or global) maximum or minimum.

The preceding formulation is particularly useful from the point of view of U.S. policymaking. It emphasizes the alternative results available through changes in a U.S. controlled variable, the level of dollars supplied. The assumption was that the South Vietnamese government would continuously vary the exchange rate to maintain equilibrium in the foreign exchange market. Suppose now instead that it sets a particular exchange rate and maintains it indefinitely. The United States continues to make available \bar{m} U.S. dollars, so that depending upon the level of

³This should be thought of as a "total" elasticity since both the income and substitution effects of the price change are included.

domestic prices there may be an excess demand or supply of foreign exchange. In the former case dollars must be rationed among users, and in the latter some dollar balances will remain idle. This formulation is more useful from the point of view of the South Vietnamese, who probably take \bar{m} as more or less given and see the exchange rate as a manipulatable tool.

Let the exchange rate set by the government be equal to \tilde{r} . In addition let the actual amount of foreign exchange used be given by equation (3''').

$$(3''') \quad m = m\left(\frac{p}{\tilde{r}}\right), \quad m'(\cdot) \geq 0$$

where the function, (\cdot) , was derived from the following relation:

$$m = \begin{cases} f\left(\frac{p}{\tilde{r}}, p_0, Q + r_0 m\right), & f(\cdot) \leq \bar{m} \\ \bar{m}, & f(\cdot) > \bar{m} \end{cases}$$

If (p/\tilde{r}) is such that $f(\cdot) > \bar{m}$, then $m = \bar{m}$, and there is excess demand for dollars. If (p/\tilde{r}) is less than that level, the relation between m and (p/\tilde{r}) is exactly that implied by equation (3'), and there may be an excess supply of dollars. Under these conditions the domestic price differential equation becomes

$$(5') \quad \frac{dp}{dt} = a v \left[\frac{d Q - (1-d) \left(\frac{\tilde{r}}{p}\right) m \left(\frac{p}{\tilde{r}}\right)}{Q + m' \left(\frac{p}{\tilde{r}}\right)} \right] p .$$

Inflation will occur, as before, if the government does not choose a value of \tilde{r} that closes the inflationary gap. But in contrast to the previous case, the process of inflation may be self-limiting, if foreign exchange is in excess supply initially. Define

the terms of trade, Z , by

$$Z = p/\tilde{r} .$$

Then the percentage rate of inflation is proportional to i , where

$$i \equiv \frac{d Q - (1-d) m(Z)/Z}{Q + m'(Z)}$$

and Z rises over time if inflation is occurring. If the derivative of i , with respect to Z , is negative, the rate of inflation will decline as prices rise. Generally, the rate of inflation and the domestic price level are positively or inversely related according as

$$Q + \frac{m'(Z) m(Z)}{Z} (1-d) [1 - \epsilon(Z)] - m''(Z) [d Q - (1-d) \frac{m(Z)}{Z}] \gtrless 0 ,$$

where $\epsilon(Z) = m'(Z) Z/m(Z)$ and is the elasticity of the import equation, Eq (3'''). If $\epsilon(Z) > 1$ and $m''(Z) > 0$, then $di/dZ < 0$, so that increases in the domestic price level reduce the relative rate of inflation. The problem of course is that eventually real imports may reach the maximum, \bar{m} , at which point $\epsilon(Z) = m''(Z) = 0$. Then $di/dZ > 0$, so that inflation may begin to feed upon itself. At such a point, devaluation would be required to minimize the inflationary impact of the government deficit. If $\epsilon(Z) < 1$ and $m''(Z) < 0$, it could turn out to be useful to devalue before the point of zero excess supply of foreign exchange were reached.⁴ This would be true if there existed some value, \bar{Z} , such that

⁴This assumes that the government would be willing to sacrifice some real income. Otherwise, it could theoretically use all the foreign exchange available and deflate continuously while revaluing concomitantly.

$$\frac{m(\bar{Z})}{\bar{Z}} = \frac{1-d}{dQ} \quad \text{and} \quad m(\bar{Z}) \approx \bar{m}.$$

In this case, for any observed level of domestic prices, it would be possible to set the exchange rate at such a level that the fiscal deficit was exactly offset by the value of imports.

IV. CONCLUSIONS

The results of the model show that even if only one policy instrument, the exchange rate, were available to the South Vietnamese government it would be possible to achieve useful policy goals with respect to both domestic prices and the balance of payments. Of particular interest for Vietnam is the case where there is excess demand for foreign exchange, since this is a condition likely to be met with there. Under such circumstances, devaluation at least to the point of zero excess demand for foreign exchange will reduce, if not eliminate, the inflationary impact of the fiscal deficit with no reduction in real imports and hence in real income.

The model also indicates that a U.S. aid policy designed to control inflation would not only encourage the Vietnamese to avoid the creation of excess demand for foreign exchange but also would seek to determine, via a study of the Vietnamese import demand function, what kind of elasticities were to be dealt with and thus what kind of aid level changes would contribute to a lower rate of inflation.

