International Finance Discussion Papers

Number 370

JANUARY 1990

CONTRACTIONARY DEVALUATION WITH BLACK MARKETS FOR FOREIGN EXCHANGE

Steven B. Kamin

ABSTRACT

Analyses of the possible contractionary effects of exchange rate devaluation typically assume the foreign exchange market to be unified, thereby ignoring the large fraction of transactions taking place in the black markets for foreign exchange that exist in many developing countries. This paper explores how the existence of these black markets may alter the impact of an official devaluation on aggregate output. It is argued that devaluations will be followed by less immediate contraction in a black-market economy than in a unified-market economy, both because the black market exchange rate will depreciate by less than the official rate, and because many of the devaluation's contractionary effects will occur in anticipation of the official devaluation itself. These propositions are tested using a simple numerical simulation model.

Contractionary Devaluation with Black Markets for Foreign Exchange

Steven Kamin*

I. Introduction

Prior to the late 1970s, most studies of international economic policy, aside from Cooper (1971) and Diaz-Alejandro (1963, 1965), characterized exchange rate devaluations as benign, expansionary remedies to balance-of-payments problems. Starting with the publication of Krugman and Taylor's 1978 article, "Contractionary Effects of Devaluation," however, an increasing number of papers began to focus on the possibility of adverse consequences to exchange rate devaluation. These works provided the theoretical rationale for the economic distress often observed to be associated with the devaluation process.

It is generally recognized that in an economy where the nominal exchange rate is the only exogenous variable, a nominal devaluation can have no real effect in the long run; eventually, prices will adjust to restore the real exchange rate to its former level. As pointed out by Lizondo and Montiel (1989), therefore, the debate over the contractionary effects of devaluation is a debate over the impact effect of devaluation, during which time one or more rigidities prevent instantaneous convergence to a new equilibrium. Krugman and Taylor's 1978 article highlighted two types of such rigidities: first, sluggish movements in real quantities such as exports and imports in response to relative price movements, and second, sluggish movements in nominal quantities such as

---

*/ The author is a staff economist in the International Finance Division. This paper represents the views of the author and should not be interpreted as reflecting those of the Board of Governors of the Federal Reserve System or other members of its staff. I am indebted to Paul Krugman, Catherine Mann, Lance Taylor, and Timothy Wilson for their helpful comments and suggestions.

wage rates or the money supply. More recent analyses have tended to assume away rigidities in prices, product, and consumption decisions, explicitly analyzing transition dynamics using optimizing models in which it takes time to accumulate or decumulate asset stocks. (See Lizondo and Montiel, 1988.)

Notwithstanding their increasing sophistication, however, almost all analyses of devaluation's contractionary effect have assumed a unified exchange market, so that devaluation raises all import costs in the economy by the same extent. Many countries, however, maintain an over-valued exchange rate and ration sales of foreign exchange to importers. In response, black markets have often developed in which foreign exchange trades at a higher local currency price than in the official market, and this black market exchange rate may be as important a determinant of import costs as the official rate.

This paper explores the impact of an official devaluation on aggregate output in the context of black markets for foreign exchange. It will be argued that devaluation will result in less immediate contraction in a black market economy than it would in an economy with a unified exchange market. This is true for two reasons. First, a devaluation of the official exchange rate will result in a lesser depreciation of the black market rate; hence, average import costs will rise by less than they would in a non-black market economy, and any resultant contractionary effect will be smaller as well. Second, expectations are likely to depreciate the black market rate in advance of the official devaluation. To the extent that much of the adjustment in price and output occurs before the devaluation even takes place, there

will be a smaller impact on these variables following the official action.

The implication of these considerations is that efforts to postpone devaluation, based on consideration of its harmful effects, are likely to be misguided. In general, even without black markets, the longer devaluation is postponed, the more overvalued the official rate will become and the greater the need for additional adjustment will be. Moreover, postponing the official devaluation will most likely accentuate the ongoing depreciation of the black market rate, which in turn could lead to further domestic price inflation and demand contraction even before the devaluation occurs. These are the very outcomes the policy-makers seek to avoid in the first place, and they will occur without the benefits to the official external balance generally associated with an official devaluation.

The plan of this paper is as follows. Section II describes a comparative-static model of black markets for foreign exchange, based on earlier work by the author (Kamin, 1987 and 1988b). Section III sketches a simple Keynesian model of aggregate demand determination in the presence of black markets, and uses this model to discuss the theoretical responses of non-traded goods output to depreciations of the official and black market exchange rate. As it turns out, most of these responses are theoretically ambiguous. To resolve these ambiguities, Section IV presents the results of various simulation experiments using a computable model with stylized values for its parameters. Section V incorporates a portfolio sector into the model in order to determine the dynamics of the black market rate between steady states; with the addition of these

equations, the computable model is re-simulated to show the perfect-foresight path of non-tradeables output in anticipation of a future devaluation.

II. The Black Market for Dollars

Consider a small open economy with three goods:

(1) a non-domestically-consumed export good with a fixed world price set to unity;

(2) a non-domestically-produced imported intermediate good with a fixed world price set to unity;

(3) a non-traded good with endogenous price P_N.

The government is assumed to fix the official exchange rate E (expressed in local currency units per dollar) at an over-valued level, so that the flow demand for dollars by importers at this price exceeds the flow supply of dollars by exporters. All exporters are required to surrender their earnings to the central bank at this rate; the central bank's dollar sales to importers OS are rationed according to the function:

$$OS = OS' + \beta * OX \qquad \beta \leq 1 \tag{1}$$

OS' is a fixed constant, OX represents officially measured export earnings remitted to the central bank, and β is a fixed parameter.

In response to the excess demand for dollars, a black market for dollars priced at the black market rate E^b emerges. We assume, initially, that this rate equates flow demands for dollars in the black market with flow supplies of dollars to this market.

The demand for dollars D is a derived demand for imported inputs by the non-traded goods sectors; the production of exports is assumed to depend solely on labor use. It is assumed that there are no domestic substitutes for the input, which is demanded inelastically according to the formula:

$$D = a_I N \qquad (2)$$

N: non-traded goods output

a_I: unit input requirement for imported inputs

By assumption, all dollars purchased from the central bank by importers may be risklessly resold on the black market, so that arbitrage ensures that the premium on black market dollars is equated to that on rationed imports sold to final purchases of goods. Hence, users of imported inputs pay the black market rate E^b for them. For a given level of non-traded goods output N, dollar demands D are invariant to either the official exchange rate E or the black market rate E^b.[1]

The flow supply of dollars to the black market S derives both from official dollar sales OS and under-invoiced dollar earnings. Let X represent total dollar export earnings and ϕ the share of total export earnings diverted to the black market. Then:

$$S = \phi X + OS = \phi X + \beta * OX + OS' = \phi X + \beta(1-\phi)X + OS' \qquad (3)$$

1/ As will be discussed below, however, N will respond to changes in both E and E^b.

The export sector is assumed to maximize domestic currency profits subject to rising marginal labor costs of production as well as rising costs associated with the under-invoicing share ϕ. We can derive the supply curve for total exports as a function of the weighted average of the real (wage-deflated) official and black market exchange rates:[2]

$$X = X(\phi e^b + (1-\phi)e) \quad X'(\ ) > 0 \tag{4}$$

e: E/W

e^b: E^b/W

W: nominal wage rate

The under-invoicing share ϕ can be shown to positively depend upon the real black market premium:

$$\phi = \phi(e^b - e) \qquad \phi'(\ ) > 0 \tag{5}$$

For a given value of the real official rate e, a unique real black market rate e^b will equate dollar demands and supplies in steady-state equilibrium:

$$a_I N = \phi X + \beta(1-\phi)X + OS' \tag{6}$$

2/ See Kamin (1988b) for details.

We now address the impact of an official exchange rate devaluation. Log-differentiating, (6) yields the elasticity of the black market rate, in steady-state equilibrium, with respect to a devaluation of the official rate:

$$\eta_{e^b,e} = \frac{\eta_{X,e}X[\phi + \beta(1-\phi)] + \eta_{\phi,e}\phi(1-\beta)X - \eta_{N,e}a_I N}{\eta_{N,e}ba_I N - \eta_{X,e}bX[\phi + \beta(1-\phi)] - \eta_{\phi,e}b\phi(1-\beta)X} \quad (7)$$

$$\eta_{X,e} > 0 \qquad \eta_{\phi,e} < 0 \qquad \eta_{N,e} \lesseqgtr 0$$

$$\eta_{X,e^b} > 0 \qquad \eta_{\phi,e^b} > 0 \qquad \eta_{N,e^b} \lesseqgtr 0$$

Theoretically, the sign of $\eta_{e^b,e}$ is indeterminate. First, the response of the black market rate depends on the elasticities of non-tradeables production with respect to both the official and the black market rate; these elasticities are defined in the following section, and are theoretically ambiguous. Second, even if we assume, as indicated in empirical simulations in Section IV, that depreciations of either exchange rate are contractionary, the response of the black market rate to official devaluation is still indeterminate, and a depreciation of the black market rate depends on the condition:

$$\eta_{X,e}X[\phi + \beta(1-\phi)] - \eta_{N,e}a_I N < -\eta_{\phi,e}\phi(1-\beta)X \quad (8)$$

The left-hand side of (8) incorporates factors tending to depress the black market rate in the event of official devaluation: a rise in total exports and a fall in non-traded goods output (and hence derived demand for dollars). The right-hand side represents the diversion of

dollar supplies from the black market to the central bank as e rises and the premium falls; this tends to raise the black market rate e^b.

Regardless of the sign of $\eta_{e^b,e}$, the black market premium is likely to decline in response to official devaluation. If it did not, the under-invoicing share ϕ would remain unchanged while total exports and hence dollar supplies to the black market rose; at the same time, if depreciations of the official and black market rates are contractionary, the demand for dollars would fall. The result would be an excess supply of dollars to the black market which would force the black market rate downwards.

III. Output and Price Determination with Black Markets

We now analyze the response to non-traded goods output and prices to devaluation. The model follows closely that used by Krugman and Taylor (1978) to examine the effects of an official devaluation, but incorporates the black market behavior described above.[3]

III.1 Output Determination

Output in the non-traded goods sector is demand determined, and all final demands are devoted to non-traded goods; the non-traded goods sector uses imported inputs in production, but no final goods are

---

3/ In principle, the determination of all output, including exports, should be considered. However, we have already discussed the determinants of export production in Section II. Moreover, by assuming exports to be fixed in the short run, Krugman and Taylor (1978) largely succeeded in focusing most subsequent discussion of the impact effect of devaluation on the non-tradeables sector alone.

imported. Wage rates are fixed in nominal terms, while prices are determined through mark-ups over the cost of labor and intermediate goods:

$$P_N = (1 + mu)\ (a_L W + a_I E^b) \qquad (9)$$

P_N : non-traded goods price

mu : mark-up rate

a_L, a_I: unit input requirements for labor and imported inputs

As discussed above, the world dollar price of imports $P_M = 1$, and firms pay the black market rate for imported inputs, either directly on the black market or indirectly via the premium charged by officially licensed importers. We abstract from monetary issues by assuming the monetary authority controls domestic credit to keep the supply of real money balances (in terms of P_N) constant.

Total final demand (for non-traded goods) arises from fixed real investment spending and endogenous consumption spending out of income by workers and capitalists. Worker income is determined:

$$Y_w = W*L(X) + Wa_L N \qquad (10)$$

L(X): labor use in export sector as function of total exports.[4]

[4/] The difference in labor use specifications is required by the assumption that output in the export sector is a function of the real (wage-deflated) exchange rate, while output in the non-traded goods sector is determined by domestic demand alone. Therefore, labor unit input requirements must be a rising function of total output in the export sector, but a constant in the non-traded goods sector.

$a_L N$: labor use in non-traded goods sector.

Income accruing to capitalists is specified:

$$Y_k = X(\phi E^b + (1-\phi)E - W*L(X)/X) + (E^b - E)[\beta(1-\phi)X + OS'] \quad (11)$$

$$+ mu(a_L W + a_I E^b)N$$

The first term represents the profits of export sector firms. The second represents the rents or profits accruing to recipients of official foreign exchange at the cheap rate E, resold at the higher rate E^b. The third term represents the profits of firms in the non-traded goods sector.

Finally, total demand for final, non-traded goods is expressed:

$$P_N N = c_w Y_w + c_k Y_k + P_N I \quad (12)$$

c_w, c_k : marginal propensities to consume by workers, capitalists

I : real investment spending (exogenous)

For given official and black market exchange rates, and hence exports and under-invoicing, equilibrium non-tradeable output N is determined:

$$N = 1/D*\{(c_w - c_k)(W*L(X))/P_N \quad (13)$$

$$+ c_k[X(\phi E^b + (1-\phi)E) + (E^b - E)(\beta X(1-\phi) + OS')]/P_N + I\}$$

$$D: \quad (1 - c_w Wa_L/P_N - c_k mu/(1+mu))$$

Non-traded goods output depends upon consumption out of export earnings, consumption out of rents accruing to importers, and pre-determined real investment, as well as the multiplier 1/D. This multiplier, in turn, varies positively with the marginal propensities to consume and with the real wage W/P_N.

III.2 Response of non-tradeable output to exchange rate changes

In conventional analyses of devaluation, all impacts of the exchange rate adjustment stem directly from the response of import and export prices to the change in the official exchange rate alone. In the black market economy described above, on the other hand, the general equilibrium impact of an official devaluation will be comprised of both direct and indirect effects on economic activity. Because, in this polar case, the official exchange rate does not (directly) affect the cost of imported goods, an official devaluation's direct impact will be limited to its effect on the profitability of those exports officially reported, as well as on the monopoly rents earned by importers reselling national foreign exchange at a premium. However, the devaluation will also exert an additional indirect effect insofar as it causes the black market rate to change, thus affecting import costs, prices, and real wages.

In this section, the direct, partial equilibrium effects of both an official and black market depreciation on non-tradeable output are discussed. We then describe the total or general equilibrium impact of an official devaluation, taking into account both of these channels of

transmission, and compare it to the impact of a devaluation when no black markets are present.

Direct effect of an official devaluation: By normalizing equations (10) through (12) on the nominal wage and log-differentiating, we can calculate the partial equilibrium elasticity of non-tradeable goods output N with respect to the real official exchange rate e (when the black market rate e^b is held fixed). After considerable manipulation we derive:[5]

$$\eta_{N,e} = \frac{1}{D} \cdot \frac{1}{p_N N} \cdot \tag{14}$$

$$\Big\{\eta_{X,e}\Big[c_k X\Big(\phi e^b + (1-\phi)e^b + (e^b-e)\beta(1-\phi)\Big) + (c_w-c_k)\eta_{L,X}L(X)\Big]$$

$$+ \eta_{\phi,e}\Big[c_k \phi X(1-\beta)(e^b-e)\Big]$$

$$+ c_k e\Big[X(1-\phi) - X\beta(1-\phi) - OS'\Big]\Big\}$$

The first line in the expression within the brackets $\{\ \}$ in equation (14) incorporates all devaluation effects operating through the positive response of total exports. Capitalist consumption rises because of increases in total export revenues, as well as increases in rents earned by importers buying dollars from the central bank at e and re-selling them at e^b; the increase in export revenues remitted to the central bank leads to increases in rationed dollar sales to these importers. If workers have higher consumption propensities than

---

5/ See Kamin, 1987, for details.

capitalists, the rise in employment engendered by the export response leads an additional fillip to consumption, as indicated by the second term in the first line. This channel thus exerts an unambiguously positive effect on total spending. However, the impact effect of devaluation on total exports is likely to be quite small.[6]

The second line in equation 14 indicates the net effect of the reduction in under-invoicing in response to devaluation on total spending. This is unambiguously negative; only β of every export dollar converted at the central bank is re-sold, so reduced black-market profits by exporters due to reduced under-invoicing dominate increased black-market profits by importers able to purchases more dollars at the official rate.

The third line in equation 15 is the domestic currency value (at the official exchange rate) of the officially measured trade balance. Cooper (1971) and K-T (1978) have already noted that a devaluation from the position of an initial trade deficit will tend to be contractionary, and this effect shows up here as well. With an official devaluation, increased revenues for exporters are offset by higher costs for importers. Since countries implementing devaluations are likely to be running an official trade deficit (see Kamin, 1988a), this channel is likely to exert a negative effect on spending.

6/ In their analysis of the impact effect of devaluation, Krugman and Taylor (1978) discounted the short-term response of total exports to devaluation as being essentially negligible. Follow-up articles such as Hanson (1983) have relaxed other K-T assumptions--the inelasticity of import demand, or the rigidity of nominal wages--but retained the fixed-export assumption. Finally, Kamin (1988b) presents evidence supporting the short-term responsiveness of the under-invoicing share to exchange rate changes, but not that of total exports.

In sum, when the black market rate is held constant and total export responses are assumed to be small, the direct, partial equilibrium effect of an official devaluation is likely to be contractionary. However, in this polar case, the contractionary effect operates through the reduction of black market profits rather than through the increases in the price level cited by other scholars. These price level effects stem from depreciations of the black market rate as discussed below.

Direct effect of a black market rate depreciation

The elasticity of non-tradeables production with respect to the black market rate, for a fixed official exchange rate, can be derived analogously to the case of an official devaluation and is shown below:

$$\eta_{N,e^b} = \frac{1}{D} \cdot \frac{1}{p_N N} \cdot \tag{15}$$

$$\Big\{ \eta_{X,e^b} \left[c_k X \left(\phi e^b + (1-\phi)e + (e^b - e)\beta(1-\phi) \right) + (c_w - c_k)\eta_{L,X} L(X) \right]$$

$$+ \eta_{\phi,e^b} \left[c_k \phi X (1-\beta)(e^b - e) \right]$$

$$+ c_k \Big[e^b \left(\phi X + \beta(1-\phi)X + OS' - a_I N \right) \left(1 - s_I \right) - e \left(X(1-\phi) - \beta(1-\phi)X - OS' \right) s_I \Big]$$

$$+ (c_k - c_w) s_I y_w \Big\}$$

s_I: $\frac{(1+ mu) a_I e^b}{p_N}$; share of imported imports (including mark-up) in total costs

The first two terms in the expression between the brackets $\{\ \}$ are almost exactly as in the expression for $\eta_{N,e}$ shown in equation (15). As in the impact of an official devaluation, a black market depreciation raises total exports and hence total spending; in contrast to an official devaluation, however, a black market depreciation raises under-invoicing and hence acts to raise spending through this channel as well.

The third term in the equation (15) represents the impact of black market depreciation when the black market trade account ($\phi X+\beta(1-\phi)X+OS' - a_I N$) and/or the official trade account ($X(1-\phi)-\beta X(1-\phi) - OS'$) are out of balance. Black market depreciation is expansionary when the black market trade balance is in surplus and contractionary when it is in deficit; this mirrors the effect of the official trade balance in the context of an official devaluation. Conversely, black market depreciation is contractionary when the official trade balance is in surplus and expansionary when the official trade balance is in deficit. Since the nominal local currency value of the official trade balance is fixed by the official exchange rate, a depreciation of the black market rate raises the general price level and therefore lowers the (absolute value of the) real official trade balance.

The final term in the expression for $\eta_{N,e}{}^b$ represents the contractionary effect of black market depreciation through its impact on income distribution, and exactly mirrors the effect K-T (1978) derived for an official devaluation. For rigid nominal wages, increases in the black market rate raise input costs, which are passed along, with a mark-up, to final consumers; this lowers wages and redistributes income from workers to capitalists. If capitalists consume less out of income than do workers, total spending and output will fall.

Even when total exports are assumed to be fixed, the expression for η_{N,e^b} is theoretically ambiguous. The under-invoicing effect shown in the second term of equation (15) is positive. As will be shown in Section V.1, the black market trade balance is likely to be in surplus, so that the third term will be positive as well. However, assuming $c_w > c_k$, the income distribution effect of a black market depreciation will be negative.

Total (general equilibrium) effect of official devaluation: The total effect of an official devaluation includes both its direct partial equilibrium effect ($\eta_{N,e}$) and its indirect effect in depreciating the black market rate ($\eta_{e^b,e}$) and hence influencing output through the partial equilibrium effect of the black market rate on output (η_{N,e^b}):

$$\hat{N} = \hat{e} \cdot \eta_{N,e} + \hat{e}^b \eta_{N,e^b} = \hat{e}\left(\eta_{N,e} + \eta_{N,e^b} \cdot \eta_{e^b,e}\right) \qquad (16)$$

Combining equations (14) and (15) and suppressing the response of total exports by setting $\eta_{X,e} = \eta_{X,e^b} = 0$,[7] we derive the total effect:

$$\eta'_{N,e} = \eta_{N,e} + \eta_{N,e^b} \cdot \eta_{e^b,e} = \frac{1}{D} \cdot \frac{1}{p_N N} \cdot \qquad (17)$$

$$\left\{c_k \phi X(1-\beta)(e^b - e) \cdot \eta_{\phi,e}\left[1 - \frac{de^b}{de}\right]\right.$$

7/ Obviously, for a sufficiently rapid response of total exports, a devaluation will always be expansionary. An appropriate research question might be to ask exactly how substantial the export response would have to be to offset the contractionary effects of devaluation.

$$+ c_k e\left(1-s_I\right)\left[\left(X(1-\phi) - X\beta(1-\phi)-OS'\right) + \frac{de^b}{de}\left(\phi X+\beta(1-\phi)X+OS' - a_I N\right)\right]$$

$$+ (c_k-c_w)\, s_I y_w \cdot \eta_{e^b,e}\Big\}$$

Even if we assume a priori that official devaluation depreciates the black market rate, the total effect of an official devaluation on spending will be theoretically indeterminate. At least three factors are likely to be contractionary--the reduction in under-invoicing, the skewing of income distribution, and the initial official trade deficit--but they can be offset by a sufficiently large black market trade surplus. It should be reiterated that $\eta'_{N,e}$ is a comparative-static result; in practice, it will take time for e^b to fully adjust to a change in e so as to restore black market equilibrium.

Devaluation Without Black Markets for Foreign Exchange

Is devaluation in an economy with black markets more or less contractionary than devaluation in an economy with a unified exchange market? Equation (18) represents the elasticity of output with respect to devaluation in this latter case.

$$\eta''_{N,e} = \frac{1}{D} \cdot \frac{1}{p_N N} \cdot \tag{18}$$

$$\Big\{c_k e(1-s_I)\left(X - a_I N\right)$$

$$+ (c_k - c_w)\, s_I y_w\Big\}$$

Subtracting equation (18) from equation (17):

$$\eta'_{N,e} - \eta''_{N,e} = \frac{1}{D} \cdot \frac{1}{p_N N} \cdot \tag{19}$$

$$\left\{ c_k \phi X(1-\beta)(e^b - e)\eta_{\phi,e}\left[1-\frac{de^b}{de}\right] \right.$$

$$- c_k e(1-s_I)\left[1-\frac{de^b}{de}\right]\left(\phi X + \beta(1-\phi)X + OS' - a_I N\right)$$

$$\left. - (c_k - c_w)\, s_I y_w \left[1-\frac{de^b}{de}\right]\right\} \lessgtr 0$$

Depending upon parameter values and the initial starting position of the economy, devaluation in the presence of black market may be either more or less contractionary than under a unified exchange regime. As indicated by the third term within the brackets of equation (19), devaluation will be less contractionary in the black market case if income distribution effects are predominant; since the black market rate rises less than the official rate, the price level rises by less and hence real wages fall by less. On the other hand, assuming the overall trade balance $X - a_I N$ to be the same in both cases, but the black market trade balance to be in surplus in the dual market case, the lesser depreciation of the black market rate means that the local currency valuation of the black market surplus rises by less; this effect tends to make $\eta'_{N,e}$ more negative (less positive) than $\eta''_{N,e}$. Finally, the reduction of under-invoicing in the black market cases exerts a contractionary effect that does not occur in the case of the unified exchange market.

IV. Simulation Estimates of Output Elasticities

In this section, we attempt to resolve the theoretical ambiguities in the elasticities described above using a simulation model of an economy with black markets for foreign exchange. The Appendix reproduces the equations of the simulation model, as well as the sources for parameter and exogenous variable assumptions. Aside from those relations associated with black market transactions, the model follows closely that presented in Krugman and Taylor (1978). Accordingly, for all parameters held in common, the parameter values used in K-T's simulation exercise are used in the current experiments. As in K-T, total exports are kept constant as well. Initial values for the black market rate and black market premium are derived from statistics presented in Kamin (1988b), while values for the under-invoicing share and the responsiveness of the under-invoicing share to the black market premium are derived from studies presented in Bhagwati, Krueger, and Wibulswasdi (1974) and McDonald (1985).

Table 1 below compares the partial equilibrium impact of 20 percent devaluations of the black market and official exchange rates when the other rate is held constant; the results may be used to evaluate the partial elasticities $\eta_{N,e}$ and η_{N,e^b} discussed in the text above. In these experiments, both the black market rate and the official rate were specified as exogenous, while the black market trade balance was specified as responding endogenously to changes in these rates.

The first column in Table 1 presents values for indicators prior to devaluation. The values are derived from the base-case solution of the model, taking as given the official exchange rate, the black market rate, the wage rate, exports, imports, and non-discretionary sales of dollars by

the central bank. As in the devaluation experiments presented in Table 1, the black market trade balance is solved for endogenously in the base-case simulation.

As anticipated, the direct, partial equilibrium effect of an official devaluation, shown in the second and third columns of Table 1, is contractionary. This effect results solely from the initial official trade deficit and the loss of monopoly rents to black marketeers. Because there are no price level effects, the real wage is unchanged, and in fact, the income distribution swings in favor of workers in this experiment. Note also that even though total exports are kept unchanged, official exports rise due to the fall in under-invoicing, thus improving the official trade balance and causing officially measured GDP to fall by less than total GDP.

As shown in the fourth and fifth columns of Table 1, a 20 percent depreciation of the black market rate, when the official rate is kept constant, is also contractionary, and causes a greater fall in real domestic output (2.39 percent) than does an official devaluation (0.64 percent). The contraction results solely from the black market depreciation's effect in raising the price level, reducing real wages, and skewing the income distribution in favor of low-consuming capitalists. Both the trade balance and under-invoicing effects described on page 15, by contrast, would tend to make black market depreciation expansionary. Note that officially measured GDP falls by even more than non-tradeable output (2.92 percent). This reflects deterioration of the official trade balance on account of increased under-invoicing. By contrast, total GDP falls by considerably less than non-tradeable production (1.58 percent),

Table 1. Partial Equilibrium Impacts of 20 Percent Devaluations of Official and Black Market Exchange Rates*

	Pre-Devaluation	Post-Official Devaluation	(change)	Post-Black Market Devaluation	(change)
Official Exchange Rate	1	1.2	(20%)	1	(0%)
Black Market Rate	1.4	1.4	(0%)	1.68	(20%)
Under-Invoicing Share	23%	13%	(-10 % points)	35%	(12 % points)
Non-Tradeable Price	1.54	1.54	(0%)	1.64	(6.49%)
Constant-Price Non-tradeable output	p221.69	p220.28	(-0.64)	p216.39	(-2.39%)
Constant-Price Worker Income	p118.57	p117.88	(-0.58%)	p108.92	(-8.14%)
Constant-Price Capital Income	p113.85	112.4	(-1.26%)	p122.14	(7.28%)
Constant-Price Official GDP	p217.34	p216.8	(-0.25%)	p211.0	(-2.92%)
Constant-Price Total GDP	p232.41	p230.98	(-0.62%)	p228.73	(-1.58%)
Official Trade Balance	-$4.35	-$3.48	($0.87)	-$5.39	(-$1.04)
Official Exports	$32.6	$36.96	($4.36)	$27.38	(-$5.22)
Official Imports	$36.95	$40.43	($3.48)	$32.77	(-$4.18)
Black Market Trade Balance	$10.76	$10.12	(-$0.64)	$12.67	($1.91)
Total Trade Balance	$6.42	$6.65	($0.23)	$7.28	($0.86)

*/ Local currency values prefixed by "p."

with the fall in non-tradeables partially offset by a rise in the total trade surplus.

Table 2 presents the full impact of a 20 percent devaluation of the official exchange rate in general equilibrium: the black market rate is endogenously determined so as to achieve the same black market trade balance as its initial value in the experiments described above.[8] It should be emphasized that this is a comparative static experiment, with the post-devaluation values reflecting a complete transition to a new equilibrium.[9] Hence, the black market trade surplus is kept constant in both the pre- and post-devaluation periods, while in response to the 20 percent devaluation of the official exchange rate, the black market rate depreciates by 6.43 percent and the black market premium falls from 40 percent to 24 percent. Both these latter movements are consistent with direct statistical evidence on the response of black market rates and premia to devaluations in developing countries. (Kamin, 1988b).

As we would expect, the full, general equilibrium impact of an official devaluation on domestic demand, both directly and through its effect on the black market rate, is also contractionary. The contraction

---

8/ Conventionally, the black market rate might be thought to equilibrate the black market so as to set the black market trade balance to zero. There is no evidence, however, that black market trade accounts in different countries tend to be balanced on average. (See Bhagwati, Krueger, and Wibulswasdi, 1974). On the contrary, many developing countries, such as Argentina and Mexico, have experienced long periods of sustained capital flight. Accordingly, we assume an "equilibrium" level of the black market trade surplus which in turn determines the "equilibrium" black market rate and finances an "equilibrium" flow of capital flight.

9/ Section V extends the model to examine the paths of variables during the transition period between static equilibria.

(-1.61 percent) in non-tradeables production is less marked than in the case of a 20 percent black market depreciation (-2.39 percent) for the price level rises only 1.95 percent compared with 6.49 percent in the latter case. On the other hand, the contraction is obviously more severe than that resulting from the direct, partial equilibrium effect of an official devaluation alone (-0.64 percent).

Note that because the black market trade balance is kept fixed in this experiment, changes in the official trade balance equal changes in the total trade balance. Therefore, absolute changes in official GDP will equal changes in total GDP, although their percentage changes will differ slightly. Nevertheless, the increases in official exports and official imports shown in Table 2 are highly misleading, since they neglect changes in under-invoicing and black market flows. In fact, total exports remain fixed, by assumption, while total imports fall in response to the contraction in output.

Finally, we compare the effects of devaluation in an economy with black markets to those in an economy with a unified foreign exchange market. In a unified market, input costs now depend exclusively on the official exchange rate; in order to specify initial conditions similar to those prevailing in the black market experiments, the official exchange rate is equal to the former (pre-devaluation) value of the black market rate, and the black market premium and black market trade balance are set to zero. As indicated by comparing Table 3 with Table 2, the base-case solutions for the pre-devaluation values of non-tradeable output and the total trade balance are similar to, but not exactly the same as, the values for the black markets economy; the black markets economy generates monopoly rents which result in a slightly higher level of aggregate demand.

Table 2. Impact of 20 Percent Official Devaluation in General Equilibrium*

	Pre-Devaluation	Post-Devaluation	(change)
Official Exchange Rate	1	1.20	(20%)
Black Market Rate	1.4	1.49	(6.43%)
Under-Invoicing Share	23%	16%	(-7 % points)
Non-Tradeable Price	1.54	1.57	(1.95%)
Constant-Price Non-tradeable output	p221.69	p218.11	(-1.61%)
Constant-Price Worker Income	p118.57	p114.6	(-3.35%)
Constant-Price Capital Income	p113.85	p115.23	(1.22%)
Constant-Price Official GDP	p217.34	p214.35	(-1.38%)
Constant-Price Total GDP	p232.41	p229.42	(-1.29%)
Official Trade Balance	-$4.35	-$3.77	($0.58)
Official Exports	$32.6	$35.5	($2.9)
Official Imports	$36.95	$39.27	($2.32)
Black Market Trade Balance	$10.76	$10.76	($0)
Total Trade Balance	$6.42	$7	($0.58)

*/ Local currency values prefixed by "p."

Table 3. Impact of 20 Percent Devaluation in a Unified Foreign Exchange Market

	Pre-Devaluation	Post-Devaluation	(change)
Exchange Rate	1.4	1.68	20%
Non-Tradeable Price	1.54	1.64	6.49%
Constant-Price Non-tradeable output	p219.34	p212.07	(-3.31%)
Constant-Price Worker Income	p117.42	p106.94	(-8.93%)
Constant-Price Capitalist Income	p111.44	117.46	(5.4%)
Constant-Price GDP	p228.86	p223.24	(-2.46%)
Trade Balance	$6.8	$7.98	($1.18)
Exports	$42.41	$42.41	($0)
Imports	$35.61	$34.43	($1.18)

It may be seen that compared with devaluation when there are black markets for foreign exchange, devaluation in a unified exchange regime is more inflationary, more contractionary, and more likely to skew the distribution of income; on the other hand, the devaluation in a unified exchange system is more likely to improve the total trade balance than in the black market economy. The devaluation in a unified exchange market has greater impact because all import costs rise by the full extent of the official devaluation. By contrast, import costs in the black markets economy rise only by the extent that the black market rate depreciates, and this may be much less than the changes in the official exchange rate. Hence, in an economy with widespread black market activity, fear of stagflationary effects may be an inappropriate reason to cancel or postpone devaluation.

V. Output Behavior with Anticipated Devaluation

Even though devaluation in a black market economy is less contractionary than devaluation in a unified exchange system, its impact effect (a 1-1/2 percent reduction in domestic absorption) could still be a considerable disincentive to implementing the policy. In this section, we argue that most devaluations are generally anticipated beforehand, and this tends to raise the black market rate in advance of the official devaluation. This means that some of the contractionary effect of devaluations will tend to occur in advance of the official devaluation itself, and this will further limit the contractionary effect associated with an official devaluation.

V.1 Theoretical Background

To motivate the pre-devaluation rise in the black market rate more formally, we retain our assumption that in the steady state, the black market rate is determined so as to balance the black market trade account;

however, we assume that in the short run, the black market rate moves to equate portfolio demands for dollars with their outstanding stocks. Private sector agents are assumed to hold two assets in their portfolios, dollars (B) and domestic currency (M). As before, we assume the authorities keep the supply of real balances $m = M/P_N$ constant. Following Dornbusch et. al. (1983), the desired ratio of the domestic currency value of private sector dollar holdings to the domestic money supply is modeled as a function of the expected (and actual, in this project foresight model) rate of depreciation of the black market rate:

$$E^b B/M = \theta(\hat{E}^b),\ 0 < \theta(\ ) < 1,\ \theta'(\ ) > 0 \qquad (20)$$

or, dividing through by the non-traded goods price $P_N = (1 + mu)\ (a_L + a_I\ E^b)$:

$$B = \theta(\hat{E}^b)\ m(1 + mu)\left[a_L(e^b)^{-1} + a_I\right] \qquad (21)$$

Increases in the black market rate lead to higher prices and nominal money stocks, but raise the domestic currency value of dollar holdings even more. This causes a decline in the portfolio demand for dollar holdings B as the black market rate increases, as shown in Figure 1 below. B is fixed at any moment by the history of past black market trade balances, and hence determines the value of e^b, which is fully flexible, at that moment.

In the long run, the black market rate must satisfy the requirements of both portfolio and trade balance equilibrium. In this example, trade balance equilibrium is most easily understood to mean a zero balance, so that dB=0; for any given official exchange rate, a single black

market rate will achieve black market trade balance, so the dB curve in Figure 1 is shown to be vertical. Steady state equilibrium occurs at the intersection of the portfolio equilibrium ($\hat{e}^b = 0$) and trade balance equilibrium (dB=0) curves; the directions of movement out of equilibrium and stable saddle path are also shown.

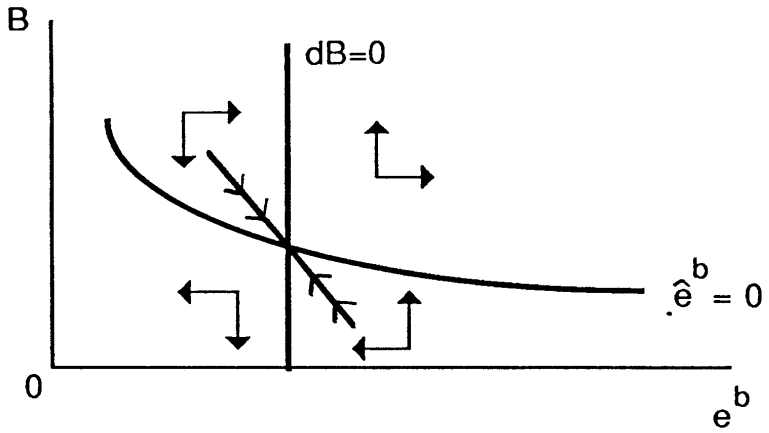


Fig. 1: Trade balance/portfolio equilibrium

Figure 2 indicates the path of the black market rate in response to advance news of a future devaluation. For $\eta_e b,_e > 0$, a devaluation shifts trade balance equilibrium from dB=0 to dB=0'. The news raises the anticipated rate of black market depreciation, thus increasing dollar demands and the current black market rate. We know that at the moment of devaluation, the market must be on the new stable saddle path associated with dB=0'. However, the black market rate cannot immediately rise to this level, for by the time the devaluation occurred, given the prevailing directions of motion, the market would end up far above the new saddle path at the moment of devaluation. As shown below, the black market rate must jump initially, then continue to depreciate while the private sector accumulates dollars (since at the old official exchange rate, the black market trade balance will be in surplus) so that the economy hits the new

stable saddle path at the exact moment of devaluation. At this point, the black market rate would continue to depreciate along the saddle path until the new equilibrium is reached.

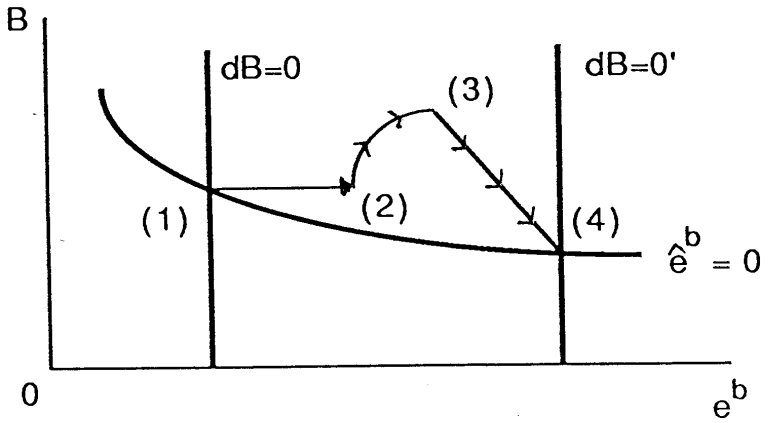


Fig. 2: Anticipated official devaluation

V.2 A Simulation Experiment

The extent to which the black market rate rises in anticipation of official devaluation, as well as the effects of these depreciations on the rest of the economy, is fundamentally an empirical question. To address this issue, we added a log-linear variant of the portfolio balance equation (20) (shown below) to the simulation model discussed above and simulated the paths of the black market rate, prices, incomes, and output under the assumption of a perfectly anticipated official devaluation. A variant of the Fair-Taylor "extended path" algorithm was used to calculate the model solution, which required the current black market rate to be solved for as a function of the endogenous future black market rate.

The portfolio balance equation actually used in the model is specified:

$$\log (M_t/(B_t \cdot E_t^b)) = \alpha - \lambda (E^b_{t+1}/ E_t^b - 1) \qquad (22)$$

It corresponds to the long-run specification of the fractional-adjustment equation estimated in a study of currency substitution in Argentina, Mexico, and Uruguay by Ramirez-Rojas (1985). In equation (22), α represents the steady-state ratio of domestic currency to foreign currency holdings, while λ indicates the responsiveness of this ratio to anticipated black market exchange rate depreciation.

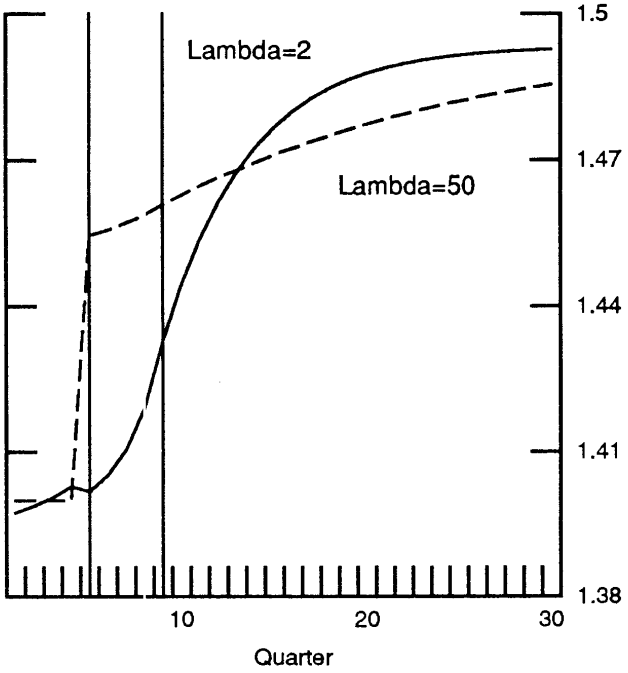
Because of the difficulty of measuring foreign-currency denominated holdings in any black market economy, measurements of either α or λ are difficult to obtain. Ramirez-Rojas found ratios of domestic to foreign currency holdings to vary widely, both across countries and over time; estimates of λ described in his study range from below 2 to over 10. For illustrative purposes, we chose a ratio of domestic currency to foreign currency holdings of 4 in the steady-state (implying $\alpha = \log (4) = 1.39$), and performed the (anticipated) devaluation experiment for two extreme values of λ: 2 and 50.

Chart 1 plots the transition paths of four key indicators--the black market rate, the export under-invoicing share, non-tradeable output and the money-to-foreign assets ratio--in anticipation of and following an official devaluation. The endpoints of the paths approach the equilibrium variable values shown in Table 2 (for a 20 percent devaluation of the official exchange rate); however, full convergence to the model's new steady-state values takes an additional 10 quarters at the least.

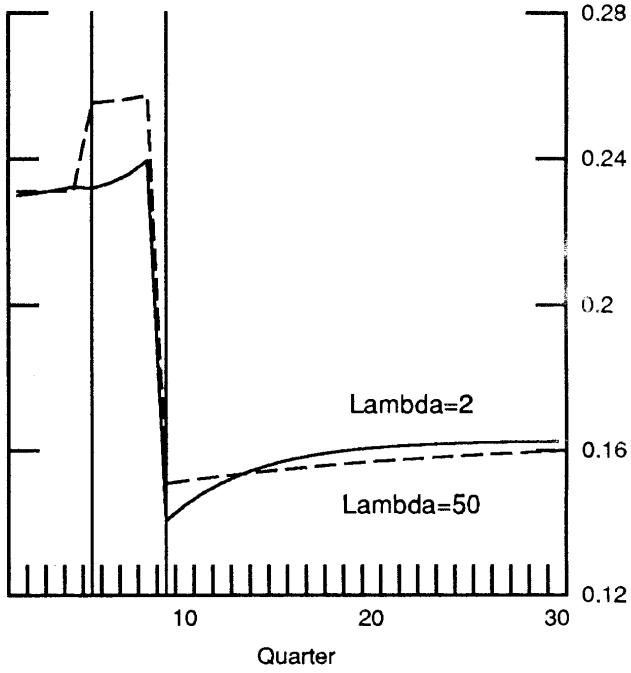
CHART 1

MACRO VARIABLES WITH ANTICIPATED DEVALUATION

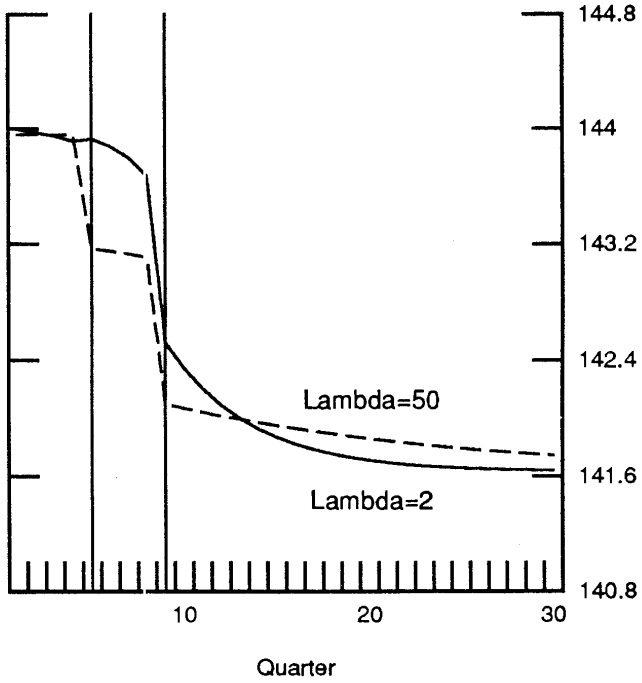
BLACK MARKET RATE



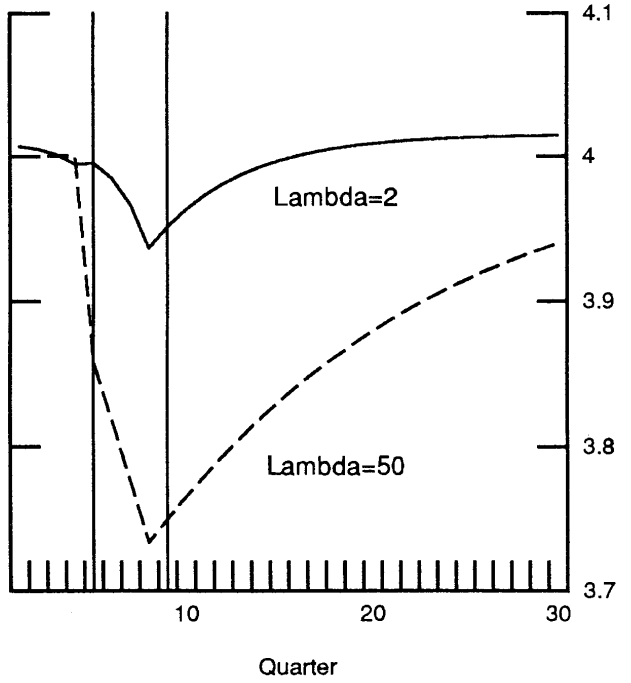
UNDER-INVOICING SHARE



NON-TRADEABLE OUTPUT



MONEY/FX RATIO



Devaluation News: Quarter 5

Devaluation: Quarter 9

As the transition paths in Chart 1 indicate, the more sensitive are portfolio decision to expectations of future depreciation (i.e., the higher are values for λ), the greater the extent of economic contraction prior to official devaluation. For λ=2, comparatively little contraction occurs until after the official devaluation; on the other hand, for λ=50, almost half of the overall contraction occurs prior to the devaluation itself. Note that even when λ is set to 50, variations in the ratio of local to foreign currency holdings are not implausibly large.

In sum, the more sensitive are financial decisions to depreciation expectations, the more futile will be postponements of devaluations in order to protect domestic incomes and production levels.

V.3 Some Supporting Evidence

The model sketched in the preceding pages is too simplified and stylized to exactly reproduce real world behavior. It does, however, contain the following implications for what we should observe during actual devaluation episodes:

1. The black market rate should depreciate before the official devaluation and then depreciate somewhat more thereafter;
2. the black market premium should rise prior to devaluation and fall immediately thereafter;
3. The trade balance should deteriorate prior to devaluation and improve thereafter;
4. Inflation should accelerate prior to devaluation and decelerate subsequently;
5. Official GDP growth should deteriorate prior to devaluation and fall somewhat more thereafter.

Table 5, below, reproduces statistics presented in Kamin (1987, 1988a) which summarize movements in the variables listed above over the course of over 40 devaluation episodes. All data are median averages of the values taken by a particular variable in a particular year for all the devaluation episodes of the sample. The year immediately following the official devaluation is labeled T.

By and large, these data support the scenario outlined in Section V.1 fairly well. Before devaluation, the black market rate and premium rise, the trade balance deteriorates, inflation accelerates, and output growth declines. In the first year of the devaluation the premium declines, the trade balance improves, the black market rate rises further and output growth declines additionally. The data are clear that the greatest drop-off in output growth tends largely to be borne before the official devaluation itself takes place. Some evidence at variance with the theoretical scenario concerns inflation, which appears to peak in the year immediately following the official devaluation. This suggests that the model was overly restrictive in assuming that all imports are brought in (implicitly or explicitly) at the black market rate. In reality, many import prices, especially those administered by government agencies or enterprises, will rise with the official devaluation as well.

Table 5: Summary Data for Indicator Movements during Devaluation Episodes

	Year Relative to Devaluation Year T						
	T-3	T-2	T-1	T	T+1	T+2	T+3
Nominal Black Market Rate (T=1):[a]	.68	.74	.86	1	1.03	1.05	1.08
Ratios of Black Market to Official Rate:[a]	1.39	1.37	1.47	1.3	1.22	1.17	1.14
GDP-Scaled Trade Balance:**[b]	-1.2%	-1.6%	-1.9%	-1.5%	-1.7%	-2.5%	-2.8%
CPI Inflation:[b]	9.9%	11.2%	14.0%	17.3%	14.7%	11.5%	13.9%
Real GDP Growth:[b]	4.7%	4.9%	3.9%	3.5%	5.2%	4.6%	5.5%

a: Source: Kamin (1987).
b: Source: Kamin (1988a).
** Trade balance as percent of GDP at year T.

Appendix: The Simulation Model

Key Model Equations

1) $P_N = (1 + mu)\ (a_{LN}W + a_I E^b)$

2) $Y_W = W(a_{LX}X + a_{LN}N)$

3) $Y_K = X\ (S_u E^b + (1 - S_u)E - a_{LX}W)$
$+ (E^b - E)\ (b(1 - S_u)X + OS')$
$+ mu\ (a_{LN}W + a_I E^b)N$

4) $N = (c_W\ Y_W + c_K\ Y_K + P_N I)/P_N$

5) $S_u = su + dsu\ (E^b/E - ebratio)$

6) $BMBAL = S_u X + b(1-S_u)X + OS' - a_I N$

Equations for perfect foresight model:

7) $M = mPN$

8) $\log\ (M/B.E^b) = alpha - lambda\ (E^b(+1)/E^b - 1)$

9) $B = B(-1) + (BMBAL - BMBAL')$

Notation

Endogenous variables:

P_N: non-traded goods price

Y_W: nominal worker income

Y_K: nominal capitalist income

N: real non-traded goods output

S_u: export under-invoicing share

(E^b): nominal black market exchange rate in local currency per dollar (only endogenous in general equilibrium simulation shown in Table 2 and Chart 1)

(BMBAL): black market trade balance in dollars (only endogenous in partial equilibrium simulation shown in Table 1)

M: nominal local-currency money stock

B: stock of dollars held by private sector

Exogenous variables:

BMBAL': steady-state black market surplus

W: nominal wage rate

E: nominal official exchange rate in local currency per dollar

X: dollar value exports

OS': fixed (non-discretionary) sales of dollars to importers

I: real investment spending

parameters:

mu: mark-up rate

a_{LN}: unit labor requirement in non-traded goods sector

a_{LX}: unit labor requirement in export sector (linearization of increasing costs technology described in text)

a_I: unit imported input requirement in non-traded goods sector

b: fraction of export remittances to central bank resold to importers

c_W: marginal (and average) propensity to consume by workers

c_K: marginal (and average) propensity to consume by capitalists

su: average under-invoicing share

ebratio: average ratio of black market to official exchange rate

dsu: derivative of under-invoicing share with respect to changes in black market/official exchange rate ratio

m: real money stock

alpha: log of average ratio of domestic-currency to foreign currency assets

lambda: derivative of log of currency ratio with respect to expected black market rate depreciation.

Sources for Exogenous Variable and Parameter Values

Exogenous variables:

E: 1; by assumption

W: 1; by assumption

X: 42.4; calculated so that ratio of official exports to official GDP in the base case solution equaled 15 percent, which is consistent with World Bank data and with results presented in Kamin (1988a).

OS': 10.9; calculated so that ratio of the official trade deficit to official GDP in the base case solution equaled 2 percent; this is consistent with results presented in Kamin (1988a).

I: 30; by assumption

BMBAL': 10.8; equal to black market trade balance in base case (static solution).

Parameters values:

m_u: .4; from K-T (1978).

a_{LN}: .75; from K-T (1978).

a_{LX}: .25; from K-T (1978).

a_I: .25; from K-T (1978).

b: .8; consistent with data presented in Kamin (1987).

c_w: 1; from K-T (1978).

c_k: .5; from K-T (1978).

su: .13; mid-range estimate in Bhagwati, Krueger, and Wibulswasdi (1974).

ebratio: 1.17; mid-range estimate in Bhagwati, Krueger, and Wibulswasdi (1974).

dsu: .44; mid-range estimate derived from regression results presented in McDonald (1985).

m: 36; calculated using representative velocity estimate of 4 and base-case real GDP of about 145.

alpha: 1.39; conservative assumption consistent with data presented in Ramirez-Rojas (1985).

lambda: 2, 10, 30, 50; range of values: 2 and 10 are most representative of parameters estimated by Ramirez-Rojas (1985).

REFERENCES

Bhagwati, Jagdish N., Anne Krueger, and C. Wibulswasdi, 1974, Capital Flight from LDC's: A Statistical Analysis," in Bhagwati, ed., Illegal Transactions in International Trade, (North-Holland, Amsterdam), 1974.

Cooper, Richard N., Currency Depreciation in Developing Countries, Essays in International Finance No. 86, Princeton, N.J., Princeton University, International Finance Section, June 1971.

Diaz-Alejandro, Carlos F., "A Note on the Impact of Devaluation and the Redistributive Effect," Journal of Political Economy 71, (December 1963), pp. 577-580.

_____, Exchange Rate Devaluation in a Semi-Industrialized Economy: The Experience of Argentina 1955-61, Cambridge, Mass., MIT Press, 1965.

Dornbusch, Rudiger, et al., "The Black Market for Dollars in Brazil," Quarterly Journal of Economics, February, 1983.

Hanson, James A., "Contractionary Devaluation, Substitution in Production and Consumption, and the Role of the Labor Market," Journal of International Economics 14, (February 1983), pp. 179-89.

Kamin, Steven B., Devaluation, External Balance, and Macroeconomic Performance in Developing Countries, Ph.D. Dissertation, MIT, 1987.

_____, "Devaluation, External Balance, and Macroeconomic Performance in Developing Countries: A Look at the Numbers," Princeton Studies in International Finance, No. 62, August 1988a.

_____, "Devaluation, Exchange Controls, and Black Market for Foreign Exchange in Developing Countries," International Finance Discussion Papers, No. 334, October 1988b.

Krugman, Paul and Lance Taylor, "Contractionary Effects of Devaluation," Journal of International Economics, 8 (August 1978), pp. 445-456.

Lizondo, Saul, and Peter Montiel, "Dynamics of Devaluation and 'Equivalent' Fiscal Policies for a Small Country with Optimizing Agents," unpublished mimeo, 1988.

_____, "Contractionary Devaluation in Developing Countries: An Analytical Overview," IMF Staff papers, Washington, D.C., 1989.

McDonald, Donough C., "Trade Data Discrepancies and the Incentive to Smuggle: An Empirical Analysis," IMF Staff Papers, December 1985.

Ramirez-Rojas, C.L., "Currency Substitution in Argentina, Mexico, and Uruguay," IMF Staff Papers, 32, Washington, D.C., December 1985, pp. 629-667.

International Finance Discussion Papers

IFDP NUMBER	TITLES	AUTHOR(s)
355	An Econometric Analysis of UK Money Demand in *Monetary Trends in the United States and the United Kingdom* by Milton Friedman and Anna J. Schwartz	David F. Hendry Neil R. Ericsson
354	Encompassing and Rational Expectations: How Sequential Corroboration Can Imply Refutation	Neil R. Ericsson David F. Hendry
353	The United States as a Heavily Indebted Country	David H. Howard
352	External Debt and Developing Country Growth	Steven B. Kamin Robert B. Kahn Ross Levine
351	An Algorithm to Solve Dynamic Models	Wilbur John Coleman II
350	Implications of the U.S. Current Account Deficit	David H. Howard
349	Financial Integration in the European Community	Sydney J. Key
348	Exact and Approximate Multi-Period Mean-Square Forecast Errors for Dynamic Econometric Models	Neil R. Ericsson Jaime R. Marquez
347	Macroeconomic Policies, Competitiveness, and U.S. External Adjustment	Peter Hooper
346	Exchange Rates and U.S. External Adjustment in the Short Run and the Long Run	Peter Hooper
345	U.S. External Adjustment: Progress and Prospects	William L. Helkie Peter Hooper
344	Domestic and Cross-Border Consequences of U.S. Macroeconomic Policies	Ralph C. Bryant John Helliwell Peter Hooper
343	The Profitability of U.S. Intervention	Michael P. Leahy
342	Approaches to Managing External Equilibria: Where We Are, Where We Might Be Headed, and How We Might Get There	Edwin M. Truman
341	A Note on "Transfers"	David B. Gordon Ross Levine
340	A New Interpretation of the Coordination Problem and its Empirical Significance	Matthew B. Canzoneri Hali J. Edison

International Finance Discussion Papers

IFDP NUMBER	TITLES	AUTHOR(s)
	1990	
370	Contractionary Devaluation with Black Markets for Foreign Exchange	Steven B. Kamin
	1989	
369	Exchange Rate Variability and the Level of International Trade	Joseph E. Gagnon
368	A Substitute for the Capital Stock Variable in Investment Functions	Guy V.G. Stevens
367	An Empirical Assessment of Non-Linearities In Models of Exchange Rate Determination	Richard A. Meese Andrew K. Rose
366	Equilibrium in a Production Economy with an Income Tax	Wilbur John Coleman II
365	Tariffs and the Macroeconomy: Evidence from the USA	Andrew K. Rose Jonathan D. Ostry
364	European Integration, Exchange Rate Management, and Monetary Reform: A Review of the Major Issues	Garry J. Schinasi
363	Savings Rates and Output Variability in Industrial Countries	Garry J. Schinasi Joseph E. Gagnon
362	Determinants of Japanese Direct Investment in U.S. Manufacturing Industries	Catherine L. Mann
361	The U.S. and U.K. Activities of Japanese Banks: 1980-1988	Henry S. Terrell Robert S. Dohner Barbara R. Lowrey
360	Policy Rules, Information, and Fiscal Effects in a "Ricardian" Model	Eric M. Leeper
359	A Forward-Looking Multicountry Model: MX3	Joseph E. Gagnon
358	Implications for Future U.S. Net Investment Payments of Growing U.S Net International Indebtedness	Lois E. Stekler William L. Helkie
357	U.S. Policy on the Problems of International Debt	Edwin M. Truman
356	International Economic Policy: The Role of Exchange Rates	Edwin M. Truman

Please address requests for copies to International Finance Discussion Papers, Division of International Finance, Stop 24, Board of Governors of the Federal Reserve System, Washington, D.C. 20551.