

Economic Growth and the Balance of Payments

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The paper uses a simple comparative statics framework to suggest a new approach for analyzing the effects of economic growth on the balance of payments. The balance of payments will be nonzero only if one or more markets are out of equilibrium at the beginning of the relevant time period. One obvious policy implication is that government actions should focus on the market or markets that are slow to clear. A less obvious policy conclusion is that tariffs, quotas, and other types of commercial policy may be the proper policies toward payments deficits that are associated with disequilibrium in the home market for traded goods. Similarly, controls and/or taxes on international capital flows may be the proper policy when asset markets fail to clear, as may happen when interest rates are not free to vary.

I. Introduction and Literature Review

A. *Introduction*

The objective here is to present a general approach for the analysis of the balance of payments effects of economic growth, wherein the latter is defined as exogenous increases in productive capacity. The basic premise is based upon an idea in Hahn (1977), as it has been developed by Miller (1981, 1986a, 1986b), and applied to the issue of economic growth by Chakraborty (1987). This is that the ex ante balance of payments for a country will be nonzero only when one or more domestic markets are initially in a state of disequilibrium. Consequently, economic

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growth may have different effects on the balance of payments in various countries, or in the same country at different points in time, depending on which market initially moves out of equilibrium, or, equivalently, on which market is the slowest to clear in a situation where all markets initially move out of equilibrium.

It is proven below that all other theories of the balance of payments, BP, (and theories of how growth affects the BP) represent special cases of our general approach. Moreover, there exists a yet to be developed special case theory that may be particularly relevant for developing countries. In order not to create false expectations, however, it must be pointed out at the outset that our general approach leads to no simple conclusions. In other words, we find that economic growth will have an uncertain effect on the balance of payments, depending on the specifics of the economy involved.

This conclusion is not new, since (as detailed below) both the Keynesian and the macro-model versions of the monetary approach to the balance of payments, MBP, have also reached this conclusion. What is new here are the conclusions about how alternative initial market disequilibria (that arise from economic growth) are associated with payments imbalances, and, also, how our general approach lends itself much more readily to the use of intuition on the part of policy makers. Our general approach also contains policy implications that are, in part, at odds with the conventional wisdom, especially with regard to developing countries. Furthermore, these policy implications are easily extended beyond the issue of how the balance of payments is affected by economic growth. They are relevant to balance of payments effects of an exogenous event, such as monetary, fiscal, or commercial policy.

B. Literature Review

The literature contains at least three approaches toward analyzing how the balance of payments is affected by economic growth; the Keynesian approach, the foreign exchange market approach, and the monetary approach (MBP). The traditional Keynesian approach points out that an increase in output and income will tend to stimulate imports and deteriorate the balance of payments. This Keynesian conclusion was weakened by the discovery of pro-cyclical movements in the capital account by Branson (1968), Miller & Whitman (1970) and others. Harry G. Johnson (1966) correctly pointed out that, within the context of a Keynesian IS/LM open economy model, an increase in income and output would deteriorate the trade balance but improve the capital account, thereby having an uncertain effect on the balance of payments.

The Keynesian approach has been criticized because it does not distinguish between alternative causes of an increase in income or output. That is, within the traditional Keynesian model, an increase in economic activity typically occurs via a rightward shift in the aggregate demand curve. Thus, the higher income that deteriorates the trade balance and improves the capital account represents a movement along an aggregate supply curve, rather than a rightward shift in the supply curve. Since economic growth is typically defined as an increase in productive capacity, it follows that the traditional Keynesian approach has not been focused properly. However, we shall prove below that the Keynesian approach may be reinterpreted as implicitly assuming that the bond or credit market is slow to clear. With this interpretation, a modified version of the Keynesian approach becomes particularly relevant in developing countries wherein the nominal interest rate is pegged by the government at a level that lies below the rate that would clear the credit market.

What we call the foreign exchange market approach to economic growth and the balance of payments represents a more realistic version of the Keynesian approach, wherein economic growth is represented by an exogenous increase in productive capacity that manifests itself via a rightward shift in the short run aggregate supply of commodities curve. Such a shift raises income and output, and puts a downward pressure on prices. Thus, the trade balance may deteriorate via the positive effect of income on imports, or may improve via the larger volume of exports and lower imports that should arise when the increased productive capacity exerts its negative influence on domestic prices.

The early MBP investigations of economic growth and the balance of payments by Mundell (1968), H.G. Johnson (1972), and R. Komiya (1969) all concluded that economic growth will improve the balance of payments of a small open economy. As is well known, within the MBP an excess demand (supply) of money creates a BP surplus (deficit) of equal magnitude. Thus, since economic growth always raises the home demand for money, it also creates a home excess demand for money, and a balance of payments surplus.

In contrast to this standard MBP conclusion, Dornbusch (1971) allegedly proves that growth exerts an uncertain influence on the balance of payments, even within an MBP framework. However, within his model, Dornbusch assumes that economic growth is always accompanied by an increase in the monetary growth rate.¹ Hence, the uncertain effect

¹ The Dornbusch model accomplishes this by assuming that the government budget deficit increases when the economic growth rate rises, and that some portion of the deficit is always financed via a monetary expansion.

that growth exerts on the balance of payments occurs because: (i) growth in itself always increases the demand for money and tends to create a payments surplus in the traditional MBP manner; (ii) growth increases the monetary growth rate, which exerts a negative influence on the balance of payments.

Frenkel, Gylfason and Helliwell (1980) present a model that allegedly synthesizes the Keynesian and the MBP models. Within their framework, an increase in income exerts an uncertain effect on the balance of payments. Their model, however, represents a macro-model (as opposed to a single money market equation) version of the MBP, because the balance of payments is always (by assumption) equal to the initial excess demand or supply of money. The uncertainty that their model generates with regard to increases in income and the balance of payments arises because their model allows home prices to fall when economic capacity rises. This allows for the possibility that the income induced increase in the demand for money might possibly be more than neutralized by an increased real money supply via the lower price level. Within the early single equation MBP models cited above, home interest rates and prices are pegged to foreign rates and prices by the small country assumption, so that such uncertainty does not arise.

This, however, illustrates an important point that we emphasize below, namely that within the MBP, the Keynesian approach, or any other approach, economic growth exerts an uncertain effect on the balance of payments if home interest rates, prices, and output are allowed to vary. Such a conclusion, moreover, helps to motivate the approach suggested here. We prove below that any of the macro-model approaches lead to uncertain conclusions. This uncertainty also exists when we take a "theoretical short-cut," so to speak, by eschewing the cumbersome macro-model for a simple one equation approach based upon the market which is assumed to be out of equilibrium. However, the single equation short-cut lends itself much more readily to the use of intuition and deduction. All of this will become clear only after the rigorous analysis to which we now turn.

II. A General Approach to the Balance of Payments

A. *General Case*

In a much overlooked review of the monetary approach to the balance of payments, Frank Hahn (1977) mentioned, almost in passing, that the MBP is a valid theory only if all markets but the money market are always

in a state of equilibrium. In a series of papers, Miller (1978, 1981, 1986a, 1986b) has developed this idea into a general approach for the analysis of the balance of payments and exchange rates. The basic idea is illustrated by two Walrasian type of identities:

$$(1a) \quad \Phi_C + \Phi_A + \Phi_M \equiv 0$$

$$(1b) \quad X_C + X_A + X_M \equiv -X_{FX} \equiv -BP,$$

where $X_C \equiv \Phi_C - BT$, $X_A = \Phi_A - KF$, and $X_M = \Phi_M$, and C = commodities, A = interest bearing assets or bonds, M = money, FX = foreign exchange, and BP = the ex ante balance of payments. Each Φ_i in (1a) represents the total ex ante home supply minus total home demand for good i . The X_i in (1b) are the total market excess supplies of each good. For example, Φ_C is home output minus total home absorption of commodities. When the balance of trade, BT, is subtracted from Φ_C we get X_C . Similarly, X_A equals Φ_A minus net capital flows, KF. The total market excess supply of money, X_M , equals Φ_M via the simplifying assumption that each country's money is held only by residents of that country.

Identity (1a) is the aggregate budget constraint for the economy, i.e., the sum of all home ex ante excess supplies must always be zero. Identity (1b) is obtained by subtracting $BP = BT + KF$ from both sides of (1a). Identity (1b) tells us that the sum of all market excess supplies, including the excess supply of foreign exchange, must always equal zero.

The logic underlying (1b) is as follows. A country can have a payments imbalance only if individual economic units within that country have payments imbalances. Now define a "budget imbalance" as net flow of money into (budget surplus) or away from (budget deficit) an economic unit.² Such budget imbalance can arise if: (a) the economic unit initially is unhappy with its money balances; it optimally plans to draw down or build up its money balances by spending more or less on all nonmonetary goods than it would with a balanced budget; all planned transactions are realized; or (b) the economic unit initially is happy with its money balances and plans to have a balanced budget, but its actual sales or purchases are not equal to what it plans.

For example, a budget deficit (surplus) occurs when some planned sales (purchases) are not realized. When we sum the "budget imbalances" of all economic units within an economy, most of them will cancel because many units will have a deficit (surplus) only with regard to

² This is not the usual definition of a budget imbalance. Typically a budget deficit exists if spending exceeds receipts, exclusive of any borrowing.

another home unit that has a surplus (deficit). However, the sum of all the home economic units' budget deficits or surpluses will equal the home country's balance of payments.

B. Special Cases

If budget imbalances arise only because of reason (a) above, then Φ_m and X_M in (1a) and (1b) are nonzero. Identity (1a) requires that at least one other Φ_i be nonzero with the opposite sign from Φ_m . Logically, if people plan to draw down or build up their money balances, then they must be planning to have an imbalance in their transactions in commodities or nonmonetary assets. Since reason (a) above assumes that all planned transactions are realized, it follows that: (i) the balance of trade will adjust to equal a nonzero Φ_C ,...so that $X_C = 0$; and/or (ii) the net capital flow will adjust to equal a nonzero Φ_A ,...so that $X_A = 0$.

Therefore, budget imbalances associated with reason (a) above lead only to a nonzero value for the excess supply of money, X_M , in (1b), i.e.,

$$(2) \quad X_M \equiv -BP.$$

On the other hand, if budget imbalances arise only because of reason (b), then the payments imbalance on the right side of (1b) is equal in magnitude to the sum of the disequilibria in the commodity market, $X_C \neq 0$, and asset or bond market, $X_A \neq 0$. In common sense terms, when people in the aggregate cannot buy or sell all that they plan, they will add or subtract from their money balances, even through such balances may have initially been at their optimal level.³

The traditional Keynesian IS/LM open economy model may be interpreted as implicitly assuming that the balance of payments is determined by the disequilibrium in the bond or asset market, i.e.,

$$(3) \quad X_A \equiv -BP.$$

Such Keynesian models usually contain IS, LM, and BP curves drawn within the (r, y) space where r is the rate of interest. Initially all three curves intersect at the same point. When an exogenous event shifts one or more of the curves, the short run equilibrium occurs at the intersection of IS and LM, which may take place on or off the BP equilibrium locus.

³ In general, such unrealized plans will create spillover effects in all other markets. The analysis here implicitly assumes that all spillovers go entirely to the money market. Consequently, people willingly give up or accept the money associated with the budget imbalance, even though $X_M = 0$ initially.

(Points above the BP curve represent payments surpluses, and points below the BP curve correspond to payments deficits.)

In terms of (1b) above, such models are assuming that $X_C = 0 = X_M$, i.e., the commodity and the money markets are always in equilibrium in the short run. Hence, it follows from (1b) that a payments imbalance is implicitly tied up with a bond or asset market disequilibrium. As excess supply of bonds, $X_A > 0$, is associated with a payments deficit, and $X_A < 0$ implies a payments surplus. Logically, if many home economic units cannot sell all the bonds that they plan, and if they (within the short-run) carry out all other plans to buy and sell, then these units will have budget deficits which, in the aggregate, lead to an outflow of money or a home payments deficit.⁴

In sum, the Keynesian approach to the balance of payments may be interpreted as equating bond market disequilibria with payments imbalances. The MBP assumes that it is always a nonzero X_M term in (1b) that determines the balance of payments. The traditional foreign exchange market approach to the balance of payments looks simply at the right side of (1b), ... either X_{FX} or BP ... and ignores everything on the left side of (1b). All of this leads logically to one remaining special case, namely that a commodity market disequilibrium can cause a payments imbalance, i.e.,

$$(4) \quad X_C = -BP.$$

The idea that a disequilibrium in the nontraded goods market may be associated with a nonzero BP has been suggested by Rabin (1979) and by Neary (1980), but a "commodity market approach to the balance of payments" has yet to be developed. This approach may be especially relevant in countries whose balance of payments turns negative when exports decline exogenously. Critics of the MBP find it difficult to believe that the resulting trade and payments deficits arise because of an underlying home excess supply of money. Equation (4) suggests that in such circumstances the decrease in exports creates an excess supply of commodities that is the "culprit" disequilibrium market associated with the payments deficit.⁵

⁴ Miller (1986b) proves that this is also true in the simple one equation Keynesian "income-absorption" models.

⁵ The word "culprit" appears within quotation marks, because no causation is implied by identity (1b). In other words, it is formally incorrect to blame a nonzero BP on the disequilibrium in some market. Rather, (1b) simply tells us that a $BP \neq 0$ must be associated with one or more nonzero X_j .

This preliminary discussion provides the theoretical background for the analysis in this paper. The plan is to investigate how an exogenous increase in a country's capacity to produce may affect that country's balance of payments. We proceed below by assuming (one at a time) each of the special cases described above with regard to which market (the commodity, bond, or money market) moves out of equilibrium. But first it is necessary to specify a complete macro-model.

III. Analysis

A. *The General Model*

We use a period analysis model that represents an open economy version of the well known Patinkin (1966) closed economy model. It is proven in Miller (1986b) that the same general framework can be constructed within a stock-flow model. The exchange rate is fixed exogenously, but output, y , the price level, P , and interest rate, r , in the home country are free to vary, at least within one period analysis time interval. The final endogenous variable is the level of international reserves, R , or, equivalently when R_{-1} is known, the balance of payments, $R - R_{-1} = BP$.

In order to solve such a model we require four independent equations which can be chosen from:

$$(5a) \quad X_C(y, r, P, e, G, H_o, P^*, r^*, y^*) = 0$$

$$(5b) \quad X_A(y, r, P, e, G, H_o, P^*, r^*, y^*) = 0$$

$$(5c) \quad X_M(y, r, P, e, G, H_o, P^*, r^*, y^*) = 0$$

$$(5d) \quad BP = (y, r, P, e, G, H_o, P^*, r^*, y^*)$$

$$(6a) \quad y = y(P, \phi) \text{ or}$$

$$(6b) \quad P = y^{-1}(y, \phi) = f(y, \phi)$$

where each X_i = the ex ante excess supply in the i th market, and:

- y = output
- r = interest rate
- P = price level
- e = exchange rate
- G = government expenditure

H_o = exogenous high powered money

ϕ = capacity growth shift parameter

P^* , r^* , y^* = foreign prices, rate of interest, and output, respectively

The assumed sign of the effect of y , r , and P on each X_i is given above each variable.⁶ All variables are in real terms and refer to the home country unless expressed otherwise. H_o is the domestic asset component of base money in a fixed exchange rate world. Equations (5a) through (5c) represent market clearing equations for the commodity, asset or bond, and money markets, respectively. (5d) is a balance of payments equation, and BP is not constrained to zero in the short run. Finally (6a) and (6b) are alternative versions of the home country's short run aggregate supply function. Since our model's time interval is brief, we assume that the short run aggregate supply curve is relatively flat, $\partial P/\partial P$ is very small, and that (in the short-run) increases in productive capacity manifest themselves via a downward shift in this aggregate supply curve, i.e., $\partial P/\partial \phi < 0$.

From identity (1b), the open economy Walrasian identity, it follows that (5a) through (5d) represent only three independent equations. Hence, these plus the aggregate supply function can be solved for the four endogenous variables, y , P , r , and BP. The plan is to consider the three special cases:

- (i) The Keynesian Model: the bond market does not clear in the short run, so that $X_A = -BP$, and the macro-model consists of (5a), (5c), (5d), and (6);
- (ii) The MBP Model: the money market does not clear in the short run, so that $X_M = -BP$, and the model consists of (5a), (5b), (5d), and (6);
- (iii) The Commodity Market Model: the commodity market does not clear in the short run, so that $X_C = -BP$, and the macro-model consists of (5b), (5c) (5d), and (6).

B. The Keynesian Model

Our Keynesian model is, in effect, an IS/LM model for an open economy, with the aggregate supply function, (6), included. To solve, we hold all exogenous variables constant except ϕ in (6); differentiate (5a), (5b), and (5d) totally; and substitute for dP from the total differential of

⁶ For lack of rigorous empirical evidence, we initially follow Patinkin (1965) in assuming that an increase in income affects bond supply and bond demand equally, i.e., $\partial X_A/\partial y = 0$. This assumption, however, is relaxed in section IIIB below.

(6b) to get:⁷

$$(7a) \quad \overset{+}{C}_1 dy + \overset{+}{C}_2 br = (-\overset{-}{C}_3 b\phi)$$

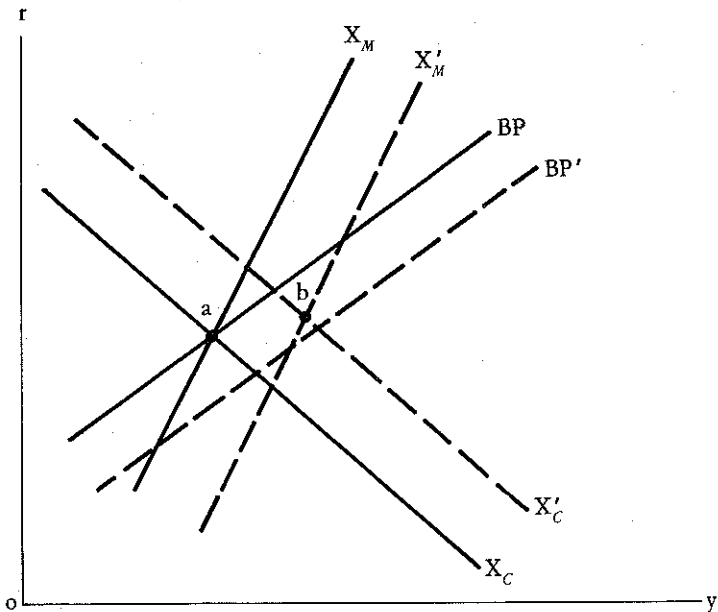
$$(7b) \quad \overset{-}{M}_1 dy + \overset{+}{M}_2 dr = (-\overset{+}{M}_3 d\phi)$$

$$(7c) \quad \overset{-}{B}_1 dy + \overset{+}{B}_2 dr - dBP = (-\overset{+}{B}_3 d\phi)$$

where C_i , M_i , and B_i represent partial derivatives of the excess supply of, respectively, commodities, money, and the balance of payments with respect to the i th argument in that excess supply function. The assumed sign of each term is given above it.

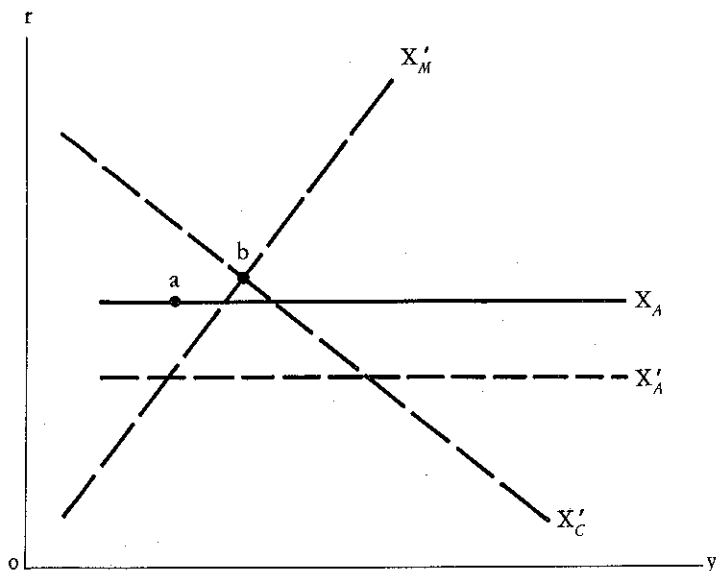
Figure 1a illustrates the familiar Keynesian model via the commodity market equilibrium locus, X_C , the money market equilibrium locus, X_M , and the balance of payments locus, BP. The slope of each curve can be ob-

Figure 1a



⁷ Our analysis assumes that the income induced deterioration in the trade balance dominates any improvement in the capital account. Chakraborty (1987) explores the consequences of dropping this assumption.

Figure 1b



tained from (7a) through (7c) as:

$$\text{Slope of } X_C = -C_1/C_2 < 0$$

$$\text{Slope of } X_M = -M_1/M_2 > 0$$

$$\text{Slope of BP} = -B_1/B_2 > 0.$$

As is well known, the relative slopes of the X_M and BP curves are uncertain on a priori grounds, but they are drawn in the typical manner with X_M steeper.

Solving (7a) through (7c) for the effects of an increase in the capacity parameter, ϕ , yields:

$$(8a) \quad \frac{dy}{d\phi} = \frac{M_2^+ C_3^- - C_2^+ M_3^+}{M_1^- C_2^+ + C_1^+ M_2^+} > 0$$

$$(8b) \quad \frac{dr}{d\phi} = \frac{C_1^+ M_3^- - M_1^- C_3^-}{M_1^- C_2^+ + C_1^+ M_2^+} > 0$$

$$(8c) \quad \frac{dBP}{d\phi} = \frac{\bar{C}_3(\bar{B}_1\bar{M}_2 - \bar{M}_1\bar{B}_2) + \bar{M}_3(\bar{C}_1\bar{B}_2 - \bar{B}_1\bar{C}_2) + \bar{B}_3(\bar{M}_1\bar{C}_2 - \bar{C}_1\bar{M}_2)}{M_1C_2 + C_1M_2}$$

$$\begin{matrix} > \\ < \\ = \end{matrix} 0.$$

An exogenous increase in productive capacity will stimulate output and income (as one would expect), but it has an uncertain effect on the rate of interest and on the balance of payments. Figure 1a illustrates what is involved here. The economy starts at point a, and then the increase in productive capacity puts a downward pressure on prices, which, in turn, shifts X_C upward, X_M downward, and BP downward, as is indicated by the dashed curves.

Figure 1a is drawn such that the new short run equilibrium at point b occurs at a higher interest rate than at "a", but from (8b) and from the geometry it is clear that "r" can conceivably rise, fall, or remain unchanged, depending on the relative slopes and shifts in X_C and X_M . In addition, point b is drawn above the BP' curve, indicating a balance of payments surplus, but clearly "b" could lie above or below BP' depending on whether the interest rate rises or falls and on the slope and magnitude of the downward shift in the BP curve. The latter will be larger as the decrease in prices exerts a large positive influence on the trade balance.

In sum, the Keynesian model tells us that economic growth may improve, deteriorate, or leave the balance of payments unchanged. In addition, we can deduce that the BP is more likely to improve: (a) with smaller decreases in the interest rate if r falls, or (b) if r rises then a larger increase makes it more likely that BP improves. Such a model is a relatively simple one, but it is very cumbersome to work with, and leaves the main conclusion about $dBP/d\phi$ almost completely up in the air. Hence, we turn to our "intellectual short-cut" by considering how an increase in ϕ affects the excess supply of bonds, X_A . Identity (1b) suggests that in the Keynesian model, the balance of payments is determined by (3). In other words, we can simply examine $dX_A/d\phi$ and determine $dBP/d\phi$ from this. Before doing so, let us prove this important idea.

The total derivative of (3) with respect to ϕ is:

$$(9a) \quad \frac{\partial X_A}{\partial y} \frac{dy}{d\phi} + \frac{\partial X_A}{\partial p} \frac{dp}{d\phi} + \frac{\partial X_A}{\partial r} \frac{dr}{d\phi} = - \frac{dBP}{d\phi}$$

From (1b) and (6b) we know that

$$(10a) \quad \frac{\partial X_A}{\partial y} = -\frac{\partial BP}{\partial y} - \frac{\partial X_M}{\partial y} - \frac{\partial X_C}{\partial y}$$

$$(10b) \quad \frac{\partial X_A}{\partial P} = -\frac{\partial BP}{\partial P} - \frac{\partial X_M}{\partial P} - \frac{\partial X_C}{\partial P}$$

$$(10c) \quad \frac{\partial X_A}{\partial r} = -\frac{\partial BP}{\partial r} - \frac{\partial X_M}{\partial r} - \frac{\partial X_C}{\partial r}$$

$$(10d) \quad \frac{dp}{d\phi} = \frac{\partial f}{\partial y} \frac{dy}{d\phi} + \frac{\partial f}{\partial \phi}$$

An appendix proves that substituting (10a) through (10d) into (9a), cancelling, and rearranging terms gives:

$$(9b) \quad dBP/d\phi = \frac{C_3(B_1M_2 - M_1B_2) + M_3(C_1B_2 - B_1C_2) + B_3(M_1C_2 - C_1M_2)}{M_1C_2 - C_1M_2}$$

which is identical to equation (8c) above.

Consequently, within the Keynesian model we can focus on (9a), instead of the solution to the overall macro-model. If we follow Patinkin (1966) by assuming (for lack of empirical evidence) that an increase in income stimulates bond supply and bond demand equally, then $\partial X_A/\partial y$, the first term on the l.h.s. of (9a), becomes approximately zero, and the X_A curve in Figure 1b is horizontal.⁸ (The initial X_C and X_M curves are not drawn in Figure 1b for simplicity.)

We also follow Patinkin (1966), by assuming that a change in price leads to a less than proportionate change in bonds demanded (in the same direction as the price change), and a more than proportionate change in bonds supplied, i.e., $\partial X_A/\partial P > 0$. When ϕ increases and exerts a downward pressure on prices, $dP/d\phi < 0$ in (9a), this serves to shift the X_A

⁸ The A_1 term also includes the effect on X_A from the change in P as the economy moves along its new short-run commodity supply curve. We assume that the supply curve is sufficiently flat in the short run so that we can set this additional term approximately equal to zero.

Figure 2a

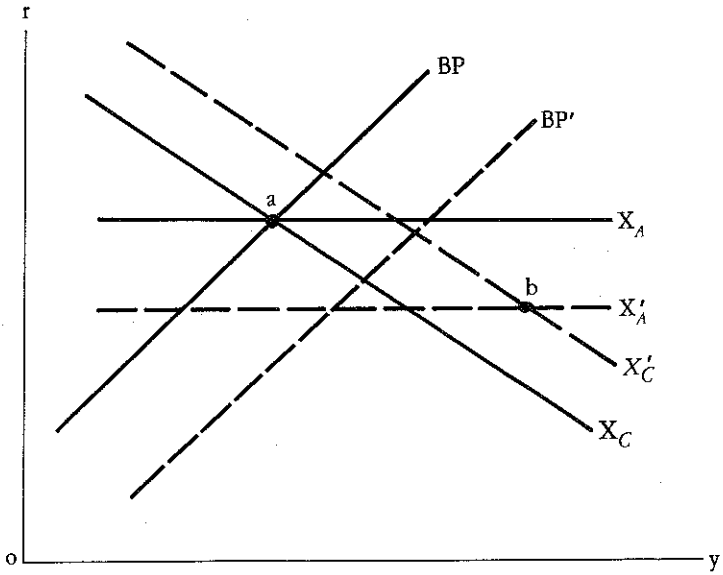
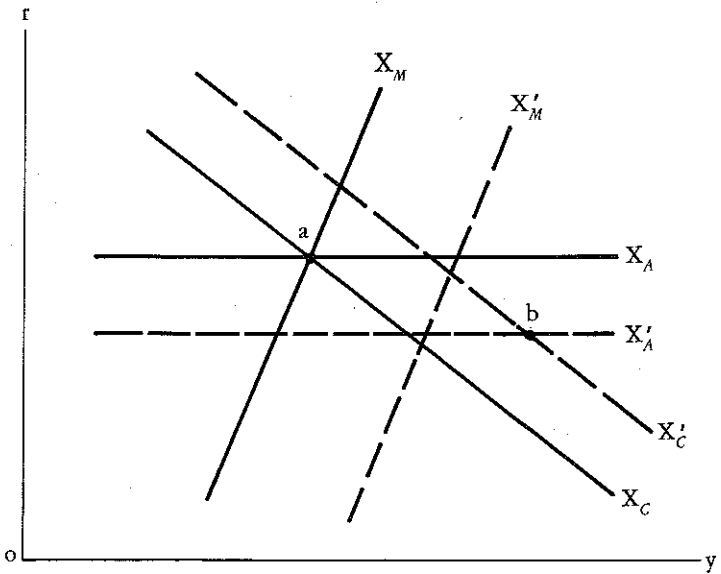


Figure 2b



curve downward to X'_A in Figure 1b. From this it follows directly from (9a) that $dB/P/d\phi$ is positive if the rate of interest rises or does not change in response to the increase in productive capacity. This is true, because a short-run equilibrium in Figure 1b at any point above the X_A curve implies $X_A < 0$, and, from (3), this implies $BP > 0$. (Note that $\partial X_A/\partial r < 0$.) In other words, our focus on the bond market provides more insights into the sign of $dB/P/d\phi$. With our assumptions, the balance of payments will improve if the interest rate does not fall.

With other assumptions regarding how income and price variations affect the bond market we can reach other conclusions. For example, assume that economic growth takes place in a developing country where bond supply and demand do not respond equally to an increase in income, i.e., $\partial X_A/\partial y \neq 0$. Also assume: (a) the government pegs the nominal interest rate, $dr/d\phi = 0$; and (b) downward wage and price rigidities prevent P from falling much, $dP/d\phi \approx 0$, for $d\phi > 0$. From (9a) it follows immediately that the balance of payments will improve or deteriorate, depending on the sign of $\partial X_A/\partial y$, i.e., how the excess supply of bonds (or excess demand for credit) varies with an increase in income or output. If bond supply (to finance investment and/or the government budget deficit) increases more than bond demand, then $\partial X_A/\partial y > 0$, and the balance of payments deteriorates in (9a).

The main idea is not the conclusions about $dB/P/d\phi$ in itself, but the methodology. In an economy where the bond (or credit) market is slow to clear (as, for example, in developing countries where interest rate ceilings prevent the bond or credit market from clearing quickly), the effects of economic growth on the balance of payments can be deduced directly from an analysis of how such growth affects the excess supply of bonds (or the excess demand for credit). Note well that we are not contending that the bond market will always be the slowest to clear in response to exogenous economic growth. This section simply points out that if the bond market clears slowly (as is more likely in countries that have interest rate ceilings) then the sign of the balance of payments can be deduced from the nature of the bond market disequilibrium.⁹

C. The Monetary Approach Model — MBP

Next let us assume that it is the money market that remains initially out of equilibrium after the economy is shocked by an exogenous increase

⁹ A simple static model such as ours provides no insights with regard to which market may be the slowest to clear. All that we can do is to analyze the effects of alternative assumptions about which market remains temporarily in disequilibrium.

in productive capacity. The MBP model consists of equations (5a), (5b), (5d), and (6), which can be solved simultaneously to obtain:

$$(11a) \quad \frac{dy}{d\phi} = \frac{\bar{C}_3 \bar{A}_2 - \bar{A}_3 \bar{C}_2}{-C_1 A_2} > 0$$

$$(11b) \quad \frac{dr}{d\phi} = \frac{C_1^+ A_3^-}{-C_1^+ A_2^-} - \frac{\bar{A}_3}{\bar{A}_2} < 0$$

$$(11c) \quad \frac{dBP}{d\phi} = \frac{\bar{C}_3 \bar{B}_1 \bar{A}_2 + \bar{A}_3 (C_1^+ B_2^- - B_1^+ C_2^-) - B_3^+ C_1^- A_2^-}{-C_1^+ A_2^-} \begin{matrix} > \\ < \end{matrix} 0.$$

Again, the sign of $dBP/d\phi$ is uncertain on a priori grounds. In Figure 2a the economy begins at point a, where X_C , X_A , and the BP curves all intersect. (The X_M curve is omitted via (1b).) The downward movement in prices that occurs when productive capacity increases serves to: (a) shift X_A downward to X'_A ; (b) shift X_C upward to X'_C ; and (c) shift the BP curve downward to BP' , as in the Keynesian model of Figures 1a and 1b. At the new short run equilibrium at point b in Figure 2a, output is clearly higher and the interest rate is lower. However, point b could lie above, below, or on the BP' curve, depending, in part, on how far down the BP curve shifts.

Identity (1b) indicates that within the MBP model, the movement in the balance of payments is determined by the sign of $dX_M/d\phi$ via:

$$(12) \quad \frac{\partial \bar{X}_M}{\partial y} \frac{dy}{d\phi} + \frac{\partial \bar{X}_M}{\partial r} \frac{dr}{d\phi} + \frac{\partial \bar{X}_M}{\partial P} \frac{dP}{d\phi} = - \frac{dBP}{d\phi}.$$

An appendix proves that this gives the identical solution for $dBP/d\phi$ as equation (11c).

Equation (12) illustrates and amplifies the previously mentioned conclusion by Frenkel, Gylfason, and Helliwell (1980) that economic growth has an uncertain effect on the balance of payments, even within an MBP macro-model. The effects of growth on income tend to improve the balance of payments by creating an excess demand for money. However, if

the interest rate and price level are free to vary, then these variations may exert influences on X_M in the opposite direction. Within our model, the lower interest rate increases the likelihood of a negative X_M ...i.e., an excess demand for money. On the other hand, the lower prices serve to reduce the demand for money, and consequently, the net change in X_M is uncertain.¹⁰

This is illustrated in Figure 2b, where the lower price level following an expansion in productive capacity shifts X_A down to X'_A and X_C to X'_C , as in Figure 2a. The lower price level also shifts X_M down to X'_M , and the short-run equilibrium moves from "a" to "b." Clearly point b could conceivably lie above or below the X'_M curve, depending on the relative slopes and shifts in the curves. Figure 2b is drawn with point b below X'_M , implying that an excess demand for money exists. From (2), this means that a payments surplus exists.

Thus, as in the Keynesian model, the MBP model allows us to take an intellectual shortcut, and provides us with a less cumbersome model for investigating how growth affects the balance of payments. In countries where the money market is slow to clear in comparison with other markets, then such an approach is warranted not only to analyze how economic growth affects the BP, but also to investigate the BP effects of any exogenous event.

D. The Commodity Market Approach

Finally, let us examine a model wherein the commodity market is assumed to clear more slowly than other markets. The model now consists of equations (5b), (5c), (5d), and (6), which can be solved simultaneously to obtain:

$$(13a) \quad \frac{dy}{d\phi} = \frac{\bar{A}_3 \bar{M}_2^+ - \bar{M}_3 \bar{A}_2^-}{\bar{M}_1 \bar{A}_2} \begin{matrix} > 0 \\ < 0 \end{matrix}$$

$$(13b) \quad \frac{dr}{d\phi} - \frac{\bar{A}_3}{\bar{A}_2} < 0$$

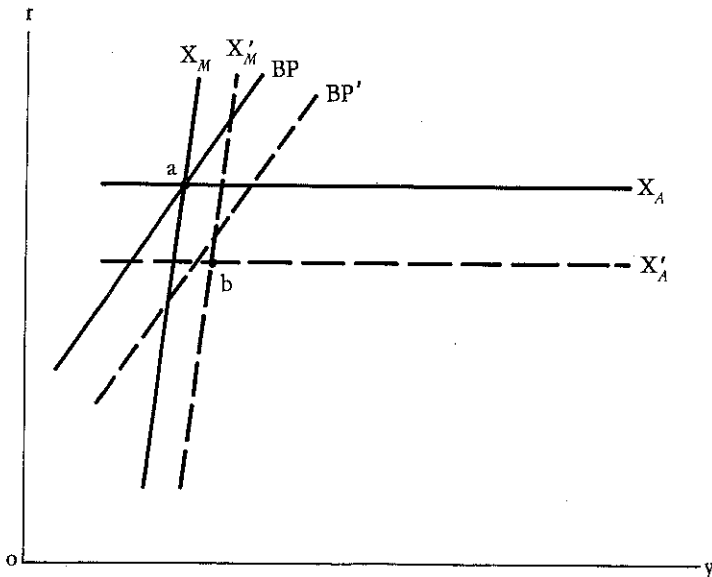
¹⁰ Again, there is no presumption here that the money market is slow to clear in developing countries, but merely that the effect of growth on the balance of payments is uncertain, even when we use the MBP model.

$$(13c) \quad \frac{dB_P}{d\phi} = \frac{\bar{A}_3(\bar{B}_1\bar{M}_2 - \bar{M}_1\bar{B}_2) - \bar{M}_3\bar{B}_1\bar{A}_2 + \bar{B}_3\bar{M}_1\bar{A}_2}{\bar{M}_1\bar{A}_2} \begin{matrix} > \\ < \end{matrix} 0.$$

The interest rate falls as in previous models, because, with our assumptions, the bond market completely determines r ; the lower prices that follow an increase in productive capacity shift the X_A curve downward to X'_A in Figure 3. However, (13a) suggests that output may rise or fall, although the presumption is that it rises. Graphically, the downward shift in the X_M curve in Figure 3 following the price reduction may not be enough to move point b to the right of the initial equilibrium at point a . Finally, as before, point b could conceivably lie above, below, or on the new BP' curve. Thus, we do not know *a priori* what is the sign of $dB_P/d\phi$.

It can easily be proven that (13c) can be obtained directly by examining how ϕ affects the excess supply of commodities, X_C . That is,

Figure 3



$$(14) \quad \frac{\partial \bar{X}_C^+}{\partial y} \frac{dy}{d\phi} + \frac{\partial \bar{X}_C^+}{\partial r} \frac{dr}{d\phi} + \frac{\partial \bar{X}_C^+}{\partial P} \frac{dP}{d\phi} = - \frac{dBP}{d\phi}$$

With the assumed signs given above each expression (including $dy/d\phi > 0$) equation (14) verifies the uncertainty associated with the sign of $dBP/d\phi$ within the commodity market macro-model. However, intuitively it seems unlikely that an increase in productive capacity...which in itself tends to create an excess supply of commodities via the first term on the l.h.s. of (14) would prompt price and interest rate reductions, as indicated by the last two terms on the l.h.s. of (14), that are strong enough to lead to an overall excess demand for commodities. Thus, our intellectual short cut suggests that in an economy where the commodity market remains temporarily out of equilibrium, an increase in productive capacity may tend to create a temporary excess supply of commodities and a balance of payments deficit.

IV. Policy Implications

The general approach to economic growth and the balance of payments contains an obvious policy implication. Economic growth (or any other shock) will have no effect on the balance of payments if all markets remain in equilibrium. Clearly, then, in order to avoid undesirable movements in the BP, the government should adopt whatever measures will facilitate the market clearing process. A list of such measures would obviously include the dropping of interest rate ceilings, and measures to stimulate competition, so as to facilitate wage and price flexibility.

Other policy implications may not be so obvious. For example, if economic growth creates an excess supply of commodities, $X_C > 0$, and a payments deficit, then commercial policy may be a valid tool if it switches expenditure from foreign to home goods and thereby reduces the excess supply of commodities.¹¹ The same conclusion holds with respect to exchange rate policy provided, of course, that the government can, indeed, alter the real exchange rate. Finally, in an economy where economic growth either creates or increases a pre-existing excess supply of bonds (or excess demand for credit), $\partial X_A / \partial \phi > 0$, then any measure to remain to stimulate saving and/or to limit capital flight will reduce X_A and improve

¹¹ The issue of welfare losses associated with commercial policy is addressed immediately below.

the balance of payments.

These policy conclusions require further discussion. Developing countries have often used commercial policy, exchange rate policy, and/or capital flow taxes or controls in attempts to improve their balance of payments. Such measures have been criticized on two grounds namely: (a) they create distortions in relative prices or interest rates that lead to welfare losses; and (b) they have no permanent effect on the balance of payments.

With regard to (b), we agree that all payments imbalances eventually work themselves out via one balance of payments adjustment mechanism or another. Thus, in a trivial sense, no policy can *permanently* alter the long run BP, since the latter is always zero. Our general approach to the balance of payments provides an important insight into this matter. A policy to alter the BP may be ineffective, even in the short-run, unless the policy affects the market (or markets) that are out of equilibrium, and that are the "cause" of the payments imbalance.

For example, assume that a payments deficit is associated with an excess supply of bonds, $X_A = -BP > 0$, in an economy that experiences a high degree of price flexibility (so that $X_C = 0$ at all times). Then commercial or other expenditure switching policies may momentarily create an excess demand for commodities, $X_C < 0$, that helps, via (1b), to offset the effects of $X_A > 0$ on the balance of payments. However, in such an economy home prices will quickly rise in order to reestablish commodity market equilibrium, $X_C = 0$. Consequently, the payments imbalance will remain unchanged unless the policy alters X_A . On the other hand, such policies should improve the BP if the payments deficit is associated with an excess supply of commodities.

With regard to criticism (a) above, the well known theorems with regard to the welfare losses associated with tariffs, taxes on capital flows, etc. all assume that markets are always in equilibrium. The permanent welfare losses arise because such measures create a divergence between actual and perceived relative prices or interest rates. However, there are welfare losses associated with market disequilibria. Consequently, if a tariff or capital flow tax moves the market to an equilibrium position, then the welfare gain from this movement must be compared with the present discounted value of future welfare losses from the distortions in relative prices or interest rates. If the appropriate discount rate is sufficiently high, or if the policy is a temporary one, then the tariff or capital flow tax can actually increase social welfare, as well as improve the balance of payments. Again, however, we must emphasize that such policies "will work" only if they affect the market that is in disequilibrium.

Appendix

A. Derivation of Equation (9b)

Substituting equations (10a)-(10d) into equation (9a) gives:

$$\begin{aligned} & \left[\frac{-\partial BP}{\partial y} - \frac{\partial X_M}{\partial y} - \frac{\partial X_C}{\partial y} \right] \frac{dy}{d\phi} + \left[\frac{-\partial BP}{\partial P} - \frac{\partial X_M}{\partial P} - \frac{\partial X_C}{\partial P} \right] \frac{dP}{d\phi} + \left[\frac{-\partial BP}{\partial r} \right. \\ & \quad \left. - \frac{\partial X_M}{\partial r} - \frac{\partial X_C}{\partial r} \right] \frac{dr}{d\phi} = -\frac{dBP}{d\phi} \\ \Rightarrow & \left[\frac{-\partial BP}{\partial y} - \frac{\partial X_M}{\partial y} - \frac{\partial X_C}{\partial y} \right] \frac{dy}{d\phi} + \left[\frac{-\partial BP}{\partial P} - \frac{\partial X_M}{\partial P} - \frac{\partial X_C}{\partial P} \right] \\ & \quad \left[\frac{\partial f}{\partial y} \cdot \frac{dy}{d\phi} + \frac{\partial f}{\partial \phi} \right] + \left[\frac{-\partial BP}{\partial r} - \frac{\partial X_M}{\partial r} - \frac{\partial X_C}{\partial r} \right] \frac{dr}{d\phi} = \frac{-dBP}{d\phi} \\ \Rightarrow & \left[\frac{\partial BP}{\partial y} - \frac{\partial X_M}{\partial y} - \frac{\partial X_C}{\partial y} + \frac{\partial BP}{\partial P} \cdot \frac{\partial f}{\partial y} + \frac{\partial X_M}{\partial P} \cdot \frac{\partial f}{\partial y} + \frac{\partial X_C}{\partial P} \cdot \frac{\partial f}{\partial y} \right] \frac{dy}{d\phi} \\ & \quad - \left[\frac{\partial BP}{\partial P} \cdot \frac{\partial f}{\partial P} + \frac{\partial X_M}{\partial P} \cdot \frac{\partial f}{\partial P} + \frac{\partial X_C}{\partial P} \cdot \frac{\partial f}{\partial P} \right] - \left[\frac{-\partial BP}{\partial r} - \frac{\partial X_M}{\partial r} - \frac{\partial X_C}{\partial r} \right] \frac{dr}{d\phi} \\ & = \frac{-dBP}{d\phi} \\ \Rightarrow & -(C_1 + M_1 + B_1) \frac{dy}{d\phi} - (C_3 + M_3 + B_3) - (C_2 + M_2 + B_2) \frac{dr}{d\phi} = -\frac{dBP}{d\phi} \\ \Rightarrow & -(C_1 + M_1 + B_1) \frac{M_2 C_3 - C_2 M_3}{M_1 C_2 - C_1 M_2} - (C_3 + M_3 + B_3) - (C_2 + M_2 + B_2) \\ & \quad \left(\frac{C_1 M_3 - M_1 C_3}{M_1 C_2 - C_1 M_2} \right) = -\frac{dBP}{d\phi} \end{aligned}$$

$$\frac{-(C_1 + M_1 + B_1)(M_2C_3 - C_2M_3) - (C_3 + M_3 + B_3)(M_1C_2 - C_1M_2) - (C_2 + M_2 + B_2)(C_1M_3 - M_1C_3)}{M_1C_2 - C_1M_2} = \frac{-dBP}{d\phi}$$

$$\Rightarrow \frac{-C_1M_2C_3 + C_1C_2M_3 - M_1M_2C_3 + M_1C_2M_3 - B_1M_2C_3 + B_1C_2M_3 - M_1C_2C_3 + C_1M_2C_3 - M_1C_2M_3 + C_1M_2M_3 - M_1C_2B_3 + C_1M_2B_3 - C_1C_2M_3 + M_1C_2C_3 - C_1M_2M_3 + M_1M_2C_3 - C_1B_2M_3 + M_1B_2C_3}{M_1C_2 - C_1M_2} = \frac{-dBP}{d\phi}$$

$$\Rightarrow \frac{-B_1M_2C_3 + B_1C_2M_3 - M_1C_2B_3 + C_1M_2B_3 - C_1B_2M_3 + M_1B_2C_3}{M_1C_2 - C_1M_2} = \frac{-dBP}{d\phi}$$

$$\Rightarrow (9b) \frac{dBP}{d\phi} = \frac{\bar{C}_3(\bar{B}_1\bar{M}_2 - \bar{M}_1\bar{B}_2) + \bar{M}_3(C_1\bar{B}_2 - \bar{B}_1C_2) + \bar{B}_3(\bar{M}_1C_2 - C_1\bar{M}_2)}{\bar{M}_1\bar{C}_2 - \bar{C}_1\bar{M}_2}$$

B. Derivation of Equation (11c)

1) Begin with (12) and note that

$$\partial X_M / \partial y = \partial BP / \partial y - \partial X_A / \partial y - \partial X_c / \partial y$$

$$\partial X_M / \partial P = \partial BP / \partial P - \partial X_A / \partial P - \partial X_c / \partial P$$

$$\partial X_M / \partial r = \partial BP / \partial r - \partial X_A / \partial r - \partial X_c / \partial r$$

$$dP / d\phi = \frac{\partial f}{\partial y} \frac{dy}{d\phi} + \frac{\partial f}{\partial \phi}$$

2) Substitute these equations into (12), cancel, & rearrange terms to get (11c).

References

- Branson, William H., *Financial Capital Flows in the U.S. Balance of Payments*, Amsterdam, North-Holland, 1968.
- Chakrabarty, Debashish, *A Theoretical and Empirical Analysis of Economic Growth and the Balance of Payments*, Ph.D. dissertation, Univer-

- sity of Pittsburgh, 1987.
- Dornbusch, Rudiger, "Notes on Growth and the Balance of Payments," *The Canadian Journal of Economics*, 4, 3, 389-395, 1971.
- Frenkel, Jacob A., Thorvaldur Gylfason and John F. Helliwell, "A Synthesis of Monetary and Keynesian Approaches to Short Run Balance of Payments Theory," *Economic Journal*, 90, 582-592, 1980.
- Hahn, Frank H., "The Monetary Approach to the Balance of Payments," *Journal of International Economics*, 7, 231-249, 1977.
- Johnson, Harry G., "The Monetary Approach to the Balance of Payments," reprinted in his *Further Essays in Monetary Economics*, London: Allen and Unwin, 1972.
- _____, "Some Aspects of the Theory of Economic Policy in a World of Capital Mobility," in *Essays in Honor of Marco Fanno*, 1966.
- Komiya, Ryutaro, "Economic Growth and the Balance of Payments: A Monetary Approach," *Journal of Political Economy*, 77, 1, 1969.
- Miller, Norman C., "Monetary vs. Traditional Approaches to the Balance of Payments," *American Economic Review*, 68, 406-411, 1978.
- _____, "The Adequacy of Keynesian Models of the Balance-of-Payments," *American Economic Review*, 71, 778-783, 1981.
- _____, "The Structure of Open Economy Macro-Models," *Journal of International Money and Finance*, 75-89, 1986a.
- _____, "A General Approach to the Balance of Payments and Exchange Rates," *Journal of International Economic Integration*, 1, 1, 85-122, 1986b.
- _____, and Marina V. Whiteman, "A Mean-Variance Analysis of U.S. Long Term Portfolio Foreign Investment," *Quarterly Journal of Economics*, 1970.
- Mundell, Robert, *International Economics*, NY: MacMillan, 1968.
- Neary, J. Peter, "Nontraded Goods and the Balance of Trade in a Neo-Keynesian Temporary Equilibrium," *Quarterly Journal of Economics*, XCV, 3, 403-429, 1980.
- Patinkin, Don, *Money, Interest and Prices*, 2nd ed., Harper and Row, 1965.
- Rabin, Alan A., "A Note on the Link between of Payments Disequilibrium and the Excess Demand for Money," *Southern Economic Journal*, 45, 1233-1238, 1979.

