THE MONETARY APPROACH TO BALANCE OF PAYMENTS: A REVIEW OF THE SEMINAL SHORT-RUN EMPIRICAL RESEARCH

Kavous Ardalan, Marist College

ABSTRACT

This paper provides a review of the seminal short-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviews the three major alternative theories of balance of payments adjustments. These theories are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention is on the trade balance with unemployed resources. In the monetary approach, on the other hand, the focus of attention is on the balance of payments (or the money account) with full employment. The monetary approach emphasizes the role of the demand for and supply of money in the economy. The paper focuses on the monetary approach to balance of payments and reviews the seminal short-run empirical work on the monetary approach to balance of payments. Throughout, the paper provides a comprehensive set of references corresponding to each point discussed. Together, these references exhaust the existing short-run research on the monetary approach to balance of payments.

INTRODUCTION

This paper provides a review of the seminal short-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviews the three major alternative theories of balance of payments adjustments. These theories are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention is on the trade balance with unemployed resources. The elasticities approach emphasizes the role of the relative prices (or exchange rate) in balance of payments adjustments by considering imports and exports as being dependent on relative prices (through the exchange rate). The absorption approach emphasizes the role of income (or expenditure) in balance of payments adjustments by considering the change in expenditure relative to income resulting from a change in exports and/or imports. In the monetary approach, on the other hand, the focus of attention is on the balance of payments (or the money account) with full employment. The monetary approach emphasizes the role of the demand for and supply of money in the economy. The paper focuses on the monetary approach to balance of payments and reviews the seminal short-run empirical work on the monetary approach to balance of payments. Due to space limitation the seminal long-run empirical work on the monetary approach to balance of payments is reviewed in another paper. Throughout, the paper provides a comprehensive set of references corresponding to each point discussed. Together, these references exhaust the existing short-run research on the monetary approach to balance of payments.

This study is organized in the following way: First, it reviews three alternative theories of balance of payments adjustments. They are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. Then, the seminal short-run empirical work on the monetary approach is reviewed. It notes that the literature may be divided into two classes, long run (associated with Johnson) and short run (associated with Prais). Then, the review focuses on the seminal short-run literature. The theoretical model is described first, and then the estimated results are reported. At the end of the discussion, some comments on the short-run approach are made.

DIFFERENT APPROACHES TO THE BALANCE OF PAYMENT ANALYSIS

Three alternative theories of balance of payments adjustment are reviewed in this section. They are commonly known as the elasticities, absorption, and monetary approaches. Johnson (1958, 1972, 1973, 1976, 1977a, 1977b, 1977c) and Whitman (1975) have discussed these other approaches to balance of payments.

The elasticities approach applies the Marshallian analysis of elasticities of supply and demand for individual commodities to the analysis of exports and imports as a whole. It is spelled out by Joan Robinson (1950).

Robinson was mainly concerned with the conditions under which devaluation of a currency would lead to an improvement in the balance of trade. Suppose the trade balance equation is written as:

X = value of exports
IM = value of imports
BT = balance of trade
BT = X – IM (1)

In this context, it is generally assumed that exports depend on the price of exports, and imports depend on the price of imports. These relations are then translated into elasticities, by differentiating the above equation with respect to the exchange rate. In effect, the exchange rate clears balance of payments. A criterion for a change of the balance of trade in the desired direction can be established, assuming that export and import prices adjust to equate the demand for and supply of exports and imports.

The effect of a devaluation on the trade balance depends on four elasticities: the foreign elasticity of demand for exports, and the home elasticity of supply, the foreign elasticity of supply of imports, and the home elasticity of demand for imports (Robinson, 1950, p. 87). For the special case where it is assumed that the trade balance is initially zero and that the two supply schedules are infinitely elastic, the elasticities condition for the impact of a devaluation to be an improvement in the trade balance, is that the sum of the demand elasticities exceed unity. This has been termed the "Marshall-Lerner condition."

This special case and the assumptions behind it should be viewed against the background of the time they were developed, the great depression of the 1930s. The theory adopted Keynesian assumptions of wage and price rigidity and mass unemployment and used these to extend the Keynesian analysis to the international sphere. Robinson (1950) mentions that her "main endeavor is to elaborate the hints thrown out by Mr. Keynes in his Treaties on Money, Chapter 21." p. 83.

Under Keynesian assumptions of sticky wages and prices, devaluation changes the prices of domestic goods relative to foreign goods, i.e., a change in the terms of trade, in foreign and domestic markets, and causes alterations in production and consumption (Johnson, 1972). This in turn has an impact on the balance of trade.

It is important to note the following two characteristics of the special case of elasticities approach: (i) Any impact of the devaluation on the demand for domestic output is assumed to be met by variations in output and employment rather than relative prices, with the repercussions of variations in output on the balance of payments regarded as secondary. This is made possible by the assumption that supply elasticities are infinite. The assumption of output and employment being variable proved highly unsatisfactory in the immediate postwar period of full and over-full employment. (ii) The connections between the balance of payments and the money supply, and between the money supply and the aggregate demand, are ignored. This is made possible by the assumed existence of unemployed resources, as well as by the Keynesian skepticism regarding the influence of money. Johnson (1972) emphasizes that the monetary approach differs crucially from the elasticities approach on both these grounds.

A notable shortcoming of the elasticities analysis is its neglect of capital flows. Even though the adherents of the elasticities approach were attempting to guide the policy-maker in improving the country's balance of payments, their focus, nevertheless, was on the balance of trade (net exports of goods and services). For the special case mentioned above, this is traceable to the emphasis in Keynesian analysis (see Whitman, 1975, p. 492) given to aggregate demand (of which net exports are a component).

Before we close this section, one important point has to be mentioned. In the literature, the elasticities approach is often mistakenly referred to as being a partial equilibrium analysis. This type of argument is based on the fact that in the special case elasticities of supplies of export and imports are assumed to be infinite, the effect of changes in the quantity of goods and services exported and imported are independent of, or are not sensitive to, the happenings elsewhere in the economy; e.g., the change in income which results from the change in exports does not have an effect on imports. The important point to note is that, whereas the special case of infinitely elastic supplies of exports is a partial equilibrium analysis, the general case is not. In general, the elasticities approach considers the usual demand and supplies for imports and exports where they are obtained on the basis of the production possibilities curve of domestic economies, like any usual general equilibrium analysis, everything depends on the happenings elsewhere in the economy, i.e., general equilibrium analysis.

The absorption approach was first presented by Alexander (1952). He sought to look at the balance of trade from the point of view of national income accounting:

Y = domestic production of goods and services
E = domestic absorption of goods and services, or domestic total expenditure
BT = balance of trade

$$BT = Y - E \tag{2}$$

The above identity is useful in pointing out that an improvement in the balance of trade calls for an increase in production relative to absorption.

When unemployed resources exist, the following mechanism is visualized: the effect of a devaluation is to increase exports and decrease imports. This in turn causes an increase in production (income) through the multiplier mechanism. If total expenditure rises by a smaller amount, there will be an improvement in the balance of trade (Alexander, 1952, pp. 262-263). Thus, the balance is set to be identical with the real hoarding of the economy, which is the difference between total production and total absorption of goods and services, and therefore equal to the accumulation of securities and/or money balances. In the absorption approach, in effect, income or expenditure clears balance of payments. The monetary approach concentrates on the accumulation of money balances only. In the presence of unemployment, therefore, devaluation not only aids the balance of payments, but also helps the economy move towards full employment and is, therefore, doubly attractive (Alexander, 1952, pp. 262-263).

Suppose, however, that the country is at full employment to begin with. It cannot hope to improve its trade balance by increasing real income. Here, it has to depend on its ability to reduce absorption. How can a devaluation achieve this? Alexander argued that the rise in the price level consequent upon the devaluation would tend to discourage consumption and investment expenditures out of a given level of income. One way this will happen is through the "real balance effect" – a reference to the public's curtailment of expenditure in order to rebuild their stock of real cash balances that was diminished by the increase in the price level. The real-balance effect plays an important role in the monetary approach as well.

However, under conditions of full employment, a devaluation cannot be expected to produce, by itself, the desired extent of change in the overall balance. The reduction in the public's expenditure in order to build their money balances will have to be supplemented by domestic deflationary policies, the so-called "expenditure-switching" and "expenditure-reducing" policies (Johnson, 1958). This, of course, is because the balance of trade cannot be improved through a rise in the output level.

The absorption approach can be said to work only in the presence of unemployed resources. The absorption approach is a significant improvement over the special case of the elasticities approach in one important sense, this is its view of the external balance via national income accounting. In this manner, the approach relates the balance to the happenings elsewhere in the economy rather than taking the partial equilibrium view of the special case of the elasticities approach in analyzing the external sector in isolation.

The "monetary approach" is so called because it considers disequilibrium in the balance of payments to be essentially, though not exclusively, a monetary phenomenon. To say that something is essentially a monetary phenomenon means that money plays a vital role, but does not imply that only money plays a role. The monetary approach takes explicit account of the influence of real variables such as levels of income and interest rates on the behavior of the balance of payments. Kreinin and Officer (1978), Magee (1976), and Whitman (1975) have reviewed the literature on the monetary approach to balance of payments. The term "monetary approach" was first used by Mundell (1968) to refer to the new theory (Mussa, 1976).

The elasticities and absorption approaches are concerned with the balance of trade while the monetary approach concerns itself with the deficit on monetary account. In principle, this balance consists of the items that affect the domestic monetary base.

In general, the approach assumes full employment and emphasizes the budget constraint imposed on the country's international spending. It views the current and capital accounts of the balance of payments as the "windows" to the outside world, through which an excess of domestic stock demand for money over domestic stock supply of money, or of excess domestic stock supply of money over domestic stock demand for money, are cleared (Frenkel and Johnson, 1976). Accordingly, surpluses in the trade account and the capital account, respectively, represent excess flow supplies of goods and of securities, and as excess domestic demand for money. Consequently, in analyzing the money account, or more familiarly, the rate of increase or decrease in the country's international reserves, the monetary approach focuses on the determinants of the excess stock demand for, or supply of, money. Dornbusch (1971, 1973a, 1973b) discusses the role of the real-balance effect.

This theory divides the country's monetary base into foreign assets and domestic assets of the monetary authorities. An increase in foreign assets of the central bank is achieved when the central bank purchases foreign exchange or gold.

Under pegged exchange rates, the central bank buys foreign exchange in order to prevent the national currency from appreciating in the foreign exchange market. The central bank's purchase of foreign assets increases its domestic monetary liabilities by the same amount.

An increase in domestic assets of the central bank is achieved when the central bank purchases bonds from the fiscal branch of the government (the treasury), or from the public. The central bank's purchases of domestic assets (e.g., bonds) increases its domestic monetary liabilities, i.e., the monetary base, by the same amount. The excess supply of money has to be matched by an equivalent excess demand for goods and/or securities. This is because the budget constraint deems that the public's flow demand for goods, securities, and money – assuming that these three encompass all that the public demands – should add up to the public's total income. Therefore, with an unchanged level of income, an excess supply of money has to be matched by an equivalent excess demand for goods and/or securities. Viewing the economy as a whole, what does the excess demand for goods and securities imply? In a closed economy, an excess demand for goods would lead to an increase in the domestic price level and a consequent fall in the real money balances the public holds. An excess demand for securities would increase their price (decrease the interest rate), increasing desired money balances. Price and interest rate changes eventually cause the existing nominal money supply to be willingly held by the public. However, in a small open economy with fixed exchange rates, the domestic price level has to maintain at parity with the price level in the rest of the world, and the domestic price of securities (and therefore the interest rate) is determined by the price of securities (and therefore the interest rate) in the world as a whole. So, in the absence of sales of domestic assets by the central bank, the desired level or real money balances is achieved by importing goods and/or securities from abroad. This creates a deficit in the money account, resulting in a fall in foreign assets of the central bank and, therefore, in the money supply.

The monetary approach is seen to have an appreciation of the inter-related nature of the various markets. The monetary approach insists that "when one market is eliminated from a general equilibrium model by Walras' law, the behavioral specifications for the included markets must not be such as to imply a specification for the excluded market that would appear unreasonable if it were made explicit." (Whitman, 1975, p. 497). The monetary approach focuses on stock and flow equilibrium, with emphasis on stock equilibrium for money. In this way it considers inter-relationships among various markets and, therefore, the inter-relationship between stock and flow equilibrium. The stock-flow consideration of the monetary approach is in fact the essential difference between the monetary approach and the elasticities and absorption approaches, where the latter two consider the flow equilibrium only.

The monetary approach, like the absorption approach, stresses the need for reducing domestic expenditure relative to income, in order to eliminate a deficit in the balance of payments. However, whereas the absorption approach looks at the relationship between real output and expenditure on goods, the monetary approach concentrates on deficient or excess nominal demand for goods and securities, and the resulting accumulation or decumulation of money.

The monetary approach looks at the balance of payments as the change in the monetary base less the change in the domestic component:

H = change in the quantity of money demanded
D = domestic credit creation

$$BP = DH - DD \tag{3}$$

where the "italic D," i.e., *D*, appearing in front of a variable designates the "change" in that variable. That is, *D* is the first difference operator: $DX = X_{(t)} - X_{(t-1)}$.

Putting just monetary assets rather than all assets "below the line" contributes to the simplicity of the monetary approach. Other things being equal, growth in demand for money, and of factors that affect it positively should lead to a surplus in the balance of payments. Growth in domestic money, other things being equal, should worsen it. Thus, the growth of real output in a country with constant interest rates causes its residents to demand a growing stock of real and nominal cash balances. This means that the country will run a surplus in the balance of payments (Johnson, 1976, p. 283). In order to avoid a payments surplus, the increase in money must be satisfied through domestic open market operations. To produce a deficit, domestic money stock must grow faster than the growth of real income.

This analysis suggests that if a country is running a deficit, then assuming that the economy is growing at its full-employment growth rate with a given rate of technological progress, it should curtail its rate of domestic monetary expansion. Use of other measures like the imposition of tariffs, devaluation or deflation of aggregate demand by fiscal policy can succeed only in the short run (Johnson, 1976, p. 283).

The decision on which variables are exogenous and which are endogenous is made in the following manner: real income is assumed exogenous in the long run.

Also, in the long run, prices and interest rates are exogenous for small countries. Thus, the quantity of money demanded is exogenous (Magee, 1976, p. 164). The monetary approach assumes that the domestic assets component of the monetary base is unaffected by balance of payments flows. This (the domestic assets) is the variable which the monetary authorities control, and, thereby, indirectly control the balance of payments.

Under fixed exchange rates, a small country controls neither its price level nor quantity of domestic money in anything but the short run. Its money supply is endogenous, and what it controls by open market operations is simply the international component of the monetary base. In a system of flexible exchange rates, the focus of analysis shifts from determination of the balance of payments to the determination of the exchange rate (Frenkel and Johnson, 1976, p. 29).

REVIEW OF THE SEMINAL SHORT-RUN EMPIRICAL RESEARCH

Empirical work on the monetary approach to the balance of payments can be divided into two different approaches; one tests the theory in long-run equilibrium, the other considers the adjustment mechanism and the channels through which equilibrium is reached. The first approach is based on the reserve flow equation developed by H. G. Johnson (1972). Testing was undertaken by J.R. Zecher (1974) and others. For a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" see appendix 1. For a comprehensive list of references which have estimated the "capital flow equation," which is a variant of the "reserve flow equation," see appendix 2. The second approach is based on theoretical work of S.J. Prais (1961), with corresponding empirical work undertaken by R.R. Rhomberg (1977) and others. For a comprehensive list of references which have estimated a short-run model in the tradition of the monetary approach to balance of payments see appendix 3. In this paper, seminal long-run approach is reviewed by representing the underlying theoretical model first, and then looking at a few well-known empirical estimations of the model.

This section reviews short-run models of the balance of payments. First, the typical theoretical formulation of the adjustment process elaborated by S.J. Prais (1961) is presented. Second, four well-known empirical studies that are based on Prais' (1961) formulation are reviewed. These four consist of one by Rudolph R. Rhomberg (1977), two by Mohsin S. Khan (1977, 1976), and the last one by Charles

Schotta (1966). Finally, some points which are overlooked in these short-run models and tests are discussed.

S.J. Prais (1961) formulated the model in terms of continuous time, which allows precise specification of the relation between stock and flow variables. Prais (1961) specifies a domestic expenditure function which emphasizes the role of deviations of actual from desired money holdings as the link between the real and monetary sectors of the economy. This particular specification has come to be widely used in the recent literature (Dornbush, 1973a, 1973b, 1975).

The model, which is in differential equation form, may be set out with a system of six equations given by equations (4) through (9):

$$LD = k.Y \quad (4)$$
$$dL/dt = X - IM \quad (5)$$
$$E = Y + a.(L - LD) \quad (6)$$
$$IM = b.Y \quad \text{or} \quad IM = b.E \quad (7)$$
$$X = X(t) \quad (8)$$
$$Y = E + X - IM \quad (9)$$

In these equations LD is the desired level of liquidity as distinguished from the actual liquidity, L. The first equation is the familiar Cambridge equation relating a desired level of liquidity, LD, to the level of income. The second equation relates the change in actual liquidity to the balance of payments, which is represented in differential form. An additive term to represent any given rate of credit creation can be introduced on the right-hand side of (5) without altering the basic mathematics. Equation (6) indicates that domestic expenditure, E, equals income plus the excess of actual over desired liquidity. Imports, equation (7), are taken as a constant fraction of income. As an alternative, imports may be taken as a fraction of expenditure, E, so as to be proportionately influenced by the liquidity situation. However, this and other variations lead to rather similar results, apart from changes in the constants. Exports are assumed exogenous and given by equation (8). Finally, national income, in equation (9), is defined as domestic expenditure plus exports less imports.

In this system, a disequilibrium – for example a deficit in the balance of payments – is corrected by a fall in the money supply via (5), followed by a fall in domestic expenditure via (6), a fall in income via (9), and a fall in imports via (7). The reduction continues until the deficit in (5) is eliminated.

Rudolf R. Rhomberg (1977) also focuses attention on the relation between money and expenditure and estimates the entire structure of the model by multiple regression technique. The basic equations of his model are given by equations (10) through (15):

$$LD(t) = k.Y(t) \quad (10)$$
$$E(t) = a_0 + a_1.Y(t) + a_2.Y(t\text{-}1) + a_3.\{[L(t\text{-}1)+L(t\text{-}2)]/2 - k.Y(t)\} \quad (11)$$
$$IM(t) = b_0 + b_1.E(t) \quad (12)$$
$$G(t) = g_0 + g_1.Y(t) \quad (13)$$
$$Y(t) = E(t) + G(t) + X(t) - IM(t) \quad (14)$$
$$L(t) = L(t\text{-}1) + X(t) + DK(t) - IM(t) + DD(t) \quad (15)$$

where *D*K is the net capital inflow, and D is the domestic component of the monetary base. The long-run desired demand for money, LD, is expressed by equation (10). Private expenditure is linearly dependent on current and last year's income, and on the excess of actual over desired cash balances. Since the stock of money, L(t), is measured at a moment of time (at the end of year t), while Y(t) is the flow of income during year t, Rhomberg (1977) expresses cash balances during year t as {[L(t) + L(t-1)]/2} and the deviation of actual from desired cash balances as {[L(t) + L(t-1)]/2 – [k.Y(t)]}. His private expenditure function is thus given by equation (11) because he assumes there is a one year lag in expenditure with respect to a change in the excess of desired over actual cash balances. Additionally, Rhomberg's (1977) model contains an import function specified by equation (12). Imports are assumed to depend on expenditures. In equation (13), Rhomberg (1977) argues that government expenditures on goods and services, G, are related to income, while, recognizing the fact that they (G) depend to a considerable extent on tax revenue, which is itself a function of income. The model is completed by the two identities defining income and the money supply.

The estimated behavioral equations (11), (12), (13) and their reduced forms for five countries of Norway, Costa Rica, Ecuador, Japan, and the Netherlands and for the period 1949-60 are given in Tables 1-A, 1-B, and 1-C.

Table 1-A: Rhomberg's Model: Expenditure Function				
	Y(t)	Y(t-1)	[L(t-1) + L(t-2)]2	R-squared
Norway	0.53	0.13	0.90	0.99
	-0.1	(0.11)	(0.47)	
Costa Rica	-	0.42	2.80	0.99
		(0.24)	(1.40)	
Ecuador	0.07	0.20	5.00	0.99
	-0.54	(0.25)	(3.80)	
Japan	0.96	-0.20	0.12	0.99
	-0.14	(0.17)	(0.53)	
Netherlands	0.54	-0.22	2.70	0.99
	-0.4	(0.29)	(1.00)	
The numbers in parenthesis indicate standard errors.				

Table 1-B: Rhomberg's Model: Import Function and Government Expenditures					
	Import Function			Government Expenditures	
	E(t)	E(t) + G(t)	R-Squared	Y(t)	R-Squared
Norway	0.59	-	0.98	0.21	0.96
	-0.02			(0.01)	
Costa Rica	-	0.23	0.93	0.20	0.89
		(0.02)		(0.02)	
Ecuador	0.25	-	0.97	0.18	0.96
	-0.01			(0.01)	
Japan	0.16	-	0.93	0.19	0.95
	-0.01			(0.01)	
Netherlands	0.69	-	0.99	0.20	0.92
	-0.02			(0.02)	
The numbers in parenthesis indicate standard errors.					

Table 1-C: Rhomberg's Model: The Reduced Forms for Income and Imports				
		Y(t-1)	X(t)	[L(t-1) + L(t-2)]/2
Income (Y)	Norway	0.09	1.76	0.66
	Costa Rica	0.38	1.18	2.47
	Ecuador	0.23	2.03	2.42
	Japan	0.2	3.86	1.5
	Netherlands	-0.28	1.81	2.38
Imports (IM)	Norway	0.1	0.54	0.73
	Costa Rica	0.12	0.06	0.76
	Ecuador	0.07	0.13	1.43
	Japan	-0.03	0.59	0.24
	Netherlands	-0.06	0.59	2.54

Results show that for Norway and Japan, a change in the money supply appears to affect expenditure appreciably. The statistical significance of the coefficient of the money variable, however, is at a lower level than that of the other coefficients of the model.

Although the high values of coefficients of determination suggest a strong relationship, the results are not dependable because estimation is done in levels of the variables (Granger and Newbold, 1974). Since time series analysis is used, where variables like income, expenditure, and imports are highly auto-correlated, regression analysis in levels may have generated spurious correlation. In this respect, the knowledge of D-W statistic is of some help in the inference from the results obtained, but the author has not published the D-W statistic and interpretations of the coefficients should be treated with caution.

Like Prais (1961), Mohsin S. Khan (1977) expresses the model in continuous time. This allows him to estimate the time pattern of adjustment to the final equilibrium values via a system of linear differential equations. Khan (1977) specifies six equations containing three behavioral relationships – for imports, exports, and aggregate expenditure – and three identities – for nominal income, the balance of payments, and the money supply.

a. Imports: Khan (1977) relates imports to aggregate domestic expenditure. In order to take account of quantitative restrictions and controls on imports, he also introduces the level of net foreign assets, R, of the country. His assumption behind the use of such a variable is the implied existence of a government policy reaction function in which controls are inversely related to reserves. The authorities are assumed to ease or tighten restrictions on imports as their international reserves increase or decrease. The import demand function is thus specified as:

$$IM^d(t) = a_0 + a_1.R(t) + a_2.E(t) + u_1(t) \quad a_1>0,\ a_2>0 \qquad (16)$$

where IM^d is demand for nominal imports, and u_1 is a random error term with "white noise" properties. Actual imports in period t are assumed to adjust to the excess demand for imports:

$$D[IM(t)] = A.[IM^d(t) - IM^s(t)] \quad A>0 \qquad (17)$$

where D(x) is the time derivative of x, i.e., D(x) = dx/dt. A further assumption is that import supply is equal to actual imports:

$$IM(t) = IM^s(t) \qquad (18)$$

Substituting (16) into (17), the estimating equation becomes:

$$D[IM(t)] = A.a_0 + A.a_1.R(t) + A.a_2.E(t) - A.IM(t) + A.u_1(t) \qquad (19)$$

b. Exports: Small countries are generally price takers in the world market and can sell whatever they produce. The volume of exports is therefore determined by domestic supply conditions. An increase in the capacity to produce in the export sector should lead to an increase in exports. Capacity to produce in the export sector is related directly to the capacity to produce in the entire economy. Khan (1977) considers permanent income to be a suitable indicator of capacity to produce, and specifies exports as a positive function of the permanent domestic income:

$$X(t) = b_0 + b_1.Y_P(t) + u_2(t) \quad b_1>0 \qquad (20)$$

where X is the nominal value of exports, and Y_P is the permanent nominal income in time period t; u_2 is a random error term. Permanent income is generated in the following way:

$$D[Y_P(t)] = B.[Y_P(t) - Y(t)] \quad B<0 \tag{21}$$

Permanent income in time period t adjusts to the difference between permanent income and actual income, Y, in period t. Equation (21) is re-written as:

$$Y_P(t) = [- B/(D-B)].Y(t) \tag{22}$$

Substituting (22) into (20):

$$X(t) = b_0 + [(- B.b_1)/(D-B)].Y(t) + u_2(t) \tag{23}$$

and solving for D[X(t)], equation (24) is obtained:

$$D[X(t)] = b_0.(D-B) - B.b_1.Y(t) + B.X(t) + u_3(t) \tag{24}$$

where $u_2(t) = (D-B).u_3(t)$. Relation (24) is Khan's export estimating equation.

c. Aggregate Expenditure: Khan's (1977) equation for desired expenditure is specified as follows:

$$ED(t) = c_0 + c_1.M^s(t) + c_2.Y(t) + u_4(t) \quad c_1>0, c_2>0 \tag{25}$$

where ED is desired aggregate nominal expenditure, and Y is nominal income, and u_4 is a random error term. The stock of money, M^s, is included because, given the stock of money that the public desires to hold, an increase in the money supply raises actual money balances above the desired level. This increases the demand for goods and services as the public attempts to reduce its excess cash balances. Moreover, the actual value of expenditure is assumed to adjust to the difference between desired expenditure and actual expenditure:

$$D[E(t)] = C.[ED(t) - E(t)] \quad C>0 \tag{26}$$

By substituting (25) into (26), the differential equation in D[E(t)] is obtained:

$$D[E(t)] = C.c_0 + C.c_1.M^s(t) + C.c_2.Y(t) - C.E(t) + C.u_4(t) \tag{27}$$

this is the equation that is estimated.

d. Nominal Income: The ex-post nominal income identity is:

$$Y(t) = E(t) + X(t) - IM(t) \quad (28)$$

e. The Balance of Payments (BP): It is specified as:

$$BP(t) = D[R(t)] = X(t) - IM(t) + SK(t) \quad (29)$$

where SK represents the non-trade variable that contains services, short-term and long-term capital flows, and all types of foreign aid receipts or repayments. For the purposes of the model, this item (SK) is assumed to be determined outside the system.

f. The Supply of Money: It equals the international, R, and domestic, D, assets held by the central bank:

$$M^s(t) = R(t) + D(t) \quad (30)$$

Khan (1977) estimates the monetary model for ten developing countries for the period 1952-70. Results are reported in Tables 2-A, 2-B, and 2-C. Certain common results emerge from the estimates. Despite some obvious dissimilarities between countries, most of the estimated coefficients in this study appear to be of the same order of magnitude. In the import equations, the coefficients for net foreign assets range from approximately 0.3 to 0.9 and the coefficients of aggregate expenditure from 0.02 to 0.10, with most of the figures at the lower end. The lag in adjustment of imports to a desired level varies from 1.340 to 6.098 years. The current income coefficients in the export equation lie between 0.02 and 0.1 and the expenditure coefficients between 0.1 and 0.7, with most between 0.3 and 0.5. With the exception of the results for one of the countries, the stock of money has a proportionally greater effect on nominal expenditure, with the estimated coefficients ranging from 1.4 to 2.2. Differences among countries as to the estimated income coefficient in the nominal expenditure equation are much greater. The lag in the adjustment of expenditure to a desired level is generally similar among countries, varying from four to six quarters; with the exception of one country, where the lag varies from one to two years.

Table 2-A: Khan's First Model: Import Function				
	Constant	B(t)	E(t)	IM(t)
Argentina	0.105	0.419	0.018	-0.194
		(3.34)	(4.16)	-2.47
Columbia	0.37	0.962	0.035	-0.355
		(4.19)	(2.34)	-2.17
Dominican Republic	0.019	0.607	0.093	-0.623
		(4.36)	(6.58)	-7.04
India	3.077	-0.327	0.045	-0.746
		(0.90)	(3.70)	-4.12
Mexico	0.003	0.841	0.013	-0.368
		(5.94)	(3.30)	-5.15
Pakistan	0.3	0.798	0.015	-0.269
		(4.88)	(2.18)	-3.42
Peru	0.353	0.98	0.037	-0.164
		(7.32)	(2.86)	-1.76
Philippines	-1.136	0.789	0.107	-0.536
		(2.44)	(5.45)	-4.35
Thailand	0.001	0.263	0.069	-0.419
		(4.07)	(3.02)	-3.53
Turkey	0.001	0.259	0.019	-0.296
		(2.04)	(2.37)	-3.23
The numbers in parenthesis are t-statistics				

Table 2-B: Khan's First Model: Export Function

	Constant	Y(t)	X(t)
Argentina	0.147	0.087	-0.569
		(4.77)	-3.92
Columbia	0.202	0.061	-0.31
		(2.05)	-1.32
Dominican Republic	0.069	0.054	-0.385
		(2.03)	-3.22
India	0.068	0.028	-0.258
		(5.64)	-3.52
Mexico	0.003	0.019	-0.27
		(2.73)	-2.64
Pakistan	0.483	0.035	-0.418
		(6.51)	-5.6
Peru	0.198	0.136	-0.333
		(4.16)	-3.06
Philippines	0.775	0.209	-0.712
		(5.81)	-4.82
Thailand	0.001	0.029	-0.126
		(0.87)	-0.82
Turkey	0.001	0.043	-0.37
		(5.15)	-4.31

The numbers in parenthesis are t-statistics.

Table 2-C: Khan's First Model: Expenditure Function				
	Constant	$M^s(t)$	Y(t)	E(t)
Argentina	0.305	1.697	0.031	-0.842
		(41.18)	(0.36)	-29.33
Columbia	0.177	1.387	0.816	-0.748
		(6.34)	(3.18)	-7.13
Dominican Republic	0.054	1.232	1.364	-0.764
		(5.21)	(2.72)	-8.87
India	3.262	1.915	0.292	-0.991
		(17.53)	(2.43)	-21.17
Mexico	0.001	2.025	0.072	-0.983
		(9.46)	(0.27)	-10.14
Pakistan	1.397	0.897	0.698	-0.519
		(3.02)	(2.42)	-4.01
Peru	1.182	1.505	1.993	-0.927
		(3.19)	(7.10)	-3.64
Philippines	0.021	1.492	0.328	-0.742
		(10.67)	(1.57)	-9.48
Thailand	0.004	1.359	0.269	-0.629
		(9.20)	(1.75)	-9.19
Turkey	0.002	2.155	-0.196	-1.013
		(13.63)	(1.29)	-18.62
The numbers in parenthesis are t-statistics.				

Simulations show that Khan's (1977) first model is able to explain the behavior of the balance of payments and income in a satisfactory manner for a wide variety of countries.

The second model developed by Khan (1976), which is applied to Venezuela, is also concerned with the short-run implications of the monetary approach. The results are very encouraging for the monetary approach, as the model is able to explain a great deal of the quarterly fluctuations in the balance of payments for Venezuela during the period 1968-73.

The model is concerned with the short-run implications of the monetary approach. In this framework, an excess supply of real money balances leads to an excess demand for goods and financial assets, which in turn changes domestic prices and interest rates; this leads to disequilibrium in the foreign exchange market and the balance of payments. The model decomposes the balance of payments into the trade and capital accounts, which permits a simultaneous study of the behavior of the individual accounts rather than simply the trade account or the overall balance of payments.

The model contains seven stochastic equations determining the following variables: real imports, real expenditures, the rate of inflation, the currency to deposit ratio, the domestic rate of interest, short-term capital flows, and the excess reserves to deposits ratio of the commercial banks. There are also four identities defining real income, the change in international reserves, the stock of money, and the stock of high-powered money. Each of these equations is discussed below.

a. Real Imports: The real value of imports is specified as a linear function of the level of real expenditures on all goods, E, and the ratio of import prices, PIM, to domestic prices, P:

$$[IM(t)/PIM(t)] = a_0 + a_1.[PIM(t)/P(t)] + a_2.[E(t)/P(t)] + u_1(t) \quad a_1<0,\ a_2>0 \qquad (31)$$

The variable u_1 is a random error term and has the classic properties. Khan (1976) introduces real expenditures as an explanatory variable rather than the more commonly used demand variable, real income. His reasoning behind this formulation is that demand for foreign goods (imports) should properly be related to domestic demand for all goods rather than to domestic demand for domestic goods plus foreign demand for domestic goods (exports). The use of real income would involve the latter. Import prices are treated as exogenous to the model, since Venezuela is a small country with a fixed exchange rate.

b. Real Expenditures: Real expenditures are defined as equal to real income less the level of the flow demand for real money balances, F:

$$[E(t)/P(t)] = [Y(t)/P(t)] - F(t) \qquad (32)$$

where Y is the level of nominal income. The flow demand for money is assumed to be a proportional function of the stock excess demand for real money balances:

$$F(t) = a.\{[M^d(t)/P(t)] - [M(t)/P(t)]\} \quad 0<a<1 \quad (33)$$

where M is the stock of nominal broad money balances and M^d refers to nominal money demand. The stock demand for real money balances is specified as a linear function of real income and rate of interest:

$$[M^d(t)/P(t)] = a_3 + a_4.[Y(t)/P(t)] + a_5.i_{vz}(t) \quad a_4>0,\ a_5<0 \quad (34)$$

where i_{vz} is the short-term rate of interest in Venezuela. Substituting equations (33) and (34) into (32), yields the following equation:

$$[E(t)/P(t)] = -a.a_3 + (1-a.a_4).[Y(t)/P(t)] - a.a_5.i_{vz}(t) + a.[M(t)/P(t)] + u_2(t)$$
$$(1-a.a_4)>0,\ a.a_5<0,\ a>0 \quad (35)$$

where u_2 is a stochastic random error term.

c. Rate of Inflation: The rate of inflation is assumed to be equal to the "expected" rate of inflation plus a function of the general level of excess demand in the economy and the proportionate rate of change of import prices. Khan (1976) represents this general level of excess demand by the difference between expected, or "permanent" real income and actual real income:

$$[DP(t)/P(t)] = a_6 + a_7.\{Y_P(t) - [Y(t)/P(t)]\} + a_8.EIP(t) + a_9.[DPIM(t)/PIM(t)] + u_3(t) \quad (36)$$

where Y_P is the level of permanent real income and EIP is the expected rate of inflation, and u_3 is a random error term. The estimated parameters are expected to carry the following signs:

$$a_7<0,\ a_8=1,\ a_9>0$$

Permanent real income and the expected rate of inflation are generated by an adaptive expectation model and then used in estimation.

d. Currency to Deposit Ratio: The ratio of currency to the deposit liabilities of commercial banks is specified as a negative function of the opportunity cost of holding currency, as measured by the domestic interest rate, and as a negative function of the level of income, since individuals and corporations tend to become more efficient in their management of cash balances as their income rises:

$$CDR(t) = a_{10} + a_{11}.i_{vz}(t) + a_{12}.Y(t) + u_4(t) \quad a_{11}<0,\ a_{12}<0 \qquad (37)$$

where CDR is the ratio of currency to total private deposits at commercial banks, and u_4 is the error term.

e. Rate of Interest: Khan's (1976) equation for the determination of the rate of interest is obtained simply by solving the equation for the demand for real money balances, equation (34), for i_{vz}:

$$i_{vz}(t) = a_{13} + a_{14}.[Y(t)/P(t)] + a_{15}.[M(t)/P(t)] + u_5(t) \qquad (38)$$

where $a_{13} = a_3/a_5$, $a_{14} = a_4/a_5$, $a_{15} = 1/a_5$. Since $a_4>0$ and $a_5>0$, then $a_{14}>0$, and $a_{15}<0$.

f. Short-Term Capital Flows: Khan (1976) assumes private short-term capital flows, *D*K, are a linear function of the change in the rate of interest in Venezuela and the change in the foreign interest rate. He argues that since most capital flows take place between Venezuela and the United States, the foreign rate is taken to be the U.S. rate, i_{us}. As there were substantial speculative inflows to Venezuela in December 1971, there is a dummy variable, DU, for the fourth quarter of 1971:

$$DK(t) = a_{16} + a_{17}.Di_{vz}(t) + a_{18}.Di_{us}(t) + a_{19}.DU + u_6(t) \quad a_{18}<0,\ a_{19}>0 \qquad (39)$$

where u_6 is a random error term.

g. Ratio of Excess Reserves to Deposits: The ratio of excess reserves of commercial banks to their total deposits liabilities, ER, is specified as a linear function of the rate of interest. As the rate of interest rises, the opportunity cost of holding reserves in the form of non-income yielding assets rises, and commercial banks can be expected to lower their demand:

$$DER(t) = a_{20} + a_{21}.i_{vz}(t) + u_7(t) \quad a_{21}<0 \tag{40}$$

where u_7 is a random error term. As the commercial banks may adjust this ratio to the desired level, DER, with a lag, an adjustment function is assumed:

$$DER(t) = F.[DER(t) – ER(t-1)] \quad 0<F<1 \tag{41}$$

Substituting (40) into (41) and solving for ER, the estimating equation is obtained:

$$ER(t) = F.a_{20} + F.a_{21}.i_{vz}(t) + (1-F).ER(t-1) + F.u_7(t) \tag{42}$$

h. Real Income: The level of real income is equal to real private expenditure plus the real value of exports less the real value of imports:

$$[Y(t)/P(t)] = [E(t)/P(t)] + [X(t)/PX(t)] – [IM(t)/PIM(t)] \tag{43}$$

where PX is the price of exports, and both X and PX are assumed to be exogenous to the model.

i. Balance of Payments: The balance of payments, BP, is equal to the current account balance of the non-petroleum sector plus that of the petroleum sector, plus short-term capital flows, plus a residual item, COB, which includes long-term capital flows, government capital flows, etc.:

$$BP(t) = DR(t) = X(t) – IM(t) + [XOIL(t) – IMOIL(t)] + DK(t) + COB(t) \tag{44}$$

where (XOIL – IMOIL) is the current account balance of the petroleum sector. The variables (XOIL – IMOIL) and COB are assumed to be exogenously determined.

j. Money Supply: The nominal stock of money is determined by the following non-linear identity:

$$M(t) = [(1 + CDR)/(CDR + ER + RRR)].H(t) \tag{45}$$

The expression within the brackets is the money multiplier and H is the stock of high-powered money. RRR is the proportion of total required reserves to total deposit liabilities of commercial banks, and this ratio is assumed to be under the influence of the monetary authorities as it can be altered by manipulating various legal reserve ratios.

k. High-Powered Money: The stock of high-powered money is equal to the stock of international reserves and the domestic asset holdings of the central bank:

$$H(t) = R(t) + D(t) \tag{46}$$

D, along with RRR, represent monetary policy variables.

l. Results: Since the data are not seasonally adjusted, seasonal dummies (S1, S2, and S3) for the first three quarters are introduced into each equation. The method of estimation is two-stage least squares. Table 3 shows the estimated values of the parameters for each of the seven equations with "t-values" in parenthesis.

Table 3: Khan's Second Model: Structural Equation Estimates
$(IM/PIM) = 2.046 - 2.287\ (PIM/P) + 0.062\ (E/P) + 0.011\ S_1 - 0.165\ S_2 + 0.0283\ S_3$ (0.97) (2.05) (10.74) (0.17) (2.51) (0.42) adjusted R-squared = 0.871 D-W = 2.14
$(E/P) = 0.069 + 0.027\ i_{vz} + 0.849\ (Y/P) + 0.744\ (M/P) + 0.187\ S_1 - 0.366\ S_2 - 0.481 S_3$ (0.06) (0.98) (9.07) (2.06) (0.76) (2.20) (2.72) adjusted R-squared = 0.996 D-W = 2.51
$(DP/P) = 0.001 - 0.004\ [Y_P - (Y/P)] + 1.062\ EIP - 0.70\ (DPIM/PIM) - 0.001\ S_1 - 0.001\ S_2 - 0.001\ S_3$ (2.92) (4.37) (10.42) (1.12) (0.70) (2.85) (2.78) adjusted R-squared = 0.998 D-W = 1.71
$CDR = 0.397 - 0.009\ i_{vz} - 0.003\ Y + 0.021\ S_1 + 0.005\ S_2 - 0.003\ S_3$ (21.45) (3.95) (15.17) (7.15) (1.77) (0.97) adjusted R-squared = 0.962 D-W = 1.56
$i_{vz} = 3.982 - 1.410\ (M/P) + 0.295\ (Y/P) + 0.473\ S_1 + 0.196\ S_2 + 0.547\ S_3$ (2.22) (1.98) (2.21) (1.10) (0.60) (1.38) adjusted R-squared = 0.585 D-W = 1.83
$DK = -0.025 + 0.005\ i_{vz} - 0.016\ i_{us} - 0.096\ DU + 0.044\ S_1 - 0.031\ S_2 + 0.028\ S_3$ (1.35) (2.08) (1.91) (1.97) (1.62) (1.18) (1.20) adjusted R-squared = 0.256 D-W = 2.52
$ER(t) = 0.019 - 0.001\ i_{vz} + 0.582\ EB(t\text{-}1) + 0.001\ S_1 + 0.013\ S_2 + 0.003\ S_3$ (1.65) (2.16) (3.10) (0.09) (2.57) (0.70) adjusted R-squared = 0.681 D-W = 1.91
The numbers in parenthesis are t-statistics.

In the import function, both explanatory variables have coefficients with the expected sign, and these coefficients are significantly different from zero at the 5 percent level. The equation appears to be well specified, with a fairly high coefficient of determination and no significant auto-correlation. There is the possibility, of course, that the good fit of the equation is due in part to real imports and real expenditures following a common time trend. For this reason Khan (1976) estimated the equation in first difference form as well. Its results are reported by equation (47):

$$D[IM(t)/PIM(t)] = -0.781 + 2.446\, D[PIM(t)/P(t)] + 0.019\, D[E(t)/P(t)]$$

(1.30) (0.64) (2.64)

$$+ 0.009\, S_1 + 0.099\, S_2 + 0.013\, S_3$$

(0.31) (1.31) (0.41)

adjusted R-squared = 0.179, D-W = 3.11 (47)

The fit of the import function is substantially reduced when the variables are transformed into first-difference form. The coefficient of relative prices has an incorrect positive sign and is not significantly different from zero. The coefficient of real expenditures, though significant, is much reduced in size. On the face of it, the estimates in equation (47) would tend to support the hypothesis that real imports and real expenditures are only spuriously correlated. However, there is another plausible explanation for the relatively poor results obtained in (47) compared to the import equation estimated in terms of levels as reported in Table 3. If the original errors are independent, first differencing introduces negative auto-correlation into the model, and this biases both the estimated standard errors of the coefficients and the coefficient of determination (Granger and Newbold, 1974). Judging by the value of the D-W statistic, the errors in equation (47) do have significant negative auto-correlation in them. Although negative serial correlation probably is not as serious as positive serial correlation (Granger and Newbold, 1974).

All three estimated coefficients in the equation for real expenditure (in Table 3) have the expected signs. However, the estimated coefficient of the interest rate is not significantly different from zero at the 5 percent level. This could be a result of the fairly high degree of correlation between the interest rate and the stock of real money balances. Both real income and real money balances have a positive impact on real expenditures, and the coefficients are significantly different from zero at the 5 percent level.

Summarizing these structural equation results, it can be observed that all but two of the economically meaningful parameters have the correct signs and are significantly different from zero at the 10 percent level. Most of the structural equations appear with a general absence of auto-correlation and a high coefficient of determination.

Khan (1976) conducts simulation experiments in order to determine the tracking ability of the model, and to see what the response of the model is to shocks. The overall performance is good, but the results have to be viewed with some caution due to the deficiencies mentioned above.

Charles Schotta's (1966) study, "sketches two extreme variants of a short-run model for the prediction of changes in money national income in Mexico." (Schotta, 1966). The monetary and Keynesian models are compared. This type of analysis is followed by others (Baker and Falero, 1971, and LeRoy Taylor, 1972).

In building his monetary model, Schotta (1966) starts with a short-run theoretical model as suggested by Prais (1961), but he reasons that, "Since the data used for estimation are annual data, it has been assumed that the equilibrium in the money markets exists at all times." (Schotta, 1966).The model is specified with four definitional equations, three structural equations, and one that defines equilibrium in the money market. They are described by equations (48) through (55):

$$DM^d = a_1 + k.DY + u_1 \quad (48)$$
$$DM^s = a_2 + a_3.BT + a_4.DLK + a_5.GD + u_2 \quad (49)$$
$$DM^d = DM^s \quad (50)$$
$$BT = X - IM \quad (51)$$
$$IM = a_6 + a_7.Y + u_3 \quad (52)$$
$$X = X(t) \quad (53)$$
$$DLK = DLK(t) \quad (54)$$
$$GD = GD(t) \quad (55)$$

where LK is long-term liabilities to foreigners, and GD is the government cash deficit. The explanation of equations are as follows: Equation (48) is a money demand equation in which the demand for money (or the change in the demand for money) is some constant fraction of money national income (or the change in money national income). Equation (49) is a money supply equation, stating that the change in the money supply is some fraction of the current account, BT, the long-term capital inflow, *D*LK, and the federal government cash deficit, GD. Equation (50) defines equilibrium in the money market and is assumed to hold continuously.

Equation (51) defines the current account balance, while equation (52) states that imports are a simple function of money income. Equations (53), (54), and (55) define exports, the change in long-term liabilities to foreigners, and the cash deficit as exogenous.

Schotta (1966) estimates the model for Mexico using the ordinary least squares technique for the 1937-63 period. The results are reported below, and the numbers in parenthesis are the standard errors of the estimated coefficients.

$$DM^d = 0.40 + \underset{(0.003)}{0.80}\ DY \qquad (56)$$

R-squared = 0.31, D-W = 1.37

$$DM = 0.50 + \underset{(0.13)}{0.32}\ BT + \underset{(0.12)}{0.47}\ DLK - \underset{(0.32)}{0.82}\ GD \qquad (57)$$

R-squared = 0.60, D-W = 1.65

$$IM = -1.06 + \underset{(0.005)}{0.19}\ Y \qquad (58)$$

R-squared = 0.98, D-W = 1.68

All the coefficients are significantly different from zero at the 5 percent level, except for the government cash deficit. The values of D-W statistic lie above the upper bound for the critical value at the 1 percent level; hence, the hypothesis of positive auto-correlation may be rejected for the three structural equations.

Schotta (1966) combines equations (48) and (49) to form the money multiplier of the external variables on the money national income. When the resultant equation was estimated, equation (59) was obtained. He also combines equation (56) and (57) to obtain equation (60):

$$DY = 3.32 + \underset{(0.77)}{2.45}\ BT + \underset{(0.81)}{4.96}\ DLK \qquad (59)$$

R-squared = 0.70, D-W = 1.72

$$DY = 1.3 + 4.0\ BT + 5.09\ DLK \qquad (60)$$

He then tests the hypothesis of equality of the regression coefficients of equation (59) with corresponding parameters in equation (60), at the 5 percent level. The null hypothesis of a significant difference is rejected in each case.

Schotta's (1966) Keynesian model is:

$$Y = C + I + G + X - IM \quad (61)$$
$$C = c.Y_d \quad (62)$$
$$Y_d = Y - T \quad (63)$$
$$T = g.Y \quad (64)$$
$$IM = m.Y \quad (65)$$
$$I = I(t) \quad (66)$$
$$G = G(t) \quad (67)$$
$$X= X(t) \quad (68)$$

where Y_d is disposable income. Equation (61) defines income. Equation (62) gives consumption as a function of disposable income. Equation (63) defines disposable income as the income left after taxes are paid. Equation (64) gives the tax structure. Equation (65) shows that the value of imports is determined by the level of nominal income. The last three equations show that investment, government expenditure, and exports are exogenous.

He solves the above system for income to yield:

$$DY = \{1/[1\text{-}c(1\text{-}g) + m]\}.(DI + DX + DG) \quad (69)$$

and this multiplier formulation is then estimated to test the explanatory power of the Keynesian model.

In order to test the explanatory power of the model, Schotta (1966) estimates structural equations (62), (64), and (65), so that the values for the parameters for the multiplier equation (69) may be determined.

$$C = 1.69 + 0.87\ Y_d \quad (70)$$
$$(0.05)$$
R-squared = 0.99, D-W = 1.07

$$T = 0.17 + 0.07\ Y \quad (71)$$
$$(0.002)$$
R-squared = 0.98, D-W = 0.80

Positive auto-correlation may be present in equation (70), since the value for D-W statistic lies between the upper and lower bounds for the critical value at the 1 percent level; the hypothesis of positive auto-correlation cannot be rejected for equation (71) at the same level. He uses the marginal propensity to import which was estimated in equation (58), together with other parameters from equation (70) and (71), to form the multiplier for changes in money national income:

$$DY = 2.63\ (DI + DG + DX) \qquad (72)$$

When the exogenous variables are regressed against income, all in first difference form, one should expect that the regression coefficients would each be equal to the value of the multiplier and to each other.

$$DY = 2.55 + 0.72\ DI + 3.37\ DG + 0.96\ DX \qquad (73)$$
$$(1.55) \quad (2.48) \quad (0.97)$$
R-squared = 0.50, D-W = 2.09

The hypothesis of the investment multiplier being different from zero cannot be rejected at the 5 percent level of significance. Multi-collinearity is present, and when correlation between variables was checked, it was confirmed. When *D*Y is regressed on *D*I, the results are:

$$DY = 2.98 + 2.73\ DI \qquad (74)$$
$$(0.74)$$
R-squared = 0.44, D-W = 2.04

When the null hypothesis that the regression coefficient in equation (74) is not equal to 2.63 is tested, it is rejected at the 5 percent level. Positive auto-correlation is not present when the D-W statistic is tested at the 1 percent level.

Statistically, the multiplier theory explains between 44 and 50 percent of the variance of money national income in Mexico, in contrast to the 70 percent of the variance explained by the monetary model. The comparison suggests that the monetary model is likely to be a better predictor of changes in income and prices in Mexico than the income level. The final conclusion is that a composite model is probably the most fruitful approach.

At this point a few comments on the short-run approach are in order. These comments are divided into two categories – the specification and the estimation of the model.

a. Specification of the Model: Short-run monetary models are based on an adjustment process in which an excess supply of real money balances results in increased expenditures on goods and services in general, and imports in particular. There are a few points that are overlooked in these short-run models. In order to demonstrate these points, let us start with the simpler case where only commodity and money markets are considered. In this case, an excess supply of real money balances spills over to the commodity market and results in excess demand for commodities. If so, then presumably both exports and imports are affected so that imports increase and exports decrease. In the specification of the existing empirical short-run models, this point is usually ignored, and exports are assumed to be either exogenous or determined by factors other than the excess supply of real money balances. It may be argued that if countries specialize in the production and export of one or, at most, a few commodities, their exports are not substantially affected by disequilibrium in their domestic money market. This explanation, of course, applies to those countries where domestic demand for exportables is not elastic; it is not, however, applicable to other countries where domestic consumption of exportables is significant.

In the more general case, where the model includes commodities, money, and bonds, the excess supply of real money balances also spills over into the bond market. On this basis, one should expect capital flows to be affected by the excess supply of real money balances. In the specification of the short-run empirical models, capital flows are either not considered, or when considered they are determined by levels or changes in rates of interest. The models of Rhomberg (1977) and Schotta (1966), and Khan's (1977) first model are examples of the first case. Their reasoning may be defended on the grounds that there is no developed capital market in the countries under consideration, which are mostly under-developed countries. Khan's (1976) second model is an example of the second case.

In the specification of some of the models that are made for short-run analysis, and therefore for consideration of disequilibrium and the adjustment process, one encounters the assumption of equilibrium in the money market. Some models make this assumption at the estimation stage of the analysis, i.e., a short-run disequilibrium model is set up, but a long-run equilibrium model is actually estimated. Others keep the assumption of monetary equilibrium at both the model-building and estimation stages of the analysis. Charles Schotta's (1966) model is an example of keeping the assumption of monetary equilibrium throughout the analysis. The second model presented and estimated by M.S. Khan (1976), is an example of dropping monetary disequilibrium just before estimation. If the model is carefully analyzed, the adjustment process in Khan's (1976) second model is assumed to take place through disequilibrium in the money market, as summarized in the expenditure equation, equation (37), and yet, at the same time, the interest rate is determined through equilibrium in the money market, as specified by equation (40).

b. Estimation of the Model: Estimation of the models is mostly done in levels. In economic time series analysis, where variables are often highly correlated, regression analysis undertaken in terms of levels may generate spurious correlation. Also, the high degree of collinearity between explanatory variables makes statistical inference difficult. In such a case it is advisable to filter the data so that the variables approximate "white noise." In most cases, first differences are adequate (Granger and Newbold, 1974).

The positive relationship between expenditures and imports in the expenditure function is consistent with other behavioral relationships. For convenience, expenditure equations of previous empirical studies are repeated here. Rhomberg (1977) specifies the following expenditure function, which is equation (11), mentioned earlier.

$$E(t) = a_0 + a_1.Y(t) + a_2.Y(t\text{-}1) + a_3.\{[L(t\text{-}1) + L(t\text{-}2)]/2 - k.Y(t)\}$$

Khan (1977), in his first model, uses the following two expenditure functions, where the second one is the transformed version of the first one. These were previously denoted as equations (25) and (27) in Khan's (1977) Model:

$$ED(t) = c_0 + c_1.M^s(t) + c_2.Y(t) + u_4(t) \qquad c_1>0,\ c_2>0$$
$$D[E(t)] = C.c_0 + C.c_1.M^s(t) + C.c_2.Y(t) - C.E(t) + C.u_4(t)$$

Khan (1976), in his second model, uses the following real expenditure function, denoted as equation (35) previously.

$$[E(t)/P(t)] = -a.a_3 + (1\text{-}a.a_4).[Y(t)/P(t)] - a.a_5.i_{vz}(t) + a.[M(t)/P(t)] + u_2(t)$$
$$(1\text{-}a.a_4)>0,\ a.a_5<0,\ a>0$$

The positive relationship between expenditures and money is also consistent with the demand for real money balances. It is known that level of expenditure is one of the determinants of the real money balances, i.e., the transaction demand for money. On this basis a positive relationship between money demand and expenditure is implied, which is consistent with the expenditure equations listed above. So, a significant positive relationship between expenditure and money may be due to other behavioral relationships.

The positive relationship between expenditure and income is quite predictable on a purely accounting basis. If variations in net exports are relatively low, then expenditure constitutes a good proxy for income through the national income accounting identity. In this respect a positive relationship between income and expenditures is expected. So, it may be argued that a significant positive coefficient for income in the above expenditure functions may give undue support to the specification of the expenditure equations. If the variance of the excess of exports over imports is small relative to the variance of real expenditures, a strong relationship between (real) income and (real) expenditure exists because expenditure is the main component of income, through the income identity, $Y = E + X - IM$.

This paper provided a review of the seminal short-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviewed the three major alternative theories of balance of payments adjustments. These theories were the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention was on the trade balance with unemployed resources. The elasticities approach emphasized the role of the relative prices (or exchange rate) in balance of payments adjustments by considering imports and exports as being dependent on relative prices (through the exchange rate). The absorption approach emphasized the role of income (or expenditure) in balance of payments adjustments by considering the change in expenditure relative to income resulting from a change in exports and/or imports. In the monetary approach, on the other hand, the focus of attention was on the balance of payments (or the money account) with full employment. The monetary approach emphasized the role of the demand for and supply of money in the economy. The paper focused on the monetary approach to balance of payments and reviewed the seminal short-run empirical work on the monetary approach to balance of payments. Throughout, the paper provided a comprehensive set of references corresponding to each point discussed. Together, these references would exhaust the existing short-run research on the monetary approach to balance of payments.

ACKNOWLEDGMENT

The author would like to thank his family (Haleh, Arash, and Camellia) for their strong support and prolonged patience with his research-related absence from home.

REFERENCES

Agenor, P.R. (1990). Government Deficits, Output and Inflation in a Monetary Model of the Balance of Payments: The Case of Haiti, 1970-83. *International Economic Journal*, Summer, 4(2), 59-73.

Aghevli, B.B. (1975). The Balance of Payments and Money Supply Under the Gold Standard Regime: U.S. 1879-1914. *American Economic Review*, March, 65(1), 40-58.

Aghevli, B.B. (1977). Money, Prices and the Balance of Payments: Indonesia 1968-73. *Journal of Development Studies*, January, 13(2), 37-57. Reprinted in Ayre, P.C.I. ed. (1977). *Finance in Developing Countries*, London: Frank Case.

Aghevli, B.B. & M.S. Khan (1977). The Monetary Approach to Balance of Payments Determination: An Empirical Test. In International Monetary Fund (1977), *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund*, Washington: International Monetary Fund.

Aghevli, B.B. & M.S. Khan (1980). Credit Policy and the Balance of Payments in Developing Countries. In Coats, Warren L., Jr. and Khatkhate, Deena R., eds. (1980). *Money and Monetary Policy in Less Developed Countries: A Survey of Issues and Evidence.* Oxford: Pergamon Press.

Aghevli, B.B. & C. Sassanpour (1982). Prices, Output and the Trade Balance in Iran. *World Development*, September, 10(9), 791-800.

Akhtar, M.A. (1986). Some Common Misconceptions about the Monetary Approach to International Adjustment. In Putnam, Bluford H. and Wilford, D. Sykes, eds. (1986). *The Monetary Approach to International Adjustment.* Revised Edition, New York and London: Greenwood Press Inc., Praeger Publishers.

Akhtar, M.A., B.H. Putnam & D.S. Wilford (1979). Fiscal Constraints, Domestic Credit, and International Reserve Flows in the United Kingdom, 1952-71: Note. *Journal of Money, Credit, and Banking*, May, 11(2), 202-208.

Alexander, S.S. (1952). Effects of Devaluation on the Trade Balance. *International Monetary Fund Staff Papers*, April, 2, 263-278. Reprinted in Caves, Richard and Johnson, Harry G., eds. (1968). *Readings in International Economics*, Homewood, Ill.: Irwin.

Ardito Barletta, N., M. Blejer & L. Landau (1983). *Economic Liberalization and Stabilization Policies in Argentina, Chile, and Uruguay: Applications of the Monetary Approach to the Balance of Payments.* Washington, DC: World Bank.

Argy, V. (1969). Monetary Variables and the Balance of Payments. *International Monetary Fund Staff Papers*, July, 16, 267-286. Reprinted in International Monetary Fund. (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington, DC: International Monetary Fund.

Argy, V. & P.J.K. Kouri (1974). Sterilization Policies and the Volatility in International Reserves. In Aliber, R.Z., ed. (1974). *National Monetary Policies and the International Financial System.* Chicago: University of Chicago Press.

Arize, A.C., E.C. Grivoyannis, I.N. Kallianiotis & J. Malindretos (2000). Empirical Evidence for the Monetary Approach to Balance of Payments Adjustments. In Arize, A.C., Bonitsis, T. Homer, I.N. Kallianiotis, K.M. Kasibhatla & J. Malindretos eds. (2000). *Balance of Payments Adjustment: Macro Facets of International Finance Revisited*, Westport, Connecticut: Greenwood Press.

Artus, J.R. (1976). Exchange Rate Stability and Managed Floating: The Experience of the Federal Republic of Germany. *International Monetary Fund Staff Papers*, July, 23(2), 312-333.

Asheghian, P. (1985). The Impact of Devaluation on the Balance of Payments of the Less Developed Countries: A Monetary Approach. *Journal of Economic Development*, July, 10(1), 143-151.

Baker, A.B. & F. Falero, Jr. (1971). Money, Exports, Government Spending, and Income in Peru 1951-1966. *Journal of Development Studies*, July, 7(4), 353-364.

Bean, D.L. (1976). International Reserve Flows and Money Market Equilibrium: The Japanese Case. In Frenkel, Jacob A. and Johnson, Harry G., eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Beladi, H., B. Biswas & G. Tribedy (1986). Growth of Income and the Balance of Payments: Keynesian and Monetarist Theories. *Journal of Economic Studies*, 13(4), 44-55.

Bergstrom, A.R. & C.R. Wymer (1976). A Model of Disequilibrium Neoclassical Growth and its Application to the United Kingdom. In Bergstrom, A.R., ed. (1976). *Statistical*

Inference in Continuous Time Economic Models. Amsterdam: North-Holland Publishing Company.

Bhatia, S. (1982). The Monetary Theory of Balance of Payments under Fixed Exchange Rates, An Example of India: 1951-73. *Indian Economic Journal*, Jan./March, 29(3), 30-40.

Bilquees, F. (1989). Monetary Approach to Balance of Payments: The Evidence on Reserve Flow from Pakistan. *Pakistan Development Review*, Autumn, 28(3), 195-206.

Blejer, M.I. (1977). The Short-Run Dynamics of Prices and the Balance of Payments. *American Economic Review*, June, 67(3), 419-428.

Blejer, M.I. (1979). On Causality and the Monetary Approach to the Balance of Payments: The European Experience. *European Economic Review*, July, 12, 289-296.

Blejer, M.I. (1983). Recent Economic Policies of the Southern Cone Countries and the Monetary Approach to the Balance of Payments. In Ardito Barletta, N., M. I. Blejer & L. Landau eds. (1983). *Economic Liberalization and Stabilization Policies in Argentina, Chile, and Uruguay: Applications of the Monetary Approach to the Balance of Payments.* Washington, DC: The World Bank.

Blejer, M.I. & R.B. Fernandez (1975). On the Trade-Off between Output, Inflation and the Balance of Payments. Working Paper, International Trade Workshop, University of Chicago, Chicago, Illinois.

Blejer, M. & R. Fernandez (1978). On the Output-Inflation Trade-Off in an Open Economy: A Short-Run Monetary Approach. *Manchester School of Economic and Social Studies*, July, 46(2), 123-138.

Blejer, M.I. & R.B. Fernandez (1980). The Effects of Unanticipated Money Growth on Prices and on Output and Its Composition in a Fixed-Exchange-Rate Open Economy. *Canadian Journal of Economics*, 13, 82-95.

Blejer, M., M. Khan, & P. Masson (1995). Early Contributions of *Staff Papers* to International Economics. *International Monetary Fund Staff Papers*, December, 42(4), 707-733.

Blejer, M.I. & L. Leiderman (1981). A Monetary Approach to the Crawling Peg System: Theory and Evidence. *Journal of Political Economy*, February, 89(1), 132-151.

Bonitsis, T.H. & J. Malindretos (2000). The Keynesian and Monetary Approaches to International Accounts Adjustment: Some Heuristics for Germany. In Arize, A.C., T.H.

Bonitsis, I.N. Kallianiotis, K.M. Kasibhatla, & J. Malindretos eds. (2000). *Balance of Payments Adjustment: Macro Facets of International Finance Revisited*, Westport, Connecticut: Greenwood Press.

Borts, G.H. & J.A. Hanson (1977). The Monetary Approach to the Balance of Payments. Unpublished Manuscript, Brown University, Providence, R.I.

Bourne, C. (1989). Some Fundamentals of Monetary Policy in the Caribbean. *Social and Economic Studies*, 38(2), 265-290.

Boyer, R.S. (1979). Sterilization and the Monetary Approach to Balance of Payments Analysis. *Journal of Monetary Economics*, April, 5, 295-300.

Brissimis, S.N. & J.A. Leventakis (1984). An Empirical Inquiry into the Short-Run Dynamics of Output, Prices and Exchange Market Pressure. *Journal of International Money and Finance*, April, 3(1), 75-89.

Brunner, K. (1973). Money Supply Process and Monetary Policy in an Open Economy. In Connolly, M.B. & A.K. Swoboda eds. (1973). *International Trade and Money.* London: George Allen and Unwin.

Burdekin, R. & P. Burkett (1990). A Re-Examination of the Monetary Model of Exchange Market Pressure: Canada, 1963-1988. *Review of Economics & Statistics*, 2(4), 677-681.

Burkett, P., J. Ramirez, & M. Wohar (1987). The Determinants of International Reserves in the Small Open Economy: The Case of Honduras. *Journal of Macroeconomics*, Summer, 9(3), 439-450.

Burkett, P. & D.G. Richards (1993). Exchange Market Pressure in Paraguay, 1963-88: Monetary Disequilibrium versus Global and Regional Dependency. *Applied Economics*, August, 25(8), 1053-1063.

Cheng, H.S. & N.P. Sargen (1975). Central-Bank Policy towards Inflation. *Federal Reserve Bank of San Francisco Business Review*, Spring, 31-40.

Civcir, I. & A. Parikh (1992). Is the Turkish Balance of Payments a Monetary or Keynesian Phenomenon? Discussion Paper No. 9216, University of East Anglia, Norwich.

Cobham, D. (1983). Reverse Causation in the Monetary Approach: An Econometric Test for the U.K. *Manchester School of Economic and Social Studies*, December, 51(4), 360-379.

Connolly, M.B. (1985). The Exchange Rate and Monetary and Fiscal Problems in Jamaica: 1961-1982. In Connolly, M.B. & J. McDermott, eds. (1985). *The Economics of the Caribbean Basin.* New York: Praeger Publishers.

Connolly, M. & J. DaSilveira (1979). Exchange Market Pressure in Post War Brazil: An Application of the Girton-Roper Monetary Model. *American Economic Review*, 69(3), 448-454.

Connolly, M.B. & D. Taylor (1976). Testing the Monetary Approach to Devaluation in Developing Countries. *Journal of Political Economy*, August, 84(4), 849-859.

Connolly, M.B. & D. Taylor (1979). Exchange Rate Changes and Neutralization: A Test of the Monetary Approach Applied to Developed and Developing Countries. *Economica*, August, 46, 281-299.

Coppin, A. (1994). The Determinants of International Reserves in Barbados: A Test of the Monetarist Approach. *Social and Economic Studies*, June, 43(2), 75-89.

Costa Fernandes, A.L. (1990). Further Evidence on the Exchange Market Pressure Model: Portugal: 1981-1985. *Economia (Portugal)*, January, 14(1), 1-12.

Courchene, T. & K. Singh (1976). The Monetary Approach to the Balance of Payments: An Empirical Analysis for Fourteen Industrial Countries. In Parkin, J.M. & G. Zis, eds. (1976). *Inflation in the World Economy.* Manchester: Manchester University Press.

Cox, W.M. (1978). Some Empirical Evidence on an Incomplete Information Model of the Monetary Approach to the Balance of Payments. In Putnam, B.H. & D.S. Wilford, eds. (1978). *The Monetary Approach to International Adjustment.* New York and London: Greenwood Press Inc., Praeger Publishers.

Cox, W.M. & D.S. Wilford (1976). The Monetary Approach to the Balance of Payments and World Monetary Equilibrium. Unpublished Manuscript, International Monetary Fund, Washington, DC.

Darby, M.R. (1980). Sterilization and Monetary Control under Pegged Exchange Rates: Theory and Evidence. Working Paper No. 449, National Bureau of Economic Research.

De Grauwe, P. (1975). International Capital Flows and Portfolio Equilibrium: Comment. *Journal of Political Economy*, October, 83(5), 1077-1080.

De Silva, K.E.A. (1977). Money Supply, Inflation and the Balance of Payments in Sri Lanka (1959-74). *Journal of Development Studies*, January, 13(2), 22-36.

Dornbusch, R. (1971). Notes on Growth and the Balance of Payments. *Canadian Journal of Economics*, August, 4(3), 389-395.

Dornbusch, R. (1973a). Devaluation, Money and Non-Traded Goods. *American Economic Review*, December, 63(5), 871-883. Reprinted in Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Dornbusch, R. (1973b). Currency Depreciation, Hoarding, and Relative Prices. *Journal of Political Economy*, July/August, 81(4), 893-915.

Dornbusch, R. (1975). A Portfolio Balance Model of the Open Economy. *Journal of Monetary Economics*, January, 1(1), 3-19.

Farhadian, Z. & R.M. Dunn, Jr. (1986). Fiscal Policy and Financial Deepening in a Monetarist Model of the Balance of Payments. *Kyklos*, 39, 66-84.

Feige, E.L. & J.M. Johannes (1981). Testing the Causal Relationship between the Domestic Credit and Reserve Components of a Country's Monetary Base. *Journal of Macroeconomics*, Winter, 3(1), 55-76.

Fleming, J.M. & L. Boissonneault (1961). Money Supply and Imports. *International Monetary Fund Staff Papers*, 8, 227-240. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: IMF.

Fontana, M. (1998). The Effects of Monetary Policy on the Balance of Payments in Fiji. *Pacific Economic Bulletin*, 13(1), 57-71.

Franco, G.R. (1979). Domestic Credit and the Balance of Payments in Ghana. *Journal of Development Studies*, 15(2), 202-215.

Fratianni, M. (1976). On the Effectiveness of Monetary Policy under Fixed Rates of Exchange. *Journal of Monetary Economics*, 2, 63-79.

Frenkel, J.A., T. Gylfason & J.F. Helliwell (1980). A Synthesis of Monetary and Keynesian Approaches to Short-Run Balance-of-Payments Theory. *Economic Journal*, September, 90(359), 582-592.

Frenkel, J.A. & H.G. Johnson (1976). The Monetary Approach to the Balance of Payments: Essential Concepts and Historical Origins. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Genberg, A.H. (1976). Aspects of the Monetary Approach to Balance-of-Payments Theory: An Empirical Study of Sweden. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Girton, L. & D. Roper (1977). A Monetary Model of Exchange Market Pressure Applied to the Postwar Canadian Experience. *American Economic Review*, Sept., 67(4), 537-548.

Granger, C.W.J. & P. Newbold (1974). Spurious Regression in Econometircs. *Journal of Econometrics*, 2, 111-120.

Grubel, H.G. & T.C.I. Ryan (1979). A Monetary Model of Kenya's Balance of Payments. Discussion Paper Series, No. 79-09-3, Department of Economics and Commerce, Simon Fraser University.

Guitian, M. (1973). Credit Versus Money as an Instrument of Control. *International Monetary Fund Staff Papers*, November, 20, 785-800. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Guitian, M. (1976). The Balance of Payments as a Monetary Phenomenon: Empirical Evidence, Spain 1955-1971. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Gupta, S. (1984). Causal Relationship between Domestic Credit and International Reserves: The Experience of Developing Countries. *Kredit und Kapial*, 17(2), 261-271.

Hacche, G. & J.C. Townend (1981). Monetary Models of Exchange Rates and Exchange Market Pressure: Some General Limitations and an Application to Sterling's Effective Rate. *Weltwirtschaftliches Archiv*, 117(4), 622-637.

Herring, R.J. & R.C. Marston (1977). Sterilization Policy: The Trade-off between Monetary Autonomy and Control over Foreign Exchange Reserves. *European Economic Review*, February, 10, 325-343.

Hodgson, J.S. & R.G. Schneck (1981). Stability of the Relationship between Monetary Variables and Exchange Market Pressure: Empirical Evidence. *Southern Economic Journal*, April, 941-958.

Hodjera, Z. (1976). Alternative Approaches in the Analysis of International Capital Movements: A Case Study of Austria and France. *International Monetary Fund Staff Papers*, November, 23, 598-623.

Horne, J. (1979). The Effect of Devaluation on the Balance of Payments and the Labour Market: United Kingdom, 1967. *Economica*, February, 46(181), 11-25.

Horne, J. (1981). Beggar-My-Neighbour Devaluation: The Case of Ireland, 1967. *European Economic Review*, March, 15(3), 327-338.

Ibrahim, I.B. & R.M. Williams (1978). The Monetary Approach to Japanese Reserve Accumulation. Unpublished Manuscript, College of Business Administration, University of Hawaii, Honolulu.

International Monetary Fund (IMF) (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington, DC: International Monetary Fund.

International Monetary Fund (IMF) (1987). Theoretical Aspects of the Design of Fund-Suported Adjustment Programs. *IMF Occasional Paper*, No. 55. Washington, DC: International Monetary Fund.

International Monetary Fund (IMF) (1996). *Financial Programming and Policy: The Case of Sri Lanka.* Washington, DC: International Monetary Fund

Jager, H. (1978). The Global Monetaristic Variant of the Monetary Approach to the Balance of Payments: An Empirical Study of the Netherlands. *De Economist*, 126(3), 342-369.

Jayaraman, T.K. (1993). Monetary Approach to Fiji's Balance of Payments. Economics Division Working Paper, South Pacific 93/2, National Center for Development Studies, The Australian National University, Canberra.

Jimoh, A. (1990). The Monetary Approach to Balance of Payments Evidence from Nigeria. *Eastern Africa Economic Review*, 6(1), 69-75.

Johannes, J. (1981). Testing the Exogeneity Specification Underlying the Monetary Approach to the Balance of Payments. *Review of Economics and Statistics*, Feb. 63(1), 29-34.

Johnson, H.G. (1958). Towards a General Theory of the Balance of Payments. In Johnson, Harry G., ed. (1958). *International Trade and Economic Growth*, London: George Allen and Unwin. Reprinted in Frenkel, J.A. & H.G. Johnson (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Johnson, H.G. (1972). The Monetary Approach to Balance of Payments Theory. *Journal of Financial and Quantitative Analysis*, Papers and Proceedings, March, 7, 1555-1572. Reprinted in Johnson, H.G., ed. (1973). *Further Essays in Monetary Theory.* London: George Allen & Unwin, 1972. Reprinted in Connolly, M. & A. Swoboda, eds. (1973). *International Trade and Money*, London: Allen and Unwin. Reprinted in Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Johnson, H.G. (1973). The Monetary Approach to Balance of Payments. In Johnson, H.G., ed. (1973). *Further Essays in Monetary Economics.* London: George Allen & Unwin (1972). Cambridge: Harvard University Press (1973).

Johnson, H.G. (1976). The Monetary Theory of Balance-of-Payments Policies. In Frenkel, J.A. & Johnson, H.G., eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Johnson, H.G. (1977a). The Monetary Approach to Balance of Payments Theory and Policy: Explanation and Policy Implications. *Economica*, August, 44(175), 217-229.

Johnson, H.G. (1977b). The Monetary Approach to the Balance of Payments: A Non-Technical Guide. *Journal of International Economics*, August, 7(3), 251-268.

Johnson, H.G. (1977c). Money, Balance of Payments Theory, and the International Monetary Problem. *Essays in International Finance.* No. 124, International Finance Section, Princeton University, Princeton, New Jersey.

Jonson, P.D. (1976). Money and Economic Activity in the Open Economy: The United Kingdom, 1880-1970. *Journal of Political Economy*, October, 84(5), 979-1012.

Jonson, P.D. & H.I. Kierzkowski (1975). The Balance of Payments: An Analytical Exercise. *Manchester School of Economics and Social Studies*, 43, 105-133.

Joyce, J. & L. Kamas (1985). Money, Income, Prices and the Balance of Payments: Causal Tests for Developing Countries. Working Paper, Wellesley College, October.

Kamas, L. (1986). The Balance of Payments Offset to Monetary Policy: Monetarist, Portfolio Balance, and Keynesian Estimates for Mexico and Venezuela. *Journal of Money, Credit, and Banking*, November, 18(4), 467-481.

Kanesathasan, S. (1961). Government Imports and Import Taxes in Monetary Analysis of Income and Imports. *International Monetary Fund Staff Papers*, December, 8, 412-426.

Kemp, D.S. & D.S. Wilford (1979). Exchange Rates and the Balance of Payments in Latin America. *Business Economics*, September, 14, 30-34.

Kenneally, M. & M. Finn (1985). The Balance of Payments as a Monetary Phenomenon: A Review and Consideration of Irish Evidence 1960-1978. *Economic and Social Review*, October, 17(1), 39-72.

Kenneally, M. & T.V. Nhan (1986). The Strength and Stability of the Relationships between Monetary Variables and Exchange Market Pressure Reconsidered. *Southern Economic Journal*, July, 53(1), 95-109.

Khan, M.S. (1973). The Effect of Growth on the Balance of Payments of Developing Countries: An Empirical Note. *Pakistan Economic and Social Review*, Autumn, 11(3), 354-359.

Khan, M.S. (1974). Experiments with a Monetary Model for the Venezuelan Economy. *International Monetary Fund Staff Papers*, July, 21(2), 389-413.

Khan, M.S. (1976). A Monetary Model of Balance of Payments: The Case of Venezuela. *Journal of Monetary Economics*, 2, 311-332.

Khan, M.S. (1977). The Determination of the Balance of Payments and Income in Developing Countries. In International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Khan, M.S. (1990). Macroeconomic Policies and the Balance of Payments in Pakistan: 1972-1986. International Monetary Fund Working Paper 90/78, International Monetary Fund, Research Department, Washington, DC, September.

Khan, M.S. & M.D. Knight (1981). Stabilization Programs in Developing Countries: A Formal Framework. *International Monetary Fund Staff Papers*, March, 1-53.

Kieran, M. (1970). Monetary Policy and the Business Cycle in Postwar Japan. In Meiselman, D., ed. (1970). *Varieties of Monetary Experience.* Chicago: University of Chicago Press.

Killick, T. & F.M. Mwega (1993). Monetary Policy in Kenya, 1967-88. In Page, S., ed. (1993). *Monetary Policy in Developing Countries.* London: Routledge.

Kim, I. (1985). Exchange Market Pressure in Korea: An Application of the Girton-Roper Monetary Model. *Journal of Money, Credit, and Banking*, May, 17(2), 258-263.

Knight, M.D. & D.J. Mathieson (1979). Model of an Industrial Country under Fixed and Flexible Exchange Rates. In Martin, J. & A. Smith, eds. (1979). *Trade and Payments Adjustment under Flexible Exchange Rates*, Macmillan.

Knight, M.D. & D.J. Mathieson (1983). Economic Change and Policy Response in Canada under Fixed and Flexible Exchange Rates. In Bhandari, J.S. & B.H. Putnam, eds. (1983). *Economic Interdependence and Flexible Exchange Rates.* Cambridge, Massachusetts: MIT Press.

Knight, M.D. & C.R. Wymer (1976). A Monetary Model of an Open Economy with Particular Reference to the United Kingdom. In Artis, M.J. & A.R. Nobay, eds. (1976). *Essays in Economic Analysis: The Proceedings of the Association of University Teachers of Economics, Shefield 1975.* Cambridge: Cambridge University Press.

Knight, M.D. & C.R. Wymer (1978). A Macroeconomic Model of the United Kingdom. *International Monetary Fund Staff Papers*, December, 25(4), 742-778,

Knoester, A. & J. Van Sinderen (1985). Money, the Balance of Payments and Economic Policy. *Applied Economics*, 17, 215-240.

Kouri, P.J.K. (1975). The Hypothesis of Offsetting Capital Flows: A Case Study of Germany. *Journal of Monetary Economics*, January, 1, 21-39.

Kouri, P.J.K. & M.G. Porter (1972). Interest Rates, Capital Flows, and Exchange Rate Expectations. Unpublished Manuscript, International Monetary Fund, October.

Kouri, P.J.K. & M.G. Porter (1974). International Capital Flows and Portfolio Equilibrium. *Journal of Political Economy*, May/June, 82(3), 443-467.

Kreinin, M.E. & L.H. Officer (1978). The Monetary Approach to the Balance of Payments: A Survey. *Princeton Studies in International Finance*, No. 43, International Finance Section, Department of Economics, Princeton University, Princeton, New Jersey,.

Kulkarni, K.G. (1985). Capital Flows as an Offset to Monetary Policy: The Netherlands Evidence. *Indian Economic Journal*, July-September, 33(1), 127-129.

Lachman, D. (1975). A Monetary Approach to the South African Balance of Payments. *South African Journal of Economics*, September, 43(3), 271-283.

Laidler, D.E.W. (1975). Price and Output Fluctuations in an Open Economy. In Laidler, D.E.W., Ed. (1975). *Essays on Money and Inflation.* Manchester: University of Manchester Press, Chicago: University of Chicago Press.

Laidler, D., B. Bentley, D. Johnson, & S.T. Johnson (1981). A Small Macroeconomic Model of an Open Economy: The Case of Canada. Research Report 8110, University of Western Ontario, July.

Laidler, D. & P. O'Shea (1980). An Empirical Macro-Model of an Open Economy under Fixed Exchange Rates: The United Kingdom, 1954-1970. *Economica*, 47, 141-158.

Laney, L.O. (1979). National Monetary Independence and Managed Floating Exchange Rates. Unpublished Manuscript, Federal Reserve Bank of Dallas.

Laskar, D.M. (1981). *Sterilization Behavior and Independence of Monetary Policy under a Pegged Exchange Rates System: An Econometric Approach.* UCLA Ph.D. Dissertation.

Laskar, D.M. (1982). Short-Run Independence of Monetary Policy under a Pegged-Exchange-Rates System: An Econometric Approach. *Journal of International Money and Finance*, April, 1, 57-79.

Lee, B.S. & M.E. Wohar (1991). Testing Alternative Specifications of Reserve Flow Equations: The Japanese Experience, 1959-1986. *International Economic Journal*, 5(1), 35-50.

Leiderman, L. (1980). Relationships between Macroeconomic Time-Series in a Fixed-Exchange-Rate Economy. *European Economic Review*, July, 14(1), 61-77.

Leon, H. (1988). The Monetary Approach to the Balance of Payments: A Simple Test of Jamaican Data. *Social and Economic Studies*, December, 37(4), 1-37.

Leon, H. & H. Molana (1987). Testing the Monetary Approach to Balance of Payments in Developing Countries. In Chrystal, K.A. & R. Sedgwick, eds. (1987). *Exchange Rates and the Open Economy.* New York: St. Martin's Press, Brighton; U.K.: Harvester Press, Wheatsheaf Books.

Levantakis, J.A. (1984). Stabilization Policies in the Greek Economy: Will They Work? *Journal of Policy Modeling*, June, 7(3), 441-455.

Levy, V. (1981). Oil Prices, Relative Prices, and Balance-of-Payments Adjustment: the Turkish Experience. *European Economic Review*, 15, 357-372.

Looney, R.E. (1991). A Monetary Approach to Movements in Caribbean Balance of Payments. *Social and Economic Studies*, March, 40(1), 105-132.

Luan, D.C. & N.C. Miller (1979). A Monetary Approach to International Capital Flows Applied to the United States: Note. *Journal of Money, Credit, and Banking*, Feb., 11(1), 87-90.

Magee, S.P. (1976). The Empirical Evidence on the Monetary Approach to the Balance of Payments and Exchange Rates. *American Economic Review*, May, 66(2), 163-170.

Mah, J.S. (1991). A note on the Exchange Market Pressure: The Korean Experience 1980-1987. *Applied Economics*, Part A, April, 23(4A), 587-590.

McCloskey, D. & R. Zecher (1976). How the Gold Standard Worked, 1880-1913. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

McNown, R. & M. Wallace (1977). International Reserve Flows of OPEC States. *Journal of Energy and Development*, 2, 267-278.

Miller, N.C. (1978). Monetary vs. Traditional Approaches to Balance-of-Payments Analysis. *American Economic Review*, May, 68(2), 406-411.

Miller, N.C. (1980). Offset and Growth Coefficients for Five Industrial Countries: 1960-1970. *Review of Economics and Statistics*, August, 62(3).

Miller, N.C. & S.S. Askin (1976). Monetary Policy and the Balance of Payments in Brazil and Chile. *Journal of Money, Credit, and Banking*, May, 8(2), 227-238.

Modeste, N.C. (1981). Exchange Market Pressure During the 1970s in Argentina: An Application of the Girton-Roper Monetary Model. *Journal of Money, Credit, and Banking*, May, 13(2), 234-240.

Mundell, R.A. (1968). Balance of Payments. In Sills, D.L., ed., *International Encyclopedia of the Social Sciences.* Vol. 8. pp. 1-11. USA: Crowell Collier and Macmillan, Inc.

Murray, G.I. (1978). Monetary Policy and Capital Flows. *Economic Record*, Aug., 54, 271-280.

Mussa, M. (1974). A Monetary Approach to Balance-of-Payments Analysis. *Journal of Money, Credit, and Banking*, August, 6(3), 333-351.

Mussa, M. (1976). Tariffs and the Balance of Payments: A Monetary Approach. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Myhrman, J. (1976). Balance-of-Payments Adjustments and Portfolio Theory: A Survey. In Classen, E.M. & P. Salin, eds. (1976). *Recent Issues in International Monetary Economics.* New York: North-Holand.

Neumann, M.J.M. (1978). Offsetting Capital Flows: A Reexamination of the German Case. *Journal of Monetary Economics*, January, 4, 131-142.

Obstfeld, M. (1980). Sterlitization and Offsetting Capital Movements: Evidence From West Germany, 1960-1970. Working Paper No. 494, National Bureau of Economic Research.

Obstfeld, M. (1982). Can We Sterilize? Theory and Evidence. *American Economic Review Papers and Proceedings*, 72, 45-50.

Otani, I. & Y.C. Park (1976). A Monetary Model of the Korean Economy. *International Monetary Fund Staff Papers*, March, 23(1), 165-199.

Parikh, A. (1993). Monetary Policy in Bangladesh, 1973-85. In Page, Sheila, ed. (1993). *Monetary Policy in Developing Countries*, London: Routledge.

Parkin, M. (1974a). Inflation, the Balance of Payments, Domestic Credit Expansion, and Exchange Rate Adjustments. In Aliber, R.Z., ed. (1974). *National Monetary Policies and the International Financial System.* Chicago: University of Chicago Press.

Parkin, M. (1974b). World Inflation, International Relative Prices and Monetary Equilibrium under Fixed Exchange Rates. Paper presented to second Racine Conference, Racine, Wisconsin, July.

Pentecost, E.J., C. Van Hooydonk, & A. Van Poeck (2001). Measuring and Estimating Exchange Market Pressure in the EU. *Journal of International Money and Finance*, June, 20(3), 401-418.

Phaup, E.D. & A. Kusinitz (1977). Monetary Control under Fixed Exchange Rates: A Time Series Approach. *Journal of Money, Credit, and Banking*, November, 9(4), 552-561.

Polak, J.J. (1957). Monetary Analysis of Income Formation and Payments Problems. *International Monetary Fund Staff Papers*, November, 6, 1-50. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Polak, J.J. (1998). The IMF Monetary Model at 40. *Economic Modelling*, 15(3), July, 395-410.

Polak, J.J. & V. Argy (1971). Credit Policy and the Balance of Payments. *International Monetary Fund Staff Papers*, March, 18, 1-24. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Polak, J.J. & L. Boinssonneault (1960). Monetary Analysis of Income and Imports and Its Statistical Application. *International Monetary Fund Staff Papers*, April, 7, 349-415. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Porter, M.G. (1972). Capital Flows as an Offset to Monetary Policy: The German Experience. *International Monetary Fund Staff Papers*, July, 395-424.

Porter, M.G. (1974). The Interdependence of Monetary Policy and Capital Flows in Australia. *Economic Record*, March, 50, 1-20.

Prais, S.J. (1961). Some Mathematical Notes on the Quantity Theory of Money in an Open Economy. *International Monetary Fund Staff Papers*, May, 8(2), 212-226. Reprinted in International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund.

Putnam, B.H. & D.S. Wilford (1986). International Reserve Flows: Seemingly Unrelated Regressions. In Putnam, B.H. & D.S. Wilford, eds. (1986). *The Monetary Approach to International Adjustment.* Revised Edition, New York and London: Greenwood Press Inc., Praeger Publishers.

Rasulo, J.A. & D.S. Wilford (1980). Estimating Monetary Models of the Balance of Payments and Exchange Rates: A Bias. *Southern Economic Journal*, July, 47(1), 136-146.

Rhomberg, R.R. (1977). Money, Income, and the Foreign Balance. In International Monetary Fund (1977). *The Monetary Approach to the Balance of Payments: A Collection of Research Papers by Members of the Staff of the International Monetary Fund.* Washington: International Monetary Fund. Reprinted from Jackson, E.F., ed. (1965). *Economic Development in Africa*, Oxford, England.

Robinson, J. (1950). The Foreign Exchanges. In Ellis, H. & L. Metzler. eds. (1950). *Readings in the Theory of International Trade.* Homewood, Ill.: Irwin; in *Essays in the Theory of Employment.* Second Edition, Oxford: Blackwell. (1947). Reprinted in *Collected Economic Papers IV.* Cambridge, MA: The MIT Press. (1973).

Rodriguez, C.A. (1976). Money and Wealth in an Open Economy Income-Expenditure Model. In Frenkel, J.A. & H.G. Johnson, eds. (1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

Roper, D.E. & S.J. Turnovsky (1980). Optimal Exchange Market Intervention in a Simple Stochastic Macro Model. *Canadian Journal of Economics*, May, 13(2), 296-309.

Sargen, N. (1975). An Empirical Analysis of a Monetary Model of Exchange Rate and Reserve Fluctuations. Unpublished Paper, Federal Reserve Bank of San Francisco, November.

Sargen, N. (1977). Exchange Rate Flexibility and Demand for Money. *Journal of Finance*, May, 32(2), 531-551.

Sassanpour, C. & J. Sheen (1984). An Empirical Analysis of the Effects of Monetary Disequilibria in Open Economies. *Journal of Monetary Economics*, Jan., 13, 127-163.

Schotta, C. (1966). The Money Supply, Exports, and Income in an Open Economy: Mexico 1939-63. *Economic Development and Cultural Change*, July, 14(4), 458-470.

Sheehey, E.J. (1980). Monetary Policy and Balance of Payments in Brazil and Chile: A Comment. *Journal of Money, Credit, and Banking*, August, 12(3), 547-549.

Sohrab-Uddin (1985). Monetary Approach to Balance of Payments: Evidence from Less Developed Countries. *Indian Economic Journal*, August/September, 33(1), 92-104.

Sommariva, A. & G. Tullio (1988). International Gold Flows in Gold Standard Germany: A Test of the Monetary Approach to the Balance of Payments 1880-1911. *Journal of Money, Credit, and Banking*, February, 20(1), 132-140.

Spanos, A. & M.P. Taylor (1984). The Monetary Approach to the Balance of Payments: A Critical Appraisal of Some Empirical Evidence. *Oxford Bulletin of Economics and Statistics*, November, 46(4), 329-340.

Spinelli, F. (1983). Fixed Exchange Rates and Adaptive Expectations Monetarism: The Italian Case. *Review of Economic Conditions in Italy*, February, 0(1), 97-124.

Stockman, A.C. (1979). Monetary Control and Sterilization under Pegged Exchange Rates. Unpublished Manuscript, University of Rochester, August.

Taylor, L. (1972). Money, the Balance of Payments and Income Determination in Jamaica (1950-1970). *Social and Economic Studies*, June, 21(2), 171-183.

Taylor, M.P. (1986). A Varying-Parameter Empirical Model of Balance of Payments Determination under Fixed Exchange Rates: Results from UK and West Germany. *Applied Economics*, 18, 567-582.

Taylor, M.P. (1987a). On Granger Causality and the Monetary Approach to the Balance of Payments. *Journal of Macroeconomics*, Spring, 9(2), 239-253.

Taylor, M. (1987b). Testing the Exogeneity Specification Underlying the Monetary Approach to the Balance of Payments: Some U.K. Evidence. *Applied Economics*, 19(5), 651-661.

Teal, F. & Y.M. Giwa (1985). Domestic Credit and the Balance of Payments in Ghana: A Comment. *Journal of Development Studies*, July, 21(4), 548-561.

Thornton, J. (1995). Exchange Market Pressure in Costa Rica, 1986-92: An Application of the Girton-Roper Model. *International Economic Journal*, 9(1), Spring, 67-72.

Tullio, G. (1979). Monetary Equilibrium and Balance-of-Payments Adjustment: An Empirical Test of the U.S. Balance of Payments, 1951-73. *Journal of Money, Credit, and Banking*, February, 11(1), 68-79.

Tullio, G. (1981). Fluctuations of the Italian Balance of Payments, 1951-73: An Econometric Analysis. In Tullio, G. (1981). *The Monetary Approach to External Adjustment: A Case Study of Italy.* New York: St. Martin's Press.

Vaez-Zadeh, R. (1989). Oil Wealth and Economic Behavior: The Case of Venezuela, 1965-81. *International Monetary Fund Staff Papers*, June, 36(2), 343-384.

Wallich, H.C. (1950). *Monetary Problems of an Export Economy.* Cambridge: Harvard University Press.

Watson, P.K. (1988). The Balance of Payments of Trinidad and Tobago 1973-1983: A Monetary Phenomenon? *Journal of Economic Studies*, 15(1), 19-31.

Watson, P.K. (1990). Modelling the Balance of Payments of Trinidad and Tobago: 1965-1985: A Policy Making Perspective. *Social and Economic Studies*, March, 39(1), 51-70.

Weymark, D.N. (1995). Estimating Exchange Market Pressure and the Degree of Exchange Market Intervention for Canada. *Journal of International Economics*, 39(3-4), 273-295.

Whitman, M.N. (1975). Global Monetarism and the Monetary Approach to the Balance of Payments. *Brookings Papers on Economic Activity*, 3, 491-555.

Wilford, D.S. (1977). *Monetary Policy and the Open Economy: Mexico' Experience.* New York: Praeger Publishers.

Wilford, D.S. & W.T. Wilford (1977). Monetary Approach to Balance of Payments: On World Prices and the Reserve Flow Equation. *Weltwirtschaftliches Archiv*, 113(1), 31-39.

Wilford, D.S. & W.T. Wilford (1978). On the Monetary Approach to the Balance of Payments: The Small, Open Economy. *Journal of Finance*, March, 33(1), 319-323.

Wilford, D.S. & J.R. Zecher (1979). Monetary Policy and the Balance of Payments in Mexico, 1955-1975. *Journal of Money, Credit, and Banking*, August, 11(3), 340-348.

Wohar, M. & P. Burkett (1989). External Shocks and Fiscal Deficits in a Monetary Model of International Reserve Determination: Honduras, 1960-83. *Applied Economics*, 21(7), 921-929.

Wohar, M.E. & B. S. Lee (1992). An Application of the Girton-Roper Monetary Model of Exchange Market Pressure: The Japanese Experience, 1959-1991. *Rivista Internazionale di Scienze Economiche e Commerciali*, December, 39(12), 993-1013.

Yusoff, M. (1988). Money, Prices, and Balance of Payments in Malaysia. *Indian Economic Journal*, July/September, 36(1), 33-47.

Zecher, R. (1974). Monetary Equilibrium and International Reserve Flows in Australia. *Journal of Finance*, December, 1523-1530. Reprinted in Frenkel, J.A. & H.G. Johnson eds.

(1976). *The Monetary Approach to the Balance of Payments.* London: George Allen and Unwin; Toronto: University of Toronto Press.

APPENDIX 1

This is a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation."

Aghevli and Khan (1977), Akhtar (1986), Akhtar, Putnam, and Wilford (1979), Arize, Grivoyannis, Kallianiotis, and Melindretos (2000), Asheghian (1985), Bean (1976), Beladi, Biswas, and Tribedy (1986), Bhatia (1982), Bilquees (1989), Blejer (1979), Bourne (1989), Boyer (1979), Brissimis and Leventakis (1984), Burdekin and Burkett (1990), Burkett, Ramirez, and Wohar (1987), Burkett and Richards (1993), Civcir and Parikh (1992), Cobham (1983), Connolly (1985), Connolly and Da Silveira (1979), Connolly and Taylor (1976, 1979), Coppin (1994), Costa Fernandes (1990), Courchene and Singh (1976), Cox (1978), Cox and Wilford (1976), Farhadian and Dunn, Jr. (1986), Feige and Johannes (1981), Fontana (1998), Frenkel, Gylfason, and Helliwell (1980), Genberg (1976), Girton and Roper (1977), Grubel and Ryan (1979), Guitian (1976), Gupta (1984), Hacche and Townend (1981), Hodgson and Schneck (1981), Ibrahim and Williams (1978), Jager (1978), Jayaraman (1993), Jimoh (1990), Johannes (1981), Joyce and Kamas (1985), Kamas (1986), Kemp and Wilford (1979), Kenneally and Finn (1985), Kenneally and Nhan (1986), Khan (1973, 1990), Killick and Mwega (1993), Kim (1985), Laney (1979), Lee and Wohar (1991), Leiderman (1980), Leon (1988), Looney (1991), Luan and Miller (1979), Mah (1991), McCloskey and Zecher (1976), McNown and Wallace (1977), Miller (1978), Modeste (1981), Pentecost, Van Mooydonk, and Van Poeck (2001), Phaup and Kusinitz (1977), Putnam and Wilford (1986), Rasulo and Wilford (1980), Roper and Turnovsky (1980), Sargen (1975, 1977), Sheehey (1980), Sohrab-Uddin (1985), Sommariva and Tullio (1988), Spanos and Taylor (1984), Taylor, M.P. (1987a, 1987b), Thornton (1995), Tullio (1979, 1981), Watson (1988, 1990), Weymark (1995), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), Wohar and Burkett (1989), Wohar and Lee (1992), and Zecher (1974).

APPENDIX 2

This is a comprehensive list of references which have estimated the "capital flow equation."

Argy and Kouri (1974), Artus (1976), Brunner (1973), Darby (1980), De Grauwe (1975), Fratiani (1976), Herring and Marston (1977), Hodjera (1976), Kouri (1975), Kouri and Porter (1972, 1974), Kulkarni (1985), Laskar (1981, 1982), Luan and Miller (1979), Murray (1978), Neuman (1978), Obstfeld (1980, 1982), Porter (1972, 1974), and Stockman (1979).

APPENDIX 3

This is a comprehensive list of references which have estimated a short-run model in the tradition of the monetary approach to balance of payments.

Agenor (1990), Aghevli (1975, 1977), Aghevli and Khan (1980), Aghelvi and Sassanpour (1982), Akhtar (1986), Ardito Barletta, Blejer, and Landau (1983), Argy (1969), Baker and Falero (1971), Bergstrom and Wymer (1976), Blejer (1977, 1983), Blejer and Fernandez (1975, 1978, 1980), Blejer, Khan, and Masson (1995), Blejer and Leiderman (1981), Bonitsis and Malindretos (2000), Borts and Hanson (1977), Brissimis and Leventakis (1984), Cheng and Sargen (1975), De Silva (1977), Dornbusch (1973a), Fleming and Boissonneault (1961), Franco (1979), Guitian (1973), Horne (1979, 1981), International Monetary Fund (1977, 1987, 1996), Jonson (1976), Jonson and Kierzkowski (1975), Kanesathasan (1961), Khan (1974, 1976, 1977), Khan and Knight (1981), Kieran (1970), Knight and Mathieson (1979, 1983), Knight and Wymer (1976, 1978), Knoester and Van Sinderen (1985), Lachman (1975), Laidler (1975), Laidler, Bentley, Johnson, and Johnson (1981), Laidler and O'Shea (1980), Leon and Molana (1987), Leventakis (1984), Levy (1981), Miller (1980), Miller and Askin (1976), Mussa (1974), Myhrman (1976), Otani and Park (1976), Parikh (1993), Parkin (1974a, 1974b), Polak (1957, 1998), Polak and Argy (1971), Polak and Boissonneault (1960), Prais (1961), Rhomberg (1977), Rodriguez (1976), Sassanpour and Sheen (1984), Schotta (1966), Spinelli (1983), Taylor, L. (1972), Taylor, M.P. (1986), Teal and Giwa (1985), Vaez-Zadeh (1989), Wallich (1950), Wilford (1977), and Yusoff (1988).