Seminar Paper No. 38

BALANCE OF PAYMENTS ADJUSTMENT
AND PORTFOLIO THEORY: A SURVEY

by

Johan Myhrman

INSTITUTE FOR INTERNATIONAL ECONOMIC STUDIES

University of Stockholm
Seminar Paper No. 38

BALANCE OF PAYMENTS ADJUSTMENT
AND PORTFOLIO THEORY: A SURVEY

by

Johan Myhrman


Seminar Papers are preliminary material circulated to stimulate discussion and critical comment. References in publications to Seminar Papers should be cleared with the author to protect the tentative character of these papers.

May 1974

Institute for International Economic Studies
P.O. Box
S-104 05 Stockholm 50
Sweden
I. Introduction

This paper covers a broad field with many threads going far back in history. It is surprising how much understanding there was of the international payments system and its functions by authors such as Hume, Ricardo, Thornton and John Stuart Mill. It is even more amazing, though, how so many of these earlier insights could be forgotten for such a long time. It was not until what I have called the Mundell-Johnson epoch in the 1960s that an understanding of the international monetary system was once again reached.1 What remained to be done then and what is being done now is to build models that account for many assets in an increasingly, but perhaps not yet completely, integrated international credit and goods market. The important and difficult future task of designing short-run adjustment models is left to the next generation.

My aim has been to follow the broad lines in the development up to the late 1960s and to report on the results shown by them. Following this there is a more detailed study of most of the contributions in recent years. In these later studies I have tried to give a glimpse of the typical features of the model construction and the main conclusions. It has been my ambition to simplify and to bring forth the important aspects of these models. For this reason I have written a special section to compare many of the

1) This is to some extent an overstatement. In The Netherlands there existed a "modified" quantity theory approach to macroeconomic equilibrium even during the heyday of Keynesian economics. In this approach the monetary aspects of balance-of-payments problems were often recognized, or at least were implicit in many writings. Due to their publication in Dutch, most of these writings never reached out to the Anglo-Saxon scientific world. Now there are two summaries of the Dutch literature available in English [26], [27]. However, the Dutch tradition seems to have influenced work in this field outside The Netherlands through another channel, namely the early work carried out by The International Monetary Fund under J.J. Polak. (See [57], [59]).
models and to show their similarities and differences. It has not been possible to consider the problems of growth and devaluation and their effects on the balance of payments.

II. Theoretical Background

In the 19th century classical and neoclassical theory dominated most parts of economic theory, and perhaps the strongest influence was in the theory of the balance of payments. For more than a hundred years it was thought that the monetary system operated in such a way that a country's balance of payments always automatically tended to adjust to an equilibrium situation. One way in which an adjustment can take place is through a change in the exchange rate. During this period most countries had adopted the gold standard with fixed exchange rates. The process of adjustment under this system is described in the following way by John Stuart Mill:

"When, therefore, the state of prices is such that the equation of international demand cannot establish itself, the country requiring more imports than can be paid for by her exports, it is a sign that the country has more of the precious metals or their substitutes, in circulation, than can permanently circulate, and must necessarily part with some of them before the balance can be restored. Her currency is accordingly contracted: prices fall, and among the rest, the prices of exportable articles; for which, accordingly, there arises, in foreign countries, a greater demand: while imported commodities have possibly risen in price, from the influx of money into foreign countries, and at all events have not participated in the general fall. But until the increased cheapness of English goods induces foreign countries to take a greater pecuniary value, or until the increased dearness (positive or comparative) of foreign goods makes England take less pecuniary value, the exports of England will be no nearer to paying for her imports than before, and the stream of the precious metals which had begun to flow out of England, will still flow on. This efflux will continue, until the fall of prices in England brings within reach of the foreign market some commodity which England did not previously send thither; or until the reduced price of the things which she did send has forced a demand abroad for a sufficient quantity to pay for the imports, aided, perhaps, by a reduction of the English demand for foreign goods, from their enhanced price, either positive or comparative."
Now this is the very process which took place on our original supposition of barter. Not only, therefore, does the trade between nations tend to the same equilibrium between exports and imports, whether money is employed or not, but the means by which this equilibrium is established are essentially the same. \(^2\)

We note here the following characteristics: the identification of price level and terms of trade change, emphasis on the fact that money does not change a barter economy, the essentially monetary character of the disturbance, and of the adjustment process and the automatic adjustment to equilibrium. "The trade is in a state like that which is called in mechanics a condition of stable equilibrium." \(^3\) We also note that there is no mention of what happens to output and employment. This can be interpreted as an implicit assumption about very flexible prices and wages, which is probably the most common interpretation. However, it is also possible to think of the description as a statement of more long-run comparative static equilibrium conditions. In this case, the interpretation is that even if the prices are not very flexible in the immediate short run, money supply and prices must change if a stable equilibrium is going to be reached in the longer run.

The automaticity was reached in two ways: the first being the reserve or gold outflow and the second the tying of the domestic money supply to the gold reserves.

Many empirical studies in the interwar period revealed the fact that there were surprisingly few gold movements under the gold standard regime. This led many economists to doubt the classical theory and even a specialist like F.W. Taussig was very disturbed by findings of this kind, according to Metzler \(^4\). It is rather surprising that they seem to have missed one part of the functioning of the gold standard - the exchange rates, which were not completely fixed, could move between the gold points. This meant that if the imbalance was expected to be rather temporary or if it

---

\(^2\) M11 \(^{[46]}\), chapter XXI, pp. 415-416.

\(^3\) Page 415.
was of a seasonal character, short-term credits and stabilizing speculation held back the increase in the foreign exchange rate and prevented gold movements. This is recognized by Mill:

"Disturbances, therefore, of the equilibrium of imports and exports, and consequent disturbances of the exchange, may be considered as of two classes: the one causal or accidental, which if not on too large a scale, correct themselves through the premium on bills, without any transmission of the precious metals..."

This reason for the lack of gold movements may be of small importance compared to another explanation, the income-employment mechanism. Just as the Keynesian revolution completely changed the monetary and macro theories of the closed economy and disregarded price adjustment to a large extent, it also introduced a fundamentally different view of the balance-of-payments adjustment problem. This view was not developed by Keynes himself but by Roy Harrod [21] and Joan Robinson [60]. This new theory was essentially the export multiplier case of modern textbooks. An increase in the exports from country A leads to a multiplier increase in national income in A and thereby to increased total demand and employment and to an induced increase in imports. The latter balances the export increase and tends to even out the export surplus.

The main adjustment mechanisms in the classical system, the monetary changes and the price level changes, have been discarded and the balance-of-payments adjustment problem is reduced to the achievement of equilibrium in the balance of trade in an economy with fixed wages and prices. This model has held a great popularity for a very long time with the policy-makers and planners as evidenced by e.g. the "full employment b.o.p. deficit"-concept. Parallel to this and even overshadowing it is the popular use of different elasticities in discussing the effects of devaluation. This approach was most popular in the 1940s, but it continued to be used for a

4) Mill [46], chapter XX, p. 414.
long time before it became clear to most economists that too much of it was in partial equilibrium terms. Even more serious is that the elasticity model is a real model, which fails to account for the existence of money and credit and the capital balance, and consequently fails to face the problem of balance-of-payments adjustment as distinguished from balance-of-trade adjustments.

Meade [42] was the first to really try to work out some kind of integration of general equilibrium theory and the neo-Keynesian approach. A very complicated exposition reduced the number of readers and, as it appeared at a time when monetary theory was just going to take a step forward, reduced the direct impact of Meade's theories. Perhaps an important influence of this work is through its indirect effect via Robert Mundell. It must also be remembered that Meade was the first one to construct a formal macromodel for an open economy, a very important step in the development in this field of economics, [43].

Another contribution in the early 1950's linked the concept of absorption to the formulation of macroeconomic problems in open economies. Sidney Alexander [2] analyzed the problem of the effects of devaluation on the trade balance by concentrating on the effects on real expenditures and real income. He defined an aggregate market for commodities as

\[(1) \quad Y = C + I + X \]

and

\[(2) \quad C + I = A \]

and

\[(3) \quad X = Y - A \]

5) See also Harberger, Laursen and Metzler [20, 37].

6) Meade's assumption of pegging the interest rate as a "neutral monetary policy" made his work less attractive.
where

\[ Y = \text{real income} \quad X = \text{trade balance or net exports} \]
\[ C = \text{consumption} \]
\[ I = \text{investment} \]
\[ A = \text{absorption} \]

By formulating the problem in this way he clearly saw that a devaluation has a positive effect only if it increases income more than absorption.

However, Alexander's article is also the first formulation of the commodity market equation in aggregate form in the way that it has been used in many models since then. Alexander was aware of the oversimplification of his model, and in verbal comments he discussed some extensions.

It may be correct to say that Alexander saw the aggregate macro-aspects of the problem, but it was still the simplest type of income-expenditure model, with concentration on the trade balance. It was left to someone well versed in monetary theory to take the next step: it was time for a Harry G. Johnson. In an important article from 1958 [28] Johnson sets out to "synthesize and generalize". However, the article is much more than this. Its highest value probably lies in the clear recognition that the balance-of-payments problem is fundamentally a monetary problem, which had been neglected by most economists for more than twenty years. This insight anticipates the work of the next decade by himself and Robert Mundell.

"... the formulation of the balance of payments as the difference between aggregate receipts and payments, rather than receipts and payments on international account only, has two major advantages. It brings out the essentially monetary nature of a deficit, which must be accompanied by dishoarding of domestic money or credit creation; and it relates the deficit to the operation of the economy as a whole."

7) Johnson [28].
III. The Mundell-Johnson Epoch

During the classical period, writings by Ricardo, Thornton and Mill revealed a remarkable insight into the workings of the international payments system and the problem of internal and external balance in a world economy. The main defect with the classical and the neoclassical analysis was a tendency to concentrate on the equilibrium solutions and to neglect what happened during the adjustment process. This could be one of the reasons that led some central banks to adopt a very crude form of policy. In the second half of the 19th century the Swedish central bank, for instance, had no reserves to mention and no discount rate mechanism. Therefore, when there was a gold outflow the central bank cut down on all its outstanding loans, causing a very abrupt and disastrous deflation.

The interwar period was characterized by a great bewilderment in international monetary relations with floating exchange rates, fixed exchange rates, competing devaluations and exchange controls. At the same time the Keynesian revolution took place and, as often is the case, led to an overreaction among the converted in relegating classical economics into doctrinal history. Unfortunately, Keynes presented his new ideas for a closed economy at this time. Perhaps even more disastrous for the field of international macroeconomics was the strong impact that Keynesian ideas in the Hicks-Hansen formulation had in the U.S. For several reasons, research in economics came to be completely dominated by the work in the U.S. Because the U.S. economy to a large extent approximates a closed economy it was natural that the work on macroeconomic problem was concentrated on closed economy models.

This development meant that the insights and understanding of the classical economists was more or less forgotten for about three decades and had to be rediscovered. The rediscovery was made by Rübert Mundell and Harry Johnson, who in a series of articles in the 1960s [47, 30] worked out most of the implications for macroeconomics of being open economies. The brilliant presentation and the elegant simplification of Mundell's early articles and Harry Johnson's penetrating and illuminating expositions contributed to
a great advance in this field. A close reading of the articles today gives the impression of an extraordinary knowledge of the working of the international payments system, especially seen as a system or a world economy, even if the models that were used could not handle some aspects of the problems.

The model that is used by Mundell and Harry Johnson is usually some variant of the ordinary IS-LM model but extended to an open economy. One of the important achievements is just this extension in a consistent way to an open economy. It must be emphasized at once, however, that much important knowledge is spread out in their work in the form of comments on the models or as exceptions and is not embedded in the formal model structure.

This is the first time that an aggregate model for an open economy with more than one asset is constructed and its working carefully studied. Because there are two assets in the model that are substitutes we may also say that it is the first portfolio-approach to the problem of macroeconomic equilibrium in open economies. (In a way this is not quite true since much of this is already incorporated in Meade [42, 43], but for some reasons it seems as if its importance and its implications were not recognized until Mundell saw them.)

It took much of the 1960s to work out all the implications of this basic model and of different model specifications. The importance of really trying alternative specifications and investigating their effects on the results is often belittled as "technicalities". However, even small changes in the specification can result in important changes in the conclusions, as the treatment of capital mobility shows.

8) However, see also early attempts by Fleming [10] and Vanek [71], chapter 8.

9) One problem at the time when Meade wrote was that the gold standard was very unpopular and that many of his significant ideas were in that section. In his main model he treats reserve flows as flows, not as stock adjustments, and this is one of the crucial new points in e.g. Johnson [28].
The basic model consists of the following equations

\[ (4) \quad Y = C(Y) + I(i) + X(Y,r) \]

\[ (5) \quad \bar{M} = L(i,Y) \]

\[ (6) \quad B = X(Y,r) + K(i,r) \]

where the new notations stand for

\[ i = \text{interest rate} \]
\[ r = \text{exchange rate} \]
\[ \bar{M} = \text{the supply of money} \]
\[ L = \text{the demand for money} \]
\[ B = \text{the balance of payments} \]
\[ K = \text{net capital inflow} \]

This is essentially the IS-LM model of the closed economy with unemployment and constant wages and prices extended to the open economy in the simplest way. Equation (4) gives the equilibrium condition for the output market, equation (5) for the money market and equation (6) is the balance of payments equation, which in a system of flexible exchange rates is the equilibrium condition for the market for foreign exchange. The country is assumed to be very small so that it cannot affect prices and incomes in the rest of the world.

The three equations are the core of this model-type and they can be solved for the equilibrium values of \( Y \), \( i \) and \( r \) or \( B \). By changing the specification of the model it is possible to handle many cases. As it now stands, it represents the extreme Keynesian case with fixed wages and fixed prices. With both prices and wages flexible, it is a classical model and with wages fixed and prices flexible, it is an intermediate case. It is also possible to work with different degrees of capital mobility, with or without sterilization policies, and so on. In a very clear
and useful article Takayama [68] has assembled all these cases.

For the case of flexible exchange rates and the Keynesian assumption, both fiscal policy and monetary policy have positive effects on the level of real income and on employment. If we assume perfect capital mobility, the effect of fiscal policy becomes zero. This is due to the fact that when the interest rate is fixed and the money supply is constant, there is only one income level that can make the demand for money equal to the supply. An increase in government expenditure, therefore, cannot change this "equilibrium" income, but only lead to increased imports and an equal capital outflow.

In the classical case, both fiscal and monetary policy have positive effects on the price level. With perfect capital mobility fiscal policy has no effect and an increase in the money supply leads to a proportional increase in the price level.

Under fixed exchange rates, the balance of payments will not necessarily be balanced. In the Keynesian version of the model, both fiscal and monetary policy have positive effects on the level of income. If there is perfect capital mobility, then monetary policy has no effect on real income, because any change in the interest rate leads immediately to a capital inflow or outflow, adjusting the money supply in the hands of the public to its original level. If, on the other hand, there is complete sterilization by the central bank then the degree of capital mobility does not matter. The analogous conclusions will hold in the classical case. It should be noted that the stability conditions are important for some of these conclusions.

The general conclusion for this type of model is that the more mobile financial capital is, the less effective is fiscal policy under flexible exchange rates. In the limiting case of perfect

10) See also Takayama [69].
capital mobility, fiscal policy has no effect under flexible exchange rates and monetary policy has no effect under fixed exchange rates in the absence of sterilization policy. This is also the conclusion reached by Mundell in his original article of 1963 [47], where he also points out that in that case sterilization is not possible.

The articles by Fleming [10] and Mundell [47] in the early 1960s brought out the importance of the degree of capital mobility and it also led Mundell to formulate his "Principle of Effective Market Classification" and the Assignment Problem that are built on the idea of the differential impact of the two instruments. 11

The results that have been described here have by now been reconfirmed by many authors. (See e.g. Krueger [36], von Neumann-Whitman [51], Helliwell [22], Fratianni [16] and Sohmen [63].) These results can be said to be standard for this type of short-run aggregate macromodel. However, one more generalization has been made. In the second edition of Sohmen's book [63] and in two articles by Swoboda [65, 66] it has been shown that monetary policy has no effect under fixed exchange rates on real income or the interest rate independent of the degree of capital mobility.

11) This problem will not be discussed any more in this paper, since it is a little outside the main line of interest. See Swoboda [68] and Nyberg-Viotti [52].
This striking result is reached by imposing the equilibrium condition that the rate of change of foreign exchange reserves has to be zero. In that case, this type of model is forced to an equilibrium with unchanged interest rate and real income. (See also below.)

Until now the analysis has been undertaken for a single "small" country and the assumption has been that its activities cannot influence prices, interest rates and real income in the rest of the world. Mundell [47] was the first to consider a model with two countries, or one country and the rest of the world. The result of this extension under the assumption of perfect capital mobility was that most of the earlier conclusions were still valid. The main differences were that an increase in government expenditures in one country raised its real income but could either raise or lower the real income of the other country under fixed exchange rates, whereas monetary policy raised income in both countries. Under flexible exchange rates fiscal policy has positive effects in both countries, whereas monetary expansion increases income at home and lowers it abroad. These results seem contrary to the widespread conception that flexible exchange rates make economic policy in two countries independent of each other. As Mundell points out, this result holds only when there is no capital mobility. When such mobility is present we revert to interdependence.

This type of model but with full employment was earlier treated by Metzler [45], but he never analyzed economic policy. Metzler's model has later been formalized in two articles by Holmes [23,24].

This work was continued under any degree of capital mobility by Swoboda and Dornbusch [67] who find, like Mundell, that the effectiveness of monetary policy varies inversely with the size of the country.

12) See also Roper [61].
"Furthermore, if one country, say, the United States, is very large relative to any single foreign country, and if foreign countries do not act in concert, its economic policy will largely determine income and interest-rate trends in the rest of the world (this is of course one feature of the so-called dollar standard). Again, this conclusion holds irrespective of the degree of capital mobility although the latter plays a role in determining the speed with which developments in the dominant country are transmitted to the rest of the world. Second, the model emphasises the importance of monetary factors in determining the impact of transfers and expenditure-switching policies on the level of world income and its distribution among countries. Finally, the concept of a 'natural distribution of specie' retains its importance even in a world of underemployment. This distribution does depend in general, it is true, on autonomous expenditure levels; however, the smaller the interest sensitivity of the demand for money the less the influence of exogenous changes in spending.

The main point is simply that 'Hume's Law' with its monetary mechanism of payments adjustment holds in the face of unemployment and wage rigidities."

This quotation brings out some of the characteristics of the development described in this section. It was mentioned above that the monetary aspects of the balance-of-payments adjustment, after having been totally neglected, were brought into focus again by Harry Johnson in his 1958 article [28]. During the following period the implications of introducing money in a small aggregate model for open economies was worked out by many scholars, but in particular by Mundell. The multiplier and elasticity models were found to be unsatisfactory. The basic structure of the models used was essentially the IS-LM model extended to an open economy.

Parallel to this model-technical development and partly also as a result of it, there was a growing interest in and understanding of the world economy as a system. Mundell and Johnson at an early stage came to the conclusion that most of the balance-of-payments disturbances were monetary disturbances, that the mechanism of adjustment is a monetary mechanism and that a successful working of the system as a whole required an understanding of the necessary "rules of the game" by the central banks (and the economists!). This has later been formulated in a "Monetary Theory of the Balance of Payments" [30].
IV. Portfolio Balance Proper and Balance-of-Payments Adjustment

In the previous section it was described how money and securities were introduced into aggregate models for open economies in the beginning of the 1960s. Thereby portfolio decisions were also introduced in the form of a choice between money and bonds. Several years of work with this "Keynesian" model led to a growing dissatisfaction with many of its characteristics. Some of the defects could be removed by a respecification. One example is the change from using the interest rate as the monetary policy instrument to using the money supply and finally to using only the domestic component of the monetary base as the proper instrument of monetary control.

There is, however, a much more fundamental deficiency in this model. For the closed economy the IS-LM model can be regarded as including a short-run portfolio equilibrium. For the given stocks of money and government bonds the public can be regarded as adjusting until the interest rate and the real income have reached a level where the given stocks of money and bonds are willingly held. (As Mundell has pointed out [47] there is a logical fallacy involved here since real capital is assumed to be a perfect substitute for bonds, but real capital is growing with the rate of investment and therefore there cannot be any full portfolio equilibrium.) Extended to the open economy, this is the way in which the model was first interpreted. However, it was later recognized that the conditions for portfolio equilibrium were not fulfilled, because in the open economy the money stock is not constant, except under flexible exchange rates, and the stock of bonds is not constant unless there is no capital mobility whatsoever.

A full equilibrium (or portfolio equilibrium or stock-flow equilibrium, or whatever we choose to call it) requires a) that all stocks are willingly held at the prevailing prices and incomes and b) that at these prices and incomes all stocks are constant. The first person to recognize and discuss some aspects of this problem seems to have been Harry Johnson [28], but there was not any attempt to incorporate these ideas explicitly in the formal model structure until McKinnon and Gates [40] did so. Let us
illustrate the differences in the simplest possible way and start
with a model of the type that is behind Mundell's article from
1963 [47], where he assumes perfect capital mobility. We will
apply this to a small country. We then have

(7) \( E(Y, i_o) + X(Y, r_o) - Y = 0 \)

(8) \( \bar{D} + R - L(i_o, Y) = 0 \)

where the supply of money has been divided into two components, \( \bar{D} \),
the exogenous part, which is under the control of the central bank,
and \( R \), foreign exchange reserves that are endogenous. To this a
definition of the balance of payments can be added, but this is of
little importance as long as there is no restriction on the values
it can take. There are two equations describing equilibrium in
three markets: the output market, the money market and the bond
market. However, the two markets in (7) and (8) do not form a
simultaneous system of equations. Instead, equation (7) forms a
subsystem in which income, \( Y \), is determined. Then, given \( Y \) and \( i_o \),
the demand for money is determined and this in turn determines the
amount of reserves for given \( \bar{D} \).\(^\text{13}\)

Assume now that there is less than perfect capital mobility. Then
equations (7) and (8) simultaneously determine \( i \) and \( Y \) and there
is equilibrium in this model. We call this a flow equilibrium.
If the balance of payments is not zero, however, there will be an
inflow of reserves and the money supply will change. There will
be no stock equilibrium. This problem was recognized by many
authors and it led them to assume it away, or to presume that the
monetary authorities pursued a sterilization policy (see e.g. [51]

\(^\text{13}\) This illustrates Mundell's conclusion that monetary policy
has no effect on income in this case. A change in \( \bar{D} \), with \( Y \) and
\( i_o \) given, only changes \( R \).
A more satisfactory solution has been presented by Swoboda, who introduced the extra equilibrium condition that the balance of payments has to be zero for a full equilibrium. This extra condition is a stock equilibrium condition. This gives

\[(9) \quad E(Y,i) + X(Y, r_o) - Y = 0\]

\[(10) \quad D + R - L(i,Y) = 0\]

\[(11) \quad B = X(Y,r_o) + K(i,r_o) = 0\]

The system of equations is said to give full equilibrium; monetary policy has no effect on real income and interest rates even without perfect capital mobility. What Swoboda has done is to change the balance-of-payments definition to an equilibrium condition (for the market for foreign exchange). Since an open market purchase tends to lower the interest rate and to increase income, and since both of these work in the same direction on the balance of payments by leading to reserve losses, it follows that monetary policy has no effect except to change the amount of reserves.

Swoboda's formulation takes care of stock equilibrium in the money market. From equation (11) it is seen that a capital movement, \(K(i)\), different from zero means that bonds are going in or out of the economy, which implies that there is not stock equilibrium in the bond market.

As mentioned earlier, McKinnon and Oates [40] explicitly tried to formulate a model with portfolio equilibrium. They considered the case of a model with perfect capital mobility. The model then is

\[(12) \quad E(Y,W,i_o) + X(Y,i_o) - Y = 0\]

\[(13) \quad X(Y,i_o) = 0\]

\[(14) \quad L(Y,W,i_o) - W = 0\]

where \(W\) is the sum of money and bonds in the economy. One equa-
tion is dependent on the others and can be eliminated, thereby leaving two equations to determine \( Y \) and \( W \). Equation (13) gives the essential difference from Mundell's model. It is now an equilibrium condition that the balance of trade is zero. In this way a portfolio equilibrium is assured in the sense that the net stocks of money and bonds in the private sector of the economy are not changing.

Mundell's conclusions still hold, but this not so surprising because of the assumption of perfect capital mobility. McKinnon has extended the model to incorporate less than perfect capital mobility as well as to have real capital as a separate asset [41]. The conclusions of these two studies can be summarized by the following quotation:

"Therefore, one can conclude that the effectiveness of inside monetary policy in controlling exchange reserves (which may vary in response to exogenous shocks) is lessened by an increase in external capital immobility. However, the effectiveness of outside monetary policy in influencing exchange reserves is, surprisingly, independent of the degree of external capital mobility."\(^{14}\)

These conclusions must, however, be regarded with some scepticism, since they are drawn from a very particular model specification. The output market is eliminated by Walras' Law; the market for real capital is recursive\(^{15}\) to the rest of the model and therefore also eliminated. \(^{16}\) The three remaining equations are used to solve for \( Y \), \( i \), and \( M \). But exports are constant and imports are only a constant proportion of real income. Real income can therefore, by definition, never be changed by any policy measure under fixed exchange rates. Finally, McKinnon distinguishes between an inside monetary policy and an outside monetary policy, but when he draws

---

14) Inside monetary policy is defined as an open market operation and outside monetary policy as a change in the stock of money without any change in the stock of bonds.

15) It is recursive in the sense that real capital has no separate price in this model. Therefore, once \( Y \) and \( i \) are determined in the simultaneous part of the system they can be put into the capital equation and the quantity of capital is determined. McKinnon therefore works with a subset of three equations out of the five he started with.

16) This, however, is not correct either since real capital depends on the interest rate and output demand depends on real capital.
his conclusions about the effects of these two policies he refers to a model without government. It is not possible, however, to change the money supply unless government expenditures are increased at the same time, when open market operations are ruled out.

Although Meade, Johnson, and Mundell were all aware of the stock-flow problems and commented upon them, Ott and Ott [54, 55] and McKinnon and Oates [40, 41, 53] were the first to try to introduce portfolio equilibrium explicitly into their models. They chose to use a stock equilibrium constraint to describe and analyze the full, stationary equilibrium rather than to consider any dynamic aspects.

Later another approach to the problem of portfolio equilibrium in an open economy was developed by Branson [4], Willet [73] and Willet and Forte [74]. It was built on Tobin's theory of portfolio choice and it analyzed capital movements as either a stock adjustment, which was a once-and-for-all change, or as a result of different growth rates of the whole portfolio, in which case it could be continuous. This approach to capital movements has since been used extensively to study short-term capital movements but it has always been a partial equilibrium analysis since the rest of the economy is not dealt with.

In a series of articles John Floyd [11,12,13,14] tackled the problem of incorporating these new ideas about capital movements and portfolio equilibrium into an aggregate macro model. His model seemed to be different from Mundell's, and our task is therefore to try to explain what this difference is.

Floyd uses Canada as an example of a small country faced with perfect capital mobility. Instead of bonds he uses claims to real capital as the internationally traded asset. The value of these claims is a function of current output

\[
P_k \cdot \delta = \frac{f(Y)}{i}
\]
where \( p_k \) is the price of capital assets. Only a fraction, \( q \), is held by Canadians. They hold no foreign securities. The demand for money is then written as

\[(16) \quad M^d = f(i_o, Q, K) \]

or

\[(17) \quad M^d = g(i_o, Q, Y) \]

The whole model is then in our notations

\[(18) \quad E(Y, i_o) + X(Y, r) - Y = 0 \]

\[(19) \quad M - L(i_o, Q, Y) = 0 \]

\[(20) \quad B = X(Y, r) + (1-q)I - p_k q^* \]

I is real investment. The differences from Mundell are obvious. First, the money supply is treated as a policy parameter. Secondly, the capital account in the balance of payments consists of an in-flow due to foreign purchase of new Canadian real capital and an outflow because of an increased demand for capital assets in Canada. Both \( I \) and \( Q \) are changes in stocks and in a stationary equilibrium they have to be zero. If we then also take away the sterilization assumption, we have the same model as McKinnon and Oates with the exception of the \( Q \) in the demand for money function and equities instead of bonds.

In Floyd’s model the results show that monetary policy has no effect on income in the long run under fixed exchange rates but that fiscal policy is effective. Under flexible exchange rates, both monetary and fiscal policy have positive effects on real income, and fiscal policy has larger effects than under fixed exchange rates. This difference depends in a crucial way on the fact that Mundell has a fixed-price bond with given interest rate while Floyd has an asset with a fixed interest rate but a variable price. In Floyd’s model an increase in government expenditures will increase real
income. In Mundell's model this was not possible because with a given money supply and a constant interest rate, there would not be equilibrium in the money market with a higher income. Now, in Floyd's model, when real income increases, the value of real capital assets goes up and foreigners demand more of these assets. This means that \(Q\), the domestic holdings of real capital assets, goes down, which reduces the demand for money and counterweights the effect of an increase in real income.

Another attempt to introduce both stock and flow considerations in a macro model for a small open economy is made by Neil Wallace [72] at about the same time as Floyd. Wallace uses the ordinary IS-LM model and adds a balance-of-payments equation, but, just as Floyd, he does not allow changes in the balance of payments to affect the rest of the economy. However, one of the virtues of this study is the elegant and simple derivation of the balance-of-payments equation. In this way it supplements and extends Floyd's articles because it also considers the effects of interest rate changes. A model of essentially the same type is also presented by Levin [38].

V. Portfolio Balance: Short Run

All attempts to approach the portfolio analysis that have been mentioned in the previous section have still centered around what is basically the well-known IS-LM model in one form or another. Swoboda, McKinnon and Oates imposed a stock equilibrium condition and Floyd and Wallace developed better formulations of the capital account in the balance of payments.

By this time, however, there was a widespread dissatisfaction with this model. Some of the most unsatisfactory characteristics of the model follow:

---

17) There is also an interesting discussion of the effects of introducing speculation and forward markets in a model of this type.
1) In its usual form, the model is essentially short run and is not appropriate for analysis of long-run problems (or better: for stock-flow problems). There are two reasons for this: first, positive savings and investment mean asset accumulation which is inconsistent with stock equilibrium. Secondly, the assumption of fixed wages and/or prices over a period where complete asset adjustment takes place does not seem to be in accordance with either theory or postwar experience.

2) Wealth is disregarded in the model but has been more and more recognized as an important element in the formation of economic models.

3) The government budget constraint is not explicitly included in the model. This has serious drawbacks for the analysis of economic policy and for the stock-flow adjustment.

4) Interest earnings on government and foreign securities are neglected. This is the reason for some strange results mentioned in the literature.

In the previous section some early attempts to avoid or to handle these shortcomings were described. In the subsequent work in this field the aim has been to solve or avoid these problems. We are going to divide this work into two categories, short-run portfolio equilibrium and long-run portfolio equilibrium.

The short-run portfolio equilibrium is characterized by the "normal" assumptions of "ordinary" portfolio analysis, namely that all real variables and the size of the portfolio are held constant. An interesting example of this approach has been developed by Kouri and Porter [33, 34]. Their model postulates the demand for money, domestic bonds and foreign bonds as functions of income, wealth, interest rates and risk factors. Further, it contains a money supply consisting of a foreign component and a domestic component, an exogenous current account balance, a capital account and stock equilibrium conditions for money and bonds. Foreign interest rates and income are held constant. Differentiating the model makes it
possible to solve for the domestic interest rate and the foreign reserve changes as a function of the exogenous variables. In this way pure monetary policy comes directly into the estimated equation and its effect on the balance of payments can be observed, as well as the extent of offsetting capital flows.

Karl Brunner has also used a model of this type. In a recent study [6], he extends to the open economy the elaborate and well-known model of the money supply process that he and Allan Metzler have constructed. His main conclusions are that monetary policy is not without effect in the short run, even with perfect capital mobility, and that the policy complaint in small economies about imported inflation is justified, while the assertion that monetary policy is ineffective because of 'offsetting capital flows' is simply incorrect.

In a very recent paper Dornbusch [7] reaches a similar conclusion. In both cases this is a portfolio model with wealth, income and prices constant and with both an internationally traded asset and a non-traded asset. In Dornbusch's paper the central bank makes open market operations in the non-traded asset, while an open market operation in Brunner's model is performed in bonds, the traded asset. However, this does not seem to affect the qualitative conclusions.

Girton and Henderson [18] have extended this type of portfolio model to the two-country, world economy case. Their main conclusion is that there is an automatic mechanism to balance-of-payments adjustment either through money adjustment or through securities adjustment or a combination of the two. They also find that if the small country assumption is abandoned, changes in international reserves and in interest rates are jointly determined.

---

18) An earlier use of this model for an open economy is [75].
VI. The Monetary Approach to the Balance of Payments

The work by Johnson and Mundell has recently developed into the formulation of what is called the Monetary Approach to the Balance of Payments [30]. Before taking up the second part of the portfolio approach we will briefly describe its content. This theory is in a sense a modernized version of Hume. It has three basic features: first, it affirms the fundamental proposition that the Balance of Payments is an essentially monetary phenomenon. Without money, there would not even be a balance of payments. Second, the monetary approach concentrates on the demand for money function and the money supply process as the most important relationships. Third, it deals mainly with long-run aspects of policy consequences for the balance of payments. 19

As the theory is laid out by Harry Johnson [29, 30, 31] for a small country, the interest rate and the prices are given on the world markets. Then the demand for money is

$$ (21) \quad Md = p \cdot L(y, i) $$

The supply of money is

$$ (22) \quad Ms = R + D $$

and if supply and demand are equal

$$ (23) \quad R = Md - D $$

Now let \( \frac{dR}{dt} = \varepsilon_R \) and in the same way for the other variables. Then

$$ (24) \quad \varepsilon_R = \frac{1}{r} (\varepsilon_D + \eta_y \varepsilon_y + \eta_i \varepsilon_i) - \frac{1-r}{r} \varepsilon_D $$

where \( \eta_y \) and \( \eta_i \) are the income and interest rate elasticities of the demand for money.

The rate of change of prices and interest rates are assumed to be exogenous and if the rate of growth of real income is also given

19) See Also Mussa [49] for a good presentation of the basic features.
we have instead

\[ e_R = \frac{1-r}{r} e_D \]

This says that given the rate of growth of income, the balance of payments or the rate of change of reserves is determined by the rate of change of domestic credit creation.

Aside from other merits this presentation of the theory has the virtue of very clearly bringing out some important points. First, contrary to some widespread beliefs, a higher growth rate of domestic output improves the balance of payments. Second, it is normally said that for devaluation to improve the balance of payments in a situation of rather full employment will require the support of a demand-reducing policy. However, it is clear from equation (24) that with a reduced rate of growth of domestic credit creation the devaluation becomes unnecessary.

VII. Portfolio Balance: Long Run

The second approach to portfolio equilibrium is the long-run approach. It is inspired by McKinnon's early attempt to solve this problem [41] and works with a careful specification of the full, long-run stock-flow equilibrium and sometimes with the path to this equilibrium as well. These models are aggregate general equilibrium models.

Edward Tower [70] has published an article describing such a model, where he explicitly introduces stock equilibrium conditions. He finds that both fiscal and monetary policy have effects on real output under fixed exchange rates, but that monetary policy effects under flexible exchange rates are very uncertain, while fiscal policy is still effective. Reserve changes are not constrained to zero and monetary policy is defined as interest rate policy. Out-

---

20) Another important source of inspiration is Jones' [32] comment on McKinnon's article.
put is assumed to be perfectly elastic at prevailing wages and prices as in the usual Keynesian model.

This is also true in the model by William Branson [5], which is basically a Keynesian model but extended in an interesting way to include a flexible capital stock, dynamic adjustment and portfolio equilibrium. Branson begins with formulating what he calls an "instantaneous" equilibrium. This is a situation where the stocks of money, bonds and real capital are held constant. Equilibrium is reached when real income and the yields on bonds and capital have adjusted to the levels where flow equilibrium exists. Stock adjustment functions are then constructed that describe the desire to accumulate wealth in different forms. Finally, the model is solved for a complete stock-flow equilibrium.

It is perhaps worth pointing out the difference in method from the short-run approach. In that case, income, real capital and wealth are held constant and rates of return and the relative amounts of money and bonds adjust to an equilibrium situation. In this case, money, bonds and real capital are each held constant and rates of return and real income adjust to short-run equilibrium.

In both McKinnon's model [41] and in Tower's and Branson's, the capital stock is variable. Now, this implies that a reasonable amount of time has to pass. In a recent paper [50] Myhrman argues that it seems unnecessarily unrealistic to ignore the effects on the supply of output and on prices of variations in the capital stock. His model is a long-run stationary state model for a small, open economy. It has flexible prices and output supply varies with the capital stock. There are money, bonds and capital on the asset side and a government budget constraint and portfolio equilibrium conditions are included. The most important conclusion is that under fixed exchange rates monetary policy may or may not be effective depending on what is assumed about reality and the way this is reflected in the model specification. For example, if there is a government budget constraint, then monetary policy becomes more effective the less capital mobility there is. With perfect capital mobility monetary policy has no effect.
McKinnon and Branson modified the basic Keynesian model. Myhrman constructed a different model with flexible prices and wages and a variable supply of goods depending upon the real capital stock. Frenkel and Rodriguez [17] have extended this type of model in an elegant way and they are also able to analyze the adjustment path to the long-run stationary equilibrium. They also consider some monetary policy experiments. For instance, a once-and-for-all change in the money stock brought about by an unanticipated governmental transfer will have the impact effect of raising the value of assets which induces a rise in consumption and a deterioration in the trade balance. However, in the long run the initial equilibrium is restored and there are no effects of the increase in the money supply. If the change in the money stock is instead brought about by an open market operation, then the effects will depend upon whether or not the private sector capitalizes the flow of transfers, when the government is assumed to return the yield on its holdings of securities to the private sector in the form of transfer payments. If it is capitalized, then we get the case equivalent to the other experiment and there are no effects in the long-run equilibrium. On the other hand, if it is not capitalized, there will be a positive effect on e.g. consumption.

VIII. Two-Country, World Models

The models under this subtitle are models in which it is assumed that there are two countries, the home country and a foreign country representing the rest of the world. This was also the case earlier in this survey, but in that situation, the rest of the world was assumed to be exogenous to the home country, while it is now assumed that the two economies interact.

The two countries together constitute the whole world and are therefore a closed economy. When this world was on a gold standard (and disregarding changes in the foreign exchange rates between the gold points) it was like a closed economy in our textbooks, or like a common currency union with one central bank. There were different governments, but they can be compared to
the local government of the U.S. today. They had their own budgets, their own budget expenditures, the right to tax and the right to borrow by issuing securities. But they did not have the right to create money.

In this sense, then, in all important respects, the world is like a closed economy in the analysis of macroproblems, and the concept of 'the natural distribution of the species' is relevant. There are circumstances under which it is fruitful to split this world into two parts and to investigate the interaction between these two parts. We may distinguish three cases. First, there is the problem of the world being divided into separate countries, each with its own balance of payments to be concerned about. It may therefore be of some interest to study how equilibrium in the balance-of-payments is restored after some exogenous disturbance, although no one has yet been interested in how, for instance, California's balance of payments with the rest of the U.S. has returned to equilibrium after a change in the demand for money in California.

The second reason is that the countries in the world of today have given up the strict form of the gold standard; therefore, each separate country can print its own money and choose, if so desired, to finance a budget deficit in the central bank.

Third, the separate countries may also have a system of flexible exchange rates.

An example of the first case is Lloyd Metzler's model from 1960 [45]. He started from a model that was of the neoclassical type with full employment and with both investment and savings being functions of the rate of interest. He then added a liquidity preference function and introduced trade in commodities and securities. Metzler was mainly interested in the effect of introducing liquidity preference and interest elastic capital flows on the balance-of-payments adjustment process. Would most of the adjustment to a disturbance take place through adjustments in prices and money (gold) flows, or would it be effected via
interest rate changes and capital (securities) flows? His conclusion was that this depends upon the internal conditions of saving and investment and not upon the external conditions of the demand for imports. He further concluded that the real variables are unaffected by changes in the demand for money.

In a recent article [25], James M. Holmes has formalized Metzler's model, corrected a mistake in the specification of the model, and extended it. His correction consists of a recognition that the capital flows in Metzler's model are functions of the interest rate differentials, which is not a correct specification, and he changes this so that the capital flows and the interest rates in both countries are determined simultaneously. This is the same criticism of portfolio behavior that has earlier been raised by Branson [4], Willet-Forte [74] and many others. However, Holmes did not go all the way to the explicit specification of stock equilibrium conditions. Instead, he extended Metzler's model by introducing the terms of trade as an argument in the savings and investment functions. He then found that, contrary to Metzler's results, the adjustment after a disturbance in the foreign investment sector may primarily be through price change instead of monetary flows.

Shortly after the appearance of Metzler's model, Mundell [47] constructed a similar model but included unemployment and fixed prices. Additional work was later done on this model by Swoboda and Dornbusch [67] and Roper [61]. At the same time Holmes, in two other articles [23, 24], solved the Metzler model for the case of unemployment and for the case of full employment but including flexible exchange rates.

All these models are really only variants of the Keynesian, or Hicksian, IS-LM model. We can also see that the conclusions are similar, but a few details should be noted. First, the Metzler-Holmes formulation assumes a gold standard, which implies that the separate countries cannot increase their money supply by discretionary measures. Mundell and the others assume a paper standard or a gold exchange standard.
Second, all these models are open to criticism from the same basic point of departure; namely, the capital flow behavior and the lack of a proper stock-flow specification that was extensively discussed in the "small country" case.

As was discussed above, several authors have dealt with the problem of formulating models with a proper specification of the portfolio equilibrium conditions for a small open economy. For the two-country case, however, there have only been a few attempts to do so. The first article dealing with this problem was written by Polly Allen [3]. She used a Keynesian model with fixed prices and wages and introduced explicit conditions for portfolio equilibrium in both countries. From this model she derived the result that a change in the demand for money in one of the countries does not have any effect on real income in any country or on the interest rate. The same is true for an increase in the supply of money. These results are difficult to understand. If prices are fixed and real income and interest rates unchanged, how is an excess supply of money going to be diffused into the portfolios?

In a very recent paper Rudiger Dornbusch [9] has constructed a model for a two-country, world economy with flexible exchange rates. It is a model with full employment and flexible prices and wages; it deals with both short-run and long-run equilibrium, and it has dynamic adjustment functions. One of the most appealing features of this model is its explicit treatment of the wealth-saving relationship. This is very important, since once we leave the short-run equilibrium the problem of the determinants of asset accumulation has to be faced.

The model has two assets; money and claims on real capital, with one output being produced in both countries. There is trade in output and equities between the two countries. Saving is a function of target wealth and the government budget constraint is explicitly recognized.

This model yields some very interesting results. First, the
determination of the exchange rate is seen not so much as equili-
brating trade flows but rather as adjusting so that the given 
money balances in both countries are willingly held.

Second, the exchange rate does not isolate one country from an 
inflation in the other country. An ongoing inflation in country 
A due to a persistent budget deficit financed by money creation 
will increase the demand for equities in country A, which lowers 
the rate of interest. A lower interest rate increases the demand 
for real money balances in country B, which reduces the inflation 
rate in B.

The transmission is brought about through the capital mobility. 
It is interesting to compare this result with the following con-
clusion by Mundell ten years earlier: "According to traditional 
theory, an investment boom in one country is not transmitted 
abroad under flexible exchange rates. My results show that there 
is a transmission mechanism at work when capital is mobile."21

IX. Models With More Than One Sector.

In the survey by Anne O. Krueger [36] she pointed out the 
potential value of models with traded and non-traded goods. In 
spite of this, very few such models have appeared in the litera-
ture.

Mathieson [39] has constructed a model with non-traded goods. 
In this model for a small country three goods are produced: an 
export good, an import-competing capital good and a non-traded 
good. Prices of the traded goods and the interest rate on bonds 
are given on the world market. There are also portfolio balance 
equations and a government budget constraint. The main conclu-
sions are that Mundell's results are not drastically changed by 
the presence of non-traded goods, except that fiscal policy under 
flexible exchange rates now becomes effective. This result and

21) [47], page 267.
many of the other results as well depend very much on the relative price effect between traded and non-traded goods.

Prachowny [58] reaches broadly the same conclusions in a similar model. Both Mathieson and Prachowny use "Keynesian-type" models extended in different ways.

A more "classical" model is used by Dornbusch [8]. He has a two-sector model with flexible wages and prices, full employment and continuous market clearing. The supply of output is a function of real capital and its relative price. There are portfolio equilibrium equations and stock adjustment. It is a model for a small open economy.

In this model an increase in the money supply brought about by an open market operation has no effect on the economy except on the balance sheet of the central bank. This is not surprising because of the perfect capital (bond) mobility. One of the most important conclusions is that if the central bank made the open market operation in equities (that are not traded) instead of in bonds, then there would be an expansionary effect on the economy.²²

X. Comparison of Different Models

Many authors try to differentiate their products by choosing different notations and by stressing small differences from others instead of pointing out similarities. In this section I am therefore trying to compare the different models to find out where the crucial assumptions are made.

Let us start with Mundell's famous article of 1963 [47]. If we formalize the model it can be written as

²²) However, both with non-traded assets and with non-traded commodities it is important to try to determine why they are not traded and what would make them traded.
(26) \( E(Y, i) + X(Y) - Y = 0 \)

(27) \( R + D - L(Y, i) = 0 \)

(28) \( B = X(Y) + K(i) \)

The first two equations form a system of two equations that simultaneously determine \( Y \) and \( i \) (the equation for the bond market is eliminated by Walras' law). The third equation is the balance-of-payments equation. Under a fixed exchange rate system any non-zero value of \( B \) affects the supply of money and disturbs the equilibrium in the economy. This has of course been recognized by everyone, but many have chosen to assume that this influence is eliminated by sterilization operations from the central bank. However, a sale of government securities to sterilize an inflow of foreign exchange will raise the interest rate. Then, if there is any capital mobility, more foreign exchange will flow into the country and the central bank has to step in and sterilize again. As Mundell pointed out himself, sterilization is not viable (unless the country is large enough to influence the world interest rate or sterilizes long enough, which would mean an infinite increase in foreign reserves and in future interest payments!)

Mundell came to this conclusion and chose instead to divide the money supply into one domestic component under the control of the central bank, \( D \), and one foreign component, foreign exchange reserves, \( R \), which is not under the control of the central bank.\(^{23}\)

Earlier, the sterilization assumption made it possible to isolate the first two equations mentioned above to a subset of the model, where \( Y \) and \( i \) were determined and then \( B \) was recursively determined in the third equation without affecting the rest of the system.

\(^{23}\) It has to be remembered that there is no banking system in this type of model so the money supply is identical to the supply of base money. With a banking system in the model the central bank determines the composition but not the total of assets backing the money supply.
This is also the approach of Floyd in the above-mentioned articles. However, this means that the careful work he puts into the specification of the capital flows affects his balance-of-payments equation, but does not have any effect on the rest of his model. Therefore it is not possible to compare his results with Mundell's, as Floyd does, without changing this specification.

The same problem exists if monetary policy is defined as a setting of the interest rate, as Mundell stated in his earlier works. When Tower uses this specification, he eliminates the possibility of comparison with Mundell's work and that of most other authors.

Regarding D as the monetary policy variable gives three equations to determine Y, i and R, but Mundell chose to assume perfect capital mobility and could then use the two first equations to determine Y and R. Given i, Y is determined by the first equation and R is then determined by the second equation. The third equation is not used. Dividing the supply of money into the two components R and D and regarding D as the monetary policy variable, attention is immediately focused on an important problem, namely whether it is the level of reserves or the change in reserves that is determined in the model. In the early literature it was not unusual to treat the whole money supply, R + D, as the monetary policy parameter and then the three equations determined Y, i and B. As soon as the money supply is divided it is evident that the level of reserves, R, is the relevant variable to be determined in the model together with real income and the interest rate, and that the third equation should be set equal to zero as an equilibrium condition. (This problem is also discussed from a slightly different angle in an article by Aghelvi and Borts [1], where they reach the conclusion that the level of reserves, R, is the proper policy target by analyzing the dynamic behavior of the model.)

This is done by Swoboda when he drops the assumption of perfect capital mobility and adds the condition that the balance of payments has to be zero. There are now three equations to determine
Y, i and R, but once more there is a sub-system - in this case the first and the third equations - for determining Y and i. Here, the second equation recursively determines R. A change in D cannot affect anything in the first and third equations and therefore it only leads to an opposite change in R.

McKinnon and Oates introduce real non-human wealth in the first equation. They change the third equation so that the trade balance is equal to zero and they assume perfect capital mobility. This time there is a subset of one equation, the third, to determine real income. Then W, real non-human wealth, is determined by the first equation.

Let us continue by considering the Monetary Approach to the Balance of Payments. Now, the above model is converted to growth rates and prices are flexible, but both prices and interest rates are determined on the world market, and the rate of growth of real income is determined exogenously. Therefore, for given values of interest rates (perfect capital mobility), prices and real income, the first and the third equations are redundant and the demand for money is also exogenously determined. For a given domestic credit creation, D, the rate of change of international reserves is determined in the second equation above, the money equation.

Turning now to the Kouri and Porter model we could say, still comparing with our basic model above, that what they do is essentially to solve equations two and three simultaneously while holding income and wealth constant. They solve for the change in international reserves and in the domestic interest rate. Therefore, when applying the model to empirical issues, they test for the assumption of perfect capital mobility or what they call offsetting capital movements. It must be remembered, though, that this is not a test of the Monetary Approach to the Balance of Payments, as that theory is a long-run theory while the Kouri-Porter model is typically short run.

In a separate paper by Kouri [34], he takes up the problem of whether monetary policy can be effective under fixed exchange rates and to what extent the answer depends on the degree of capital mobility.
This problem runs through so many of the studies under survey that it is worth some extra attention. The implication of the discussion by Kouri and Kouri and Porter is that they consider a low offset coefficient as an indication of efficient monetary policy. This is also the point at which Mundell once started. Contrary to this conclusion, both Swoboda and the Monetary Approach to the Balance of Payments come to the conclusion, though for different reasons, that monetary policy has no effect in the long run except on the foreign exchange reserves. Both McKinnon and Branson find that monetary policy has no effect on real income. There is also the connected and very important question of whether or not there is an automatic adjustment mechanism at work.

All these questions are closely related to the problem of the government budget constraint. The government budget constraint for a closed economy states that any excess of government expenditures over tax receipts must be financed through increases in either the monetary base or government securities

\[ G - T = AD + AS \]

This has been recognized by many people, among whom we may mention some of the earlier; Ott and Ott, Christ and Silber. One reason for setting up this equation is that it shows that if the government decides on the level of government expenditure and on the tax rates it can further only decide on either \( \Delta B \) or \( \Delta S \). An even more important reason for using this equation is that it spells out the fundamental interrelationships between the private and the public sector in the stock-flow adjustment process. There are rather few economists who have been aware of the real importance of this. One exception is Brunner and Metzler.24

In a situation with stock equilibrium, all stocks have to be constant. This implies that the government budget must be balanced; this is then a stock equilibrium condition. Now, some authors have

24) In their latest papers the importance of having this condition in the model is clearly demonstrated. See also Myhrman [50].
added this condition to their model and then differentiated it. As a result they have got

\[
\frac{dY}{d\gamma} = \frac{1}{\frac{\delta T}{\delta Y}}
\]

and from this they have concluded that fiscal policy has a multiplier effect on real income and that monetary policy has no effect at all in the long run when \( \Delta D = \Delta S = 0 \). This conclusion is really not warranted, except as a very special case, because government expenditures also depend upon interest payments on the government bond debt, and taxes also depend on the price level. Therefore, using this multiplier expression to deny any effect of monetary policy on real income is too much of defining away the problem.

The government budget constraint for the open economy is even more interesting. It is

\[
\Delta R + G - T = \Delta D + \Delta S
\]

or

\[
X(\gamma) + K(\gamma) + G - T = \Delta D + \Delta S
\]

where \( X \) is an unspecified trade balance and \( K \) the capital account. For stock equilibrium we now have

\[
-X(\gamma) = G - T
\]

The stock equilibrium condition for the economy is now that imports minus exports have to equal government expenditures minus taxes or that the deficit on the trade balance has to equal the deficit on the government budget. This situation has been called a quasi-equilibrium by Mundell [47].

Writing imports and taxes as functions of only real income makes

---

25) See e.g. Ott and Ott [54].
26) It is here assumed that government expenditures are fixed in nominal terms, otherwise they also depend on the price level.
27) See also Bent Hansen [19].
28) An appropriate balance-of-payments formulation should also include interest payments on outstanding debts and so on. Compare earlier discussion.
it possible to derive
\[ \frac{dY}{dG} = \frac{1}{\delta IM/\delta Y + \delta T/\delta Y} \]

where IM = imports and exports are assumed constant.

This has been done by Oates [53], McKinnon [41] and Branson [5], and the conclusion is that monetary policy has no effect on real income. This conclusion is even less warranted than for the closed economy because now interest payments to and from foreigners must also be taken into consideration together with the earlier facts.

Swoboda does not mention the government budget constraint, but when he introduces the condition that the balance of payments has to be zero he says that it is to ensure full equilibrium, which is the same as a stock-flow equilibrium. Such a condition in a model with a government budget constraint means that it must be split into two parts, one part being that the balance of payments has to be in equilibrium and the other that the government budget has to balance. However, it is just the property of the government budget constraint as formulated above that it ensures stock-flow equilibrium. All markets are in continuous equilibrium, but there may be a surplus in the balance of payments that is matched by a surplus in the government budget of equal size.

Which assumption is then the better approximation to the world we live in? I will argue that the government budget constraint is the better choice. The assumption of a zero balance of payments is instead the natural assumption under a gold standard. In that case, the supply of money is formally tied to the amount of foreign exchange reserves, i.e. gold, and a deficit in the balance of payments immediately reduces the amount of money available to the public, which reduces expenditures and restores the balance in the balance of payments. Under the Bretton Woods System this is no longer the case. The direct link between foreign exchange reserves and the domestic money supply is cut off. Consider a situation with a deficit in the balance of payments and an equal deficit in the budget. The balance sheet of the central bank would then be
| $\Delta R$ | -100 | $\Delta B_1$ | -100 |
| $\Delta S_g$ | +100 | $\Delta B_2$ | +100 |

Here the reserve loss is balanced by an increase in government securities in the central bank. One could also say that the deficit in the balance of payments is financed by the printing of new money by the government. The total effect on the monetary base is zero and all markets in the economy are in equilibrium.

This leads to the important and much debated question of balance-of-payments adjustment. Mundell calls the Bretton Woods System a *disequilibrium system* [47], but for a different reason. His reason seems to be "that there are no equations specifying equilibrium in the balance of payments". However, having added such an equilibrium condition, he goes on to show the automatic adjustment to equilibrium in this system and what he calls Hume's Law. In their paper Girton and Henderson also stress the automatic adjustment. I would also prefer to call this system a disequilibrium system, but for the reason of the possibility of quasi-equilibrium. In such a situation there are no forces moving the system to balance-of-payments adjustment. Now the effectiveness of monetary policy is to a large extent dependent on the degree of capital mobility. However, I must here hasten to add that I completely agree with Swoboda that the degree of capital mobility is mainly important for the speed of adjustment.

Of course, a country with a deficit in the balance of payments cannot go on with this forever, because its reserves are limited. However, the important thing is that it may be able to continue with it for some time, say for a couple of years, without the existence of any forces which necessarily would bring the balance of payments back to equilibrium, while under a gold standard the money supply would automatically decrease at the same rate as the balance of payments deficit. Now, if many countries use this degree of freedom and let reserves increase or decrease over an intermediate period, the system will move into a crisis zone.

29) They do not have the government budget constraint in their model, and it is a gold standard world.
The reason for this is that governments lack foresight. If they had perfect foresight they would change policy at the right moment, but living in a world with incomplete information as we do, they tend to wait too long and are forced to change their exchange rate. Once this has been done reserve accumulation or decumulation will be taken as a sign of an expected exchange rate change and speculation is started, thereby increasing the tendencies to disequilibrium.

This does not mean that the system always tends to such a situation. It is just an observation of the possibility of quasi-equilibrium. However, this is also a likely situation after e.g. a base-financed budget deficit, which is not an unusual event.

It can also be noted that although the existence of this government budget constraint may inhibit or delay the balance-of-payments adjustment, it stabilizes the economy from external shocks. Assume that the business cycle upturn for a small country starts with an increase in exports. As a result, money, income and prices will rise, but then taxes will also rise, the government budget becomes overbalanced and money is withdrawn from the economy, which dampens the upturn. The opposite will take place in the recession.

Turning now to the most recent development in general equilibrium, aggregate macromodels as represented by Branson [5], Myhrman [50], Dornbusch [8], [9] and Frenkel and Rodriguez [17], it is a common characteristic that they are all careful in specifying explicit stock equilibrium conditions. They also treat real capital as a separate asset with its own asset price. Therefore, all of these models incorporate a rather satisfactory treatment of the long-run stock-flow equilibrium. Myhrman does not consider short-run

30) Unless politicians raise G.

31) However, it is debatable whether it is reasonable to have real capital asset accumulation but no effect of this increase in real capital on the supply of output and on the price level, as in Branson's model.
equilibrium, but in all the other models there is an explicit treatment of short-run equilibrium and of the dynamics of asset accumulation to the new equilibrium.

The method that is used in these studies takes its inspiration from the book by Foley and Sidrauskis [15]. First, all stocks are held constant and the economy is assumed to reach a short-run equilibrium with the help of changes in all prices and current income. The values of these are then assumed to influence the desired stock of assets and eventually induce stock changes. In this way the economy keeps moving until a stationary stock equilibrium is reached. But at each moment in time the economy is in short-run equilibrium.

Now, this is an elegant method, but it requires a very high degree of information in the system. It may therefore be allowed to put a decisive questionmark on this approach, since most of the short-run adjustment problems in the Western economies seem to stem from a lack of relevant information. It also follows from this that we have to use extreme caution in connection with policy conclusions for the short run.

XI. Conclusions

This paper has covered a very long time span in the history of economics, nearly 250 years. It could have gone even further back in time, to the age of the Spanish gold and silver discoveries. And yet most of the material is from very recent years. Why then look back to misty ages at all? I have done this to show the existence of authors with a good grasp of the workings of the international payments system of their time and its adjustment to disturbances. I think this is the right setting to start from when reviewing more recent developments, since the largest part of the work done by or inspired by the two predominant researchers in this field, Robert Mundell and Harry Johnson, has consisted of regaining this insight and learning to apply it to the world of today. By this I mean that it was
not until recently that attempts have been made to regard the problem of balance-of-payments adjustment as a world economy problem and a problem for monetary theory.

It is therefore very interesting and promising that there has been such an acceleration in the number of authors in the last three or four years in this field who have used monetary theory and portfolio theory to analyze balance-of-payments adjustment and monetary and fiscal policy. The use of portfolio models in a narrow interpretation with income and wealth constant has led to a better understanding of the determinants of short-run capital flows, but more work has to be done on extending this approach to include expectations and speculation.

An even more promising line of development is the recent attempts to integrate portfolio theory with aggregate general equilibrium models for an open economy (McKinnon [41], Branson [5], Tower [70], Myhrman [50]) where asset equilibrium and output or flow equilibria are analyzed simultaneously. Dornbusch [5] and Frenkel and Rodriguez [17] have carried this work further in some recent papers with an elegant formulation of the wealth-saving relationship.

After penetrating all this material, one is left with one dominating impression. In spite of all discussions about "fundamental disequilibrium in the balance of payments" and related views on "the wrong exchange rate" and so on, it is clearly shown from all this research that we have had an equilibrium system with automatic adjustment if only the politicians and the central banks would stick to the rules of the system. These are: 1) do not change the exchange rate and 2) keep the rate of change of the money supply at the appropriate speed. Under the gold standard these rules were built into the system. Under the Bretton Woods system, each country can jeopardize the system by letting its money supply increase too much or too little in an attempt to get its rate of inflation to diverge from the rest of the world.

There is of course much room for future research in this field. The following problems seem to present a natural continuation of
recent work. First, macromodels for open economies should be worked out with a careful specification of permanent income in the economic relationships in the model, as well as a proper treatment of the government budget as an important element in the stock-flow process. Second, two-sector models with non-traded goods seem to provide an interesting field worth more exploration. Third, it must be time now to start investigating the short-run adjustment behavior of the economy. (Parkin [56] provides an interesting attempt in this direction.) Fourth, there are also reasons for trying to formulate some models of the behavior under "dirty float" or managed exchange rates. In this connection it is interesting to note that Mundell's conclusions - that under perfect capital mobility monetary policy has no effect under fixed exchange rates but that fiscal policy has, and that the reverse is true for flexible exchange rates - seem to break down under the intermediate case of crawling peg or dirty float. Are, then, both monetary and fiscal policy effective or is neither of them effective?
REFERENCES


Parkin, M., "Inflation, the Balance of Payments and Domestic Credit Expansion in a Fixed Exchange Rate Open Economy", University of Manchester, mimeographed, November 1972.


