Short-Run Data and Long-Run Theories:
Testing the Monetary Approach to the Balance of Payments

By Emmanuel Petoussis*, Athen

I. Introduction

There is now a vast literature concerning the theoretical value of the monetary approach to the balance of payments. We do not wish to add one more paper in an already satiated field. We are rather interested in examining the methodological aspects of testing the theory. These are of general interest since the main ideas are indeed common to tests of most macroeconomic theories. They concern the reconciliation of short-run data (obtained as observations at some point in time) with "long-run" theories. This paper concentrates on the theoretical and empirical implications of such an exercise.

The problems of the conventional tests of the monetary approach are shown to result from the imposition of long-run assumptions on a short-run setting in section II. Section III focuses on the analytical content of foreign reserves and domestic credit and suggests a broad framework within which an appropriate test can be carried out. The usefulness of the framework and the way it can incorporate the mechanisms of adjustment processes are demonstrated in the discussion of alternative sterilisation policies in Section IV. Finally, the above issues are put into the proper macroeconomic-modelling context by considering the main features of the relevant disequilibrium analysis in Section V. The main findings are summarised in the last section.

II. Imposing Long-Run Assumptions on a Short-Run Setting

The main proposition of the monetary approach to the balance of payments is that flows of international reserves are determined by adjustments of the money stock[1]. The stability of the demand for money is a central

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assumption of the theory. But a number of supplementary assumptions have also been used by the relevant theoretical literature in order to derive unambiguous results: perfect commodity arbitrage; perfect capital markets; flexibility of all prices and therefore full employment; and no sterilisation policies by the authorities.

Some of the assumptions have, of course, been relaxed in more refined theoretical models. But the empirical literature has tended to use the full set of them[2]. The conventional starting point is to postulate the demand for money as a function of real income y, the price level P and the interest rate R. The supply of money is set equal to the money multiplier (taken as unity for simplicity) times the supply of high powered money which consists of foreign reserves R and domestic credit C. After equating the demand with the supply and some algebraic manipulation we obtain

$$(1) \qquad (R/R + C)dlnR = b_0 + b_1 dlny + b_2 dlnP + b_3 dln(l + r) + b_4(C/R + C)dlnC$$

The test concentrates on the estimated coefficient of domestic credit $\hat{b}_4$. According to the monetary approach an increase in the money stock through domestic credit expansion, for example, creates an excess supply of money; the above set of assumptions ensures that the demand does not change. Then equalisation of money supply to its demand is realised through an outflow of reserves. Therefore, the stock of reserves drops in response to an increase in domestic credit and this is allegedly captured by a significant and negative $\hat{b}_4$.

Such a specification suffers from simultaneous-equation bias which arises from various sources. First, if the demand-for-money arguments are not exogenous, in the short run for example, we cannot identify their coefficients, i.e. $\hat{b}_1$, $\hat{b}_2$ and $\hat{b}_3$[3]. Second, if sterilisation does indeed take place, in the short run at least, the interpretation of b_4 becomes ambiguous. Consider for example, an exogenous fall in the home demand for money which causes reserves to flow out. If the monetary authorities respond by increasing domestic credit by some fraction of the reserve outflow, the supply of money still exceeds demand, more reserves will flow out and so on. An inverse rela-

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[1] Unless otherwise stated we refer to fixed exchange rates. For the purpose of this paper the arguments are symmetrical for the flexible rates as well.

[2] See, for example, empirical papers in *Frenkel* and *Johnson* (1976).

[3] This problem has been tackled by estimating b_1, b_2 and b_3 directly from a money demand equation and using the results for the estimation of (1); see e.g. *Genberg* (1976) in *Frenkel* and *Johnson, op. cit.*

tionship between reserves and domestic credit is again observed, but it is the change in the former rather that causes the change in the latter[4].

The conventional response to the problem of properly identifying b_4 has been to postulate a reaction function of the monetary authorities:

(2) $(C/R + C)dlnC = c_0 + c_1 (R/R + C)dlnR + c_2 dlnX$

where X is the target variable that might lead the authorities to expand or contract domestic credit autonomously[5].

Nevertheless, tests using (1) and (2) have rarely passed the conventional statistical criteria. A number of factors may be responsible for this failure. At first, the general theoretical problems implicit in the estimation of any reaction function which has to rely on the assumption of structural stability (cf. *Lucas*, 1976) and consistency on the part of the authorities. Second, the difficulties involved in transforming sterilisation into a testable hypothesis: (a) central banks may not dispose refined enough instruments to sterilise external flows when these are particularly large; (b) sterilisation policies may be succesful in some cyclical phases but break down after a while in others; (c) the authorities may respond asymmetrically sterilising inflows but not outflows since deficits are often conceived as more of a problem than surpluses; and (d) to the extent that sterilisation involves fiscal adjustments it will be subject to the familiar lags in decision taking, implementation and effectiveness of the relevant policies which will not only delay the desired effect but change the whole pattern of adjustment. Finally credit, the dependent variable of the reaction function, will be a policy variable only under special circumstances (see next section).

To the above we must add some well known possibilities which arise from the fact that the existence of sterilisation invalidates the assumption of instantaneous adjustment of the money supply to its demand: (a) the money market may be in continuous imbalance; (b) the observed money stock may be supply determined; and (c) inflation may be generated domestically rather than totally imported. The equilibrium framework of analysis is inappropriate then. It is quite clear that the imposition of long-run assumptions on a short-run setting is behind all the above problems.

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[4] See *Magee* (1976) and *Kreinin* and *Officer* (1978) for other sources of bias and extensive references.

[5] See e. g. *Argy* and *Kouri* (1974).

III. The Concept of Domestic Credit and Reserves
in a Broader Framework

This section concentrates on the theoretical content of reserves and domestic credit. These are linked through the identity $M = R + C$ which lies in the centre of the monetary analysis and has been readily used in empirical research.

R is defined as a cumulative series in official reserves as reported in the balance-of-payments accounts of individual countries. It can be easily shown that if this variable is identified with the foreign component of money, which is the standard approach of conventional empirical analysis, the links between the balance of payments and the stock of money that we attempt to establish break down by definition. On the other hand, domestic credit is a virtually undefined concept estimated as $C = M - R$. Yet in order to examine to what extent and under what circumstances it is a policy variable it must have a clear theoretical content; it seems essential to look at its components and their determination. Such an approach requires that the framework of analysis is broadened so that the role of all the sectors of the economy can be explicitly introduced.

But despite the emphasis of the monetary approach on the budget constraint imposed on the country through the balance of payments, the budget constraints of the various sectors of the economy are in general missing from the relevant theoretical and empirical literature. Particularly important in this context is the ommission of the government budget constraint. The monetary theory of the balance of payments is in principle similar to the analysis of economic systems that incorporate a government constraint in the tradition of *Christ* (1968)[6]. This type of analysis emphasises the influence of the government budget on the stock equilibrium of the private sector in the same way that the monetary approach concentrates on the impact of external flows on the same stock equilibrium of the private sector.

The consideration of the budget constraint of the commercial banking system is also essential. The majority of macroeconomic models, the models of the monetary approach being no exception, have entirely ignored the way in which commercial banks balance their assets and liabilities. Recourse to ex post accounting identities can be misleading. A multiplier determination of credit which is often employed to tackle the problem is an oversimplistic approach, that would be valid only under special circumstances. It also requires the assumption that the reserve base is exogenously determined

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[6] See also *Currie* (1976).

and ignores the demand for credit by its exclusive concentration on the supply side. When both supply and demand are simultaneously considered, a change in the volume of credit must be accompanied by a change in some other variable or parameter in the system. The cost of credit cannot be ignored.

We can now put the above into a common framework by considering the following identities[7]:

(3) $\Delta G + \Delta R = \Delta G_{PR} + \Delta G_B + \Delta G_F + \Delta Cu + \Delta Cu_B$

(4) $\Delta A + \Delta G_B + \Delta Cu_B = \Delta D + \Delta NFL_B + \Delta NDL_B$

(5) $\Delta M = \Delta D + \Delta Cu$

(3) is the budget constraint of the public sector (which includes the central bank). Government deficits ΔG and possible deficits in the official balance-of-payments accounts, i.e. the change in foreign reserves ΔR, are financed by four sources: borrowing from the private sector ΔG_{PR}, the banking sector ΔG_B and the foreign sector ΔG_F; and also by the issue of notes and coins, ΔCu and ΔCu_B (held by the private and banking sectors respectively). (4) is the banking sector identity. Assets include loans and advances to the private sector ΔA, holdings of government securities by the banking system ΔG_B and banking reserves. Liabilities include deposits by the private sector ΔD, net foreign liabilities of the banking sector ΔNFL_B and non-deposit liabilities ΔNDL_B. (5) defines broad money as the sum of deposits and currency held by the private sector. From these identities we can derive the following expression:

(6) $\Delta M = (\Delta G + \Delta A - \Delta G_{PR} - \Delta NFL_B - \Delta G_F - \Delta NDL_B) + \Delta R$

This identity is indeed implicit in the conventional literature; if we superimpose the identity $\Delta M = \Delta C + \Delta R$, domestic credit expansion ΔC is identified with the terms in the bracket. But how useful is such an expression? At first, inspection of (6) reveals that changes in official reserves as defined above will not give us an accurate picture of the developments in the foreign sector. An increase in reserves just because the government or the commercial banks have been able to borrow more abroad does not reflect a permanent increase in the purchasing power of the country. But it is not only a matter of the most appropriate definition of the balance of payments. In the present context we are looking for an operational definition which

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[7] For a recent similar analysis see *Coghlan* (1981).

can, at least, be used to reveal the relationship between the foreign sector and the stock of money.

To show that the analysis in terms of identity (6) is inappropriate consider an exogenous change in government or banking borrowing from abroad (G_F and NFL_B respectively). This would lead to a change in domestic credit as defined in (6) – both the above terms are included in the bracket. But it would also cause an equal and offsetting change in foreign reserves, so that the money stock remains unchanged. As a consequence of the definition used, and not due to deliberate sterilisation or other action of the authorities, changes in the money supply do not reflect changes in the balance of payments, what the monetary approach is all about.

But now replace ΔR in (6) by its components, i.e. the current account surplus CA, the capital accounts of the private and banking sectors, ΔNFL_{PR} and ΔNFL_B respectively, and the government foreign borrowing ΔG_F to obtain:

(7) $$\Delta M = (\Delta G + \Delta A - \Delta G_{PR}) + (CA + \Delta NFL_{PR}) - \Delta NDL_B$$

Here the first bracket can be identified with domestic credit expansion and the second with the external flow into the money stock (ΔNDL_B can be taken as a residual item).

Domestic credit has a clear theoretical content now and is shown to be determined by the independent decisions of the government, the banking and the private sectors. A change in the first bracket implies no automatic change in the second – unlike (6). But independency between the two is still not ensured. The government may first look at the balance of payments position before deciding about the level of the budget deficit. Banks may first consider their foreign position before determining ΔA. In the same way ΔG_{PR} may be related to ΔNFL_{PR}. But now the domestic and the foreign component of money correspond to different composite variables. Such a disaggregation is clearly more informative about the link between money and the balance of payments.

IV. The Sterilisation Issue Reconsidered

Now let us use the above framework to reconsider alternative sterilisation policies whose treatment has been the main problem of the relevant tests. This will also demonstrate the usefulness of such an approach and how it can readily incorporate the role of the adjustment process.

Consider identity (7) again. In the short run, the government can offset the impact of external flows by operating on ΔG directly and on G_{PR} or A indirectly. The first alternative means that the authorities are running budget deficits of equal magnitude but opposite signs to external flows. The second alternative corresponds to conventional open market operations. Finally, restrictions of advances can be achieved by direct or indirect intervention of the authorities in the credit market.

But within the short-run horizon which is important for policy makers all these policies will not be identical in their effects on the private sector's stock equilibrium. Consider the (change in the) net financial assets of the private sector ΔNFA_{PR}, derived from the above identities:

(8) $\Delta NFA_{PR} = \Delta D + \Delta Cu + \Delta G_{PR} - \Delta A - \Delta NFL_{PR} = \Delta G + CA$

For convenience consider a simple model with income at its full employment level and prices and interest rates constant at the level of foreign prices and rates. The demand for money, therefore, remains constant throughout[8]. Assume further that we start from a position of overall equilibrium and there is an exogenous decrease in exports, because of a drop in foreign demand for example. Consider first the case of open market operations. The government buys bonds from either the private or the banking sector to offset the effects of the resulting balance-of-payments deficit on the stock of money.

(i) If the non-bank private sector finances the current account deficit, i.e. the excess of payments over its receipts, by selling bonds directly to the government the money supply remains constant. A decrease in the foreign component of money is matched by an increase in domestic credit; in (7) by ca = Δg_{PR}[9]. But the net financial assets of the private sector decrease; by ca in (8).

(ii) If the private sector finances the balance-of-payments deficit by an additional demand for loans from the banking system, the banks can sell bonds to the government to meet the excess demand. Money supply will again remain constant as domestic credit increases, but the financial assets of the private sector drop.

(iii) Finally, if the private sector finances the deficit by withdrawing deposits from the banking system (ca = Δd) the banks will sell bonds to the government to meet their obligations and avoid a multiple contraction of

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[8] The qualitative results will not change if the above simplifying assumptions do not hold.

[9] Lower case letters are used to indicate changes induced by the external shock.

credit; $\Delta d = \Delta g_B$. But both the money supply and the financial assets of the private sector fall by ca, as can be verified from (7) and (8).

In general we would expect to observe all three methods of financing the balance-of-payments deficit. It is clear that the net financial assets of the private sector will eventually decrease. If private expenditure is a function of these assets, the non-bank private sector will begin readjusting its expenditure even before the government is forced by the continuous depletion of reserves to abandon sterilisation[10]. In other words, there is an endogenous force that will tend to return the system to equilibrium.

Now consider a situation where the government is running a budget deficit equal to the current account deficit and financed by the creation of new money. Domestic credit will increase – by Δg = ca in (7) – so that the money supply remains constant again. The net financial assets of the private sector also remain constant; in the right-hand side of (8) a decrease by ca is matched by an increase by Δg. Therefore, the difference with open market operations is that there is no endogenous force to "correct" the balance-of-payments deficit during the adjustment process. It is only up to the discretionary action by the authorities to prevent a continuous outflow of reserves[11]. The results will be identical if the government deficit is financed by borrowing abroad. This will be extremely important in analyses of less developed countries that prevent the depletion of their foreign reserves by borrowing abroad on a more or less permanent basis. On the other hand, if the authorities can control the amount of loans granted by the commercial banks, they can offset the effects of external flows by increasing A. This will have equivalent effects with open market operations. Alternative neutralisation policies, therefore, will play a crucial role in the determination of the nature and the length of the adjustment process. Such policies can be fully analysed only if all the flows into the private sector's assets are taken into account.

V. Modelling Money in Disequilibrium

To put the above into the appropriate macroeconomic-modelling context we must examine the way in which the money supply process is modelled in

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[10] The analysis is dependent upon the way in which bond holdings enter the private expenditure function. This is in return dependent upon how the private sector views bonds. Regarding them as perfect substitutes to money or as perfect substitutes to capital are the two extreme cases. For different degrees of substitutability the results must be modified accordingly – see e.g. *Tobin* and *Buiter* (1976).

[11] This was first noted by *Currie* (1976).

empirical tests. Money has been actually treated either as demand or supply determined. According to the first way of treatment, the stock of money is determined by a demand function and credit is policy determined; the equilibrating role is attributed to external flows. But as already argued, the possibility of interdependence between credit and external flows cannot be ruled out.

The second method endogenises the components of money, i. e. the right-hand side of (7), so that the stock of money is determined residually. The implicit assumption is that whatever amount of money is supplied as a result of the decisions of the various sectors is willingly held. Although this method is pre-eminently non-monetarist it runs into the same problems as the simplest monetarist formulations; an identity is used as if it were a behavioural relationship.

To consider the interactions between supply and demand a disequilibrium framework has been advocated (see e. g. *Bergstrom* and *Wymer*, 1976). Critical in the disequilibrium process is the peculiar nature of money as a means of payment. In a sense, it is the mirror of each transaction. Thus a disequilibrium in any other market is bound to be reflected on the money market before any sort of adjustment is into operation. But money acts also as a buffer in an uncertain, "imperfect" world. This means that individuals do not immediately adjust to the desired level but temporarily allow their money holdings to be above or below that level. They accept money even though they do not desire to retain ownership of it. For example, consider an individual who shifts from one asset into another, say from bonds into a physical asset. His money holdings in the period between the two transactions in the two assets will not be related to income (and other "standard" demand-for-money arguments) in some systematic way; in that sense they represent a disequilibrium demand. When money is used as a buffer, therefore, it would tend to prevent any instantaneous adjustment process.

In the above disequilibrium analysis as well as in the case of a supply determined money stock, supply shocks will have price, interest rate and output effects. In the latter case (equilibrium) this is a once and for all effect. In the former (disequilibrium) the discrepancy between the desired and the actual money stock at each and every point in time will feed into the supply process.

Recent empirical research within the disequilibrium framework has followed two different, although similar, directions. The first is associated with the continuous-time econometric methodology developed by *Bergstrom* and *Wymer*[12]. The underlying method of estimation assumes that the dynamic

structure is represented by a system of differential equations which are esti-
mated from discrete time series by imposing on the parameters of the model
the restrictions implied by a continuous-time process of data generation[13].
But apart from criticisms of this approach on econometric grounds, the rela-
tionship between domestic credit and the external sector is still unclear.
Moreover, it is not obvious that the highly complicated continuous-time
methodology leads to a dynamic structure which is less ad hoc than the one
obtained through the discrete time specification and it seems more difficult
to interpret the results in behavioural terms.

The second is associated with the "error correction mechanism"
methodology developed by *D. Hendry* and others[14]. The underlying assump-
tion[15] is that "the speed and direction of changes in observed variables is
related in a predictable way to the discrepancy between observed and
equilibrium states, and hence hypotheses about equilibrium can be investi-
gated indirectly by modelling adjustment processes" (*Davidson* and *Keil*,
1981, p. 2). A major advantage of both the above approaches is that the val-
idity of the tested hypotheses rests not only on a set of structural coefficients
but also on the estimated length of the period required by each variable to
adjust to its equilibrium value. This makes them quite attractive for policy
purposes.

In general, alternative balance-of-payments theories can be usefully
integrated into such a disequilibrium framework. A more powerful test of
the "best" theory can thus be obtained without having to rely on "causality
tests" between credit and reserves which have a rather limited scope accord-
ing to our analysis. This framework is also flexible enough to be used for
alternative modelling experiments that can take into account different
exchange rate regimes, different types of economic institutions, different
levels of disaggregation etc. Such issues seem certain to provide a promising
area of research in the future.

VI. Conclusions

This paper has concentrated on the methodology of tests of the monetary
approach to the balance of payments, as similar methodological issues are
inherent in the empirical tests of most macroeconomic theories. Emphasis
has been given to the treatment of domestic credit and, consequently, sterili-

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[12] See papers in *Bergstrom* (1976).
[13] See e.g. *Bergstrom* and *Wymer* (1976), *Jonson* (1976), *Horne* (1979).
[14] See *Hendry* (1980) for a comprehensive discussion.
[15] See *Davidson* and *Keil* (1981), *Petoussis* (1981).

sation policies. The broad framework that has been suggested can be summarised in the following requirements: (a) domestic credit and foreign reserves must be redefined for empirical purposes so that the interactions between the two and the stock of money can be clearly identified and explicitly modelled; (b) all sources of disturbance of the stock equilibrium of the private sector must be taken into account so that the money supply process, and therefore external flows, can be expressed as the outcome of independent decisions of all the sectors of the economy; and (c) the underlying adjustment processes must be explicitly considered within a disequilibrium analysis that recognises the "peculiar" nature of money and models appropriately the feedbacks between its supply and demand.

Finally, it must be noted that such an approach is perfectly consistent with the monetary theory of the balance of payments which "adopts an eclectic stance with regard to various disequilibrium adjustment processes". For one thing, these will be heavily dependent upon the particular institutional characteristics of each country. But the theory does provide a long-run solution so that the choice set can be usefully restricted. The (empirically) specified adjustment processes will always return the system to equilibrium, provided the underlying stability conditions are fulfilled.

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Zusammenfassung

Daten der kurzen Frist und Theorien der langen Frist: Tests des monetären Ansatzes der Zahlungsbilanz

Dieser Aufsatz behandelt die Methodologie des Testens des monetären Ansatzes der Zahlungsbilanz. Die Probleme der üblichen Tests werden darauf zurückgeführt, daß im Rahmen eines kurzfristigen Zusammenhangs langfristige Annahmen zugrunde gelegt werden. Ein umfassenderer analytischer Ansatz wird vorgeschlagen, in dem alle Ursachen von Störungen des Bestandsgleichgewichts des privaten Sektors berücksichtigt werden. Damit wird es möglich, die internationalen Reserven und den heimischen Kredit für empirische Zwecke sinnvoll neu zu definieren. Dieser Ansatz wird in den angemessenen makroökonomischen Modellzusammenhang eingefügt, indem die zugrunde liegenden Anpassungsprozesse als eine Ungleichgewichtsanalyse untersucht werden, die die Rückkoppelung zwischen Geldangebot und Geldnachfrage einbezieht.

Summary

Short-Run Data and Long-Run Theories: Testing the Monetary Approach to the Balance of Payments

This paper concentrates on the methodology of the tests of the monetary approach to the balance of payments. The problems of conventional tests are attributed to the imposition of long-run assumptions on a short-run setting. A broader analytical framework is suggested where all sources of disturbance of the private sector's stock equilibrium are taken into account so that foreign reserves and domestic credit can be usefully redefined for empirical purposes. This framework is put into the appropriate macroeconomic-modelling context by studying the underlying adjustment processes within a disequilibrium analysis that considers the feedbacks between money supply and money demand.

Résumé

Données à court terme et théories à long terme:
Analyse de l'approche monétaire de la balance des paiements

Ce travail se concentre sur la méthodologie des analyses de l'approche monétaire de la balance des paiements. Les analyses conventionelles imposent des conditions à long terme à des données à court terme. Un plus large cadre y est suggéré dans lequel toutes les sources de déséqulibre du stock du secteur privé sont prises en considération. De cette manière, les réserves étrangères et le crédit national peuvent être redéfinis utilement pour des fins empiriques. Ce cadre analytique est placé dans le contexte d'un modèle macroéconomique approprié: il étudie les processus d'ajustement fondamentaux avec une analyse du déséquilibre qui considère les feedbacks entre offre et demande de monnaie.