Should the Hypothesis of a Well Defined and Stable World Demand for M 1 be Reinstated?

Simple Considerations and Tests

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I.

It has been argued (*Brittain* (1981), *McKinnon* (1973, 1982 a, 1982 b)) that currency substitution translates into instability in demands for individual currencies and severely undermines any attempt by the domestic monetary authorities to monitor and/or disinflate the economy by adherence to a fixed rate of domestic monetary growth; what is needed under the present circumstances – the argument goes – is an international arrangement whereby the central banks whose currencies happen to be highly substitutable in demand agree on seeking a fixed rate of world monetary growth.

In explaining past events as well as in formulating new proposals for the future the above mentioned studies take the hypothesis of the existence of a well defined and stable world money demand more or less for granted. This could be sensible if shocks to the demands for single currencies were mainly due to currency substitution and if currency substitution involved a direct switching from one currency into another; unfortunately that is not the case (*Judd* and *Scadding* (1982), *Spinelli* (1983)) and the question remains as to whether that hypothesis is empirically valid.

The purpose of this paper is to look into such question. It is divided into two major sections; the former is mainly analytical and points to the circumstances under which it is or is not correct to make use of the concept of world money demand and to expect such demand to be stable, the latter gives a few empirical results. The conclusion will be that stability of world money demand must not be taken for granted; as a consequence the case for moving to a world monetary target is not well established.

II.

There are three alternative scenarios that may be useful to think of when tackling the issue of the existence and stability of a world demand for money function. The first one is the hypothetical world we come across in textbooks and which has a permanently fixed exchange rate, i.e., the case of the single currency area; the others are the two pre- and post-1971 actual worlds. From the point of view of our present discussion, the hypothetical currency area case is the least controversial. The presence of pegged spot and forward exchange rates as well as of inflation and interest rates that are identical throughout the area makes sure that one can safely treat the area as if it were one single closed economy, aggregate over national goods and money markets and talk about the world (or area) money demand and supply both in nominal and in real terms; indeed, under such circumstances the notion of a well defined demand for a single currency would not be of much use. With an exogenously given real income, the market for goods determines the rate of interest, while the market for money determines the rate of inflation and hence the nominal rate of interest; as a consequence, whether in such a world inflation is or is not a monetary phenomenon and whether or not it has to be tackled at the world level become meaningful issues which can be settled through an empirical analysis of the nature and degree of stability of the world demand for money function. Furthermore, there are no analytical obstacles to such an analysis in the sense that, as has been said, aggregating is a legitimate exercise.

As we move away from the hypothetical single-currency area case and start looking into the Bretton Woods kind of world, things become more complicated, and even reasonable people start to disagre. When talking about the experience of the period that goes from the mid-1950s to 1971, the general tendency is to stress the presence of fixed central parities and of a systematically growing mobility of capital, labor and goods, and to wind up by saying that that world too can be reasonably approximated by a unified currency system and be looked at as if it were one single large economy. In other words, it is thought that it still makes sense to aggregate over markets for goods and money, to insist on the notion of a common or "world" rate of inflation, and hence on the need for studies of the existence and stability of the world demand for money. As for demands for national currencies, perhaps in n-1 cases their estimation would present fewer problems than it normally does in a situation where the money supply is exogenous,[1] but it

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[1] We say "perhaps" because we abstract, as people used to do, from currency substitution.

would also turn out to be a fairly empty exercise from the point of view of the explanation of the behavior of domestic prices in the medium and long runs. It was exactly this way of looking at things that prompted *Gray, Ward* and *Zis* (1976) to attempt to explain the world demand for money function over the period 1957 - 71, and indeed prompted many others to do similar tests in the context of their discussions of the empirical foundations of the monetary approach to the balance of payments.

Such view is widespread, but it is not the only view to be held, indeed there has never been any lack of dissenting voices. For instance, right from the beginning, in his comment on the paper by *Gray, Ward* and *Zis, Miller* (1976) points to two fundamental differences between the hypothesis of a currency area and the actual world of the Bretton Woods system, namely the absence from the latter of both a common monetary policy towards inflation and income and of pegged forward exchange rates. If the presence of one fundamental precondition for the survival of a common currency area and the absence of exchange controls (see also *Friedman* (1976)) are not secured, *Miller* wonders how one could possibly consider national currencies to be perfect substitutes in supply and hence safely aggregate over them.

If the analytical validity of the aggregation procedure does not go unchallenged, the empirical results that have become available appear to be even less firm and encouraging; in fact, by looking at the three studies by *Gray, Ward* and *Zis* (1976) and by *Frowen* and *Kouris* (1977, 1979), one can not escape the impression that the case for a well-defined and stable demand for money function over the period up to the second quarter of 1971 is far from being established.

As for the third scenario, the post-1971 world, things should not be too controversial, for no matter how one looks at the problem, and in spite of the fact that as national rates of inflation differ around the world one really wonders what the purpose of the whole exercise of estimating the world demand for money is, it is fairly obvious that under the new circumstances the very notion of a world demand for or supply of money does not make much sense. First, what flexible exchange rates do is to make national currencies perfect nonsubstitutes on the supply side, so that the exercise of aggregating is fairly empty. Second, how do we define a world price level that is independent of both exchange rate changes and deviations from PPP and hence how can world money supply, world money demand, and disequilibrium money be defined in real terms? Notice that even if PPP did hold (or, if it did not hold, PPP exchange rates were used) so that an appropriate definition for the world price level were found, we would still have to define the world money stock as a composite basket of national currencies with a

constant unit effective exchange rate (*Girton* and *Roper* (1981)), which, of course, is not what is usually called the world money stock.

But let us suppose that aggregation is a possible procedure and then look into the potential degrees of stability or instability in the resulting world demand for money function. To make such function unstable it takes as little as a changing distribution (given the mean) of inflation and hence of the opportunity cost of holding money around the world, in conjunction with a money demand function where the rate of interest enters in a multiplicative fashion (*Miller* (1976)). Or, one could recall that if PPP does not hold and even if exchange rates are fixed, it is only when demands for single currencies are identical, which, of course, has never been found to be the case, that the world demand for money can be expected to be stable (*Duck* and *Zis* (1978)). What is amazing, of course, is to see that some of those who are basically trying to draw our attention to the fluctuations in the real exchange rates also tend to make use of the notion of a well defined and stable world money demand; *McKinnon* (1982a) is just a case in point as he writes "because national price levels can easily be detached from each other …".

The empirical evidence on the existence and stability of the world demand for money over the post-1971 period that was put forward by *Frowen* and *Kouris* (1977) seemed to show that such a function was indeed unstable; since the paper by Frowen and Kouris is the only one that we know of, it builds on a cross-section kind of analysis and its sample period ends with 1974: IV, we thought that, notwithstanding all the above-mentioned analytical problems, a new set of estimates would be worthwhile getting and looking at.

III.

Our definition of money corresponds to M1[2] income is taken to be GNP, world money and income are computed on the basis of current exchange rates,[3] centered on mid-quarter and deflated by population and prices, world prices are a GNP-weighted average of national retail price indexes; as for the proxy for the opportunity cost of holding money two alternative variables will be tried out, the standard Eurodollar rate and a weighted average of the Eurodollar rate net of the expected change in the exchange

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[2] We pick up M1 because *McKinnon* uses it. M1, however, is also used in the studies by *Gray, Ward* and *Zis* (1976) and *Frowen* and *Kouris* (1977, 1979), so that a comparison between our result and theirs becomes possible.

[3] Later on we will go back to this and find out what happens when base period exchange rates are used. Money and income figures are U.S. dollars.

rate with the U.S. dollar;[4] finally, in order to stick to the case of countries the currencies of which are (allegedly) highly substitutable in demand (we are then stacking the carts in favour of the hypothesis of a well defined and stable world money demand) the World is defined to be the sum of the United States, Germany and Japan. Sources and definitions are given in the Appendix.

The money demand equation is very simple; the desired world stock of money (m_t^*) depends on actual income (Y_t) and the interest rate (R_t), and actual money balances adjust by a fraction, k, of the gap between desired and actual money holdings. Formally:

(1)
$$m_t^* = a + b Y_t + c R_t$$

(2)
$$m_t - m_{t-1} = k(m_t^* - m_{t-1}) + u_t$$

Money and income are in natural logarithms, while R is in natural values in order not to constrain the interest elasticity to be the same all the way through in a situation where the interest rate displays an upward trend.[5]

The equation is fitted (by NLLS) first to the whole sample period 1961: I - 1980: IV and then to the two subsamples that correspond to the fixed and flexible exchange rate periods; furthermore, in order to look into the specific problem of the stability of the world money demand over the flexible exchange rate period, the equation is also fitted to two non-overlapping sub-samples, 1971: III - 1975: II and 1975: III - 1980: IV, and a set of recursive estimates is also obtained.

Table 1 gives a first set of results. In equation (1) the three relevant parameters, b, c and k, turn out to have the correct sign, to be statistically significant and fairly reasonable in absolute values; the implied elasticity with respect to the Eurodollar rate is -0.05. As we focus on the fixed exchange rate period – see equation (2) – the picture changes, both b and c are much lower, the interest rate variable is not significant and the S.E. value is about fifty percent of what it was before; the overall result then turns out to be quite close to the one described in *Gray, Ward* and *Zis* (1976).[6]

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[4] The latter was employed over the flexible exchange rate period only. Of course interest rates and exchange rates are quarterly averages. The expected change in the exchange rate was proxied by the 90-day premium or discount on the U.S. dollar.

[5] The replacement of actual income by permanent income (and the consequent inclusion of a learning process parameter) was tried at some stage and dropped because it did not lead to any significant improvement in the overall fit and stability of the function.

In equation (3) we have the results for the flexible exchange rate period; the elasticity with respect to income is twice as big as the one we just saw, the Eurodollar rate is strongly significant and the speed of adjustment seems to be faster. In equation (3') the alternative proxy for the opportunity cost of holding money is tried out; the difference with the results in equation (2) persists.[7]

Table 1: World Money Demand – World GNP at Current Exchange Rates
(t-statistics in parenthesis)

Equation Number	Sample Period	a	b	c	k	ϱ*	S. E. (X 100)
(1)	1961: I – 1980: IV	−.964 (−3.288)	.801 (11.922)	−.007 (−3.485)	.493 (7.621)	.851 (13.415)	.920
(2)	1961: I – 1971: II	−1.948 (6.421)	.583 (8.914)	−.002 (−.863)	.445 (6.894)	.730 (5.568)	.466
(3)	1971: III – 1980: IV	.752 (1.151)	1.253 (8.067)	0.006 (−3.097)	.649 (6.886)	.957 (22.430)	1.006
(3')	1972: I – 1980: IV	−.001 (0.001)	1.064 (7.210)	−.004 (−1.827)	.659 (5.662)	.936 (15.090)	1.149

* First order autocorrelation parameter.

Table 2 gives a set of results that were obtained in order to find out about the stability of world money demand over the flexible exchange rate period;[8] the overall impression is that on the whole the function is better-defined and more stable than some of those for individual currencies that have been found over the last few years.

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[6] The order of magnitude of b, k and c as well as the t-statistics on the interest rate variable appear to be the same. On the other hand, *Frowen* and *Kouris* (1977) came out with an elasticity of about 2.0 with respect to income and of −0.6 with respect to the eurodollar rate, which were probably due to a fairly unreasonably low estimate for k of 0.06. But perhaps one should not insist on contrasting Frowen and Kouris' (1977) results with ours since in the two studies world GNP has been computed in two different ways and this – as we will see – adds considerably to the already existing differences in results due to their use of a cross-section kind of estimation technique and of a slightly different sample period. A more meaningful exercise would be to look at the results Frowen and Kouris published in their subsequent (1979) study; there we come across a k value of 0.20 and two elasticities with respect to income and interest rates of about 0.85 and −0.10.

[7] Notice that the interest rate variable is only marginally significant. One way of looking at this result would be to say that changes in the Eurodollar rate may be due mainly to swings in the world demand for credit.

[8] The standard Eurodollar rate is used here; nothing changes if the alternative variable is employed.

IV.

One possible objection to the above results relates to the way world GNP and M1 figures have been computed, which, incidentally, is the problem raised by *Frowen* and *Kouris* (1979) in their reply to *Zis* (1978). Let's take money first. As far as this variable is concerned, there should not be any problem in the sense that, given what has been said in Section II, it is clear that one must not use a fixed base period exchange rate; indeed, the use of different exchange rates over time is just a way to recognize that from an analytical viewpoint aggregating is impaired by any change in the exchange rate. In other words, the choice to resort to the use of current exchange rates is to be viewed as the least wrong one. However, when it comes to real income one could certainly argue that the use of current exchange rates might translate into spurious correlation among variables and hence into biased estimates. Since there is more than one grain of truth to the objection, and indeed, a glance at the way the absolute values of the b coefficient behave as the flexible exchange rate period is added and dropped – see Table 1 – already confirms that, it was decided to re-compute world GNP on the basis of the 1963 exchange rate and then reestimate the equations. Results are given in Tables 3 and 4.

What emerges from Table 3 is the following: the c estimate is twice as large as before and less significant, k falls and b rises dramatically, particu-

Table 2: **World Money Demand – World GNP at Current Exchange Rates**
(t-statistics in parenthesis)

Equation Number	Sample Period	a	b	c	k	ϱ	S. E. (X 100)
(1)	1971: III – 1975: II	.255 (.104)	1.106 (2.006)	−.006 (1.313)	.527 (2.174)	.923 (3.254)	1.026
(2)	1975: III – 1980: IV	1.270 (1.813)	1.379 (7.911)	−0.006 (2.636)	.734 (6.343)	.893 (11.654)	.954
(3)	1971: III – 1976: II	.378 (.221)	1.144 (2.970)	−.006 (1.543)	.524 (3.006)	.938 (6.396)	.975
(4)	1971: III – 1977: II	.071 (0.53)	1.094 (4.221)	−.005 (−1.711)	.537 (3.867)	.969 (10.313)	.886
(5)	1971: III – 1978: II	.614 (.645)	1.200 (5.175)	−.006 (−1.613)	.516 (4.084)	.920 (12.928)	.983
(6)	1971: III – 1979: II	.444 (.590)	1.194 (6.943)	−.004 (−1.658)	.632 (5.936)	.978 (18.111)	.975
(7)	1971: III – 1980: II	.720 (.979)	1.256 (7.673)	−.007 (−2.916)	.626 (6.466)	.966 (20.807)	1.015

larly over the flexible exchange rate period; the impression is that, as the spurious correlation between world money and income is removed and the coefficient on the latter is allowed to deviate from one, this might jump around and crowd out the interest rate variable. Table 4 says just that; the interest rate variable is never significant[9] while a, b and k appear to be quite unstable. The message then is quite different from the one conveyed by Table 2.

Table 3: **World Money Demand – World GNP at 1963 Exchange Rates**
(t-statistics in parenthesis)

Equation Number	Sample Period	a	b	c	k	ϱ	S. E. (X 100)
(1)	1961: I – 1980: IV	.696 (.933)	1.152 (7.050)	−.016 (−2.376)	.243 (3.176)	.760 (7.599)	1.126
(2)	1961: I – 1971: II	−1.839 (−5.403)	.607 (8.248)	−.003 (−.883)	.430 (6.558)	.747 (5.528)	.485
(3)	1971: III – 1980: IV	3.524 (1.462)	1.831 (3.263)	−.013 (−1.415)	.334 (1.712)	.666 (3.446)	1.520
(3′)	1972: I – 1980: IV	4.838 (1.775)	2.144 (3.378)	−.014 (1.449)	.324 (1.909)	.620 (3.598)	1.516

Table 4: **World Money Demand – World GNP at 1963 Exchange Rates**
(t-statistics in parenthesis)

Equation Number	Sample Period	a	b	c	k	ϱ	S. E. (X 100)
(1)	1971: III – 1975: II	2.115 (1.134)	1.505 (3.471)	−.008 (−1.104)	.494 (2.223)	.416 (1.270)	1.289
(2)	1975: III – 1980: IV	7.070 (3.139)	2.695 (5.076)	−.009 (−1.450)	.485 (2.126)	.508 (2.613)	1.654
(3)	1971: III – 1976: II	.940 (.199)	1.229 (1.120)	−.008 (−.629)	.322 (.926)	.689 (1.801)	1.315
(4)	1971: III – 1977: II	.096 (.028)	1.033 (1.279)	−.007 (−.670)	.323 (.953)	.714 (2.053)	1.197
(5)	1971: III – 1978: II	3.821 (.750)	1.905 (1.607)	−.011 (−.697)	.237 (1.107)	.724 (3.653)	1.294
(6)	1971: III – 1979: II	2.510 (.916)	1.606 (2.502)	−.006 (−.639)	.344 (1.604)	.721 (3.207)	1.476
(7)	1971: III – 1980: II	3.667 (1.231)	1.860 (2.703)	−.016 (−1.130)	.288 (1.416)	.668 (3.333)	1.499

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[9] This does not change if the alternative interest rate variable is employed, as equation (3′), Table 3 already shows.

V.

The conclusions are the following. First, in a world under flexible exchange rates and with systematic deviations from PPP, one should be aware of the analytical problems he runs into when making use of the concept of a world demand for money. Second, it turns out that even when the world is defined to be the sum of the United States, Japan and Germany and therefore some of the shocks to demands for single currencies cancel out with aggregation, the empirical evidence is far from being one-sided in favour of the hypothesis of a well defined and stable world money demand; all in all then we must refrain from suggesting that it would pay to switch from domestic to world monetary targets.

Appendix

Data Definitions and Sources

Population.	Source IFS, line 99 Z. Annual series are mid-year estimates, i.e., end-Q2. Quarterly interpolation applied by assuming equal increases in each quarter. Consecutive quarters were then averaged to obtain mid-quarter estimates.
GNP.	Source: IFS, line 99 A. Data seasonally adjusted converted to billions of dollars and averaged to obtain midquarter.
Eurodollar.	Source: IFS – U.K. page, line 60 D.
Exchange rate.	Source: IFS, line rf.
Consumer prices.	Source: IFS, line 63. Data: period averages.
M1 (money).	Source: IFS, line 34 end-of-period. Data: seasonally adjusted, transformed to U.S. dollars and averaged to obtain mid-quarter data.

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Zusammenfassung

Sollte die Hypothese einer klar definierten und stabilen Weltnachfrage nach M1 wieder in Kraft gesetzt werden?

Es gibt die Auffassung, daß Währungssubstitution zu Instabilitäten der Nachfrage nach einzelnen Währungen führt und so die Bemühungen der nationalen Zentralnotenbanken unterminiert, die Wirtschaft auf einem stabilen Pfad heimischen Geldmengenwachstums zu halten und auf diese Weise zu beeinflussen. Nach Ansicht verschiedener Analytiker wäre es unter diesen Umständen erforderlich, die Weltgeldmenge zu kontrollieren.

Eine zentrale Voraussetzung für diese Analysen bildet die Hypothese, daß es eine klar definierte und stabile Weltgeldnachfrage gibt. Aufgabe dieser Untersuchung ist es, festzustellen, ob diese Hypothese analytisch und empirisch gültig ist. Der Aufsatz umfaßt zwei Hauptteile. Der erste ist analytischer Natur und gibt die Bedingungen an, unter denen es richtig bzw. falsch ist, daß Konzept einer Weltgeldnachfrage zu verwenden und diese Nachfrage als stabil zu erwarten. Insbesondere wird betont, daß man sich unter den Bedingungen flexibler Wechselkurse und systematischer Abweichungen von der Kaufkraftparität der Schwäche dieses Konzeptes bewußt sein sollte. Im zweiten Teil werden einige wenige empirische Ergebnisse vorgelegt. Es zeigt sich, daß die empirische Evidenz die Hypothese einer klar definierten und stabilen Weltgeldnachfrage nicht bestätigt.

Summary

Should the Hypothesis of a Well Defined and Stable World Demand for M1 be Reinstatet?

Currency substitution is said to lead to instabilities in demand for individual currencies and undermine the attempts by the national monetary authorities to monitor the economy by keeping domestic monetary growth on a steady path. According

to various analysts, what is needed under these circumstances is control over the world money stock.

Central to these analyses is the hypothesis of the existence of a well defined and stable world money demand. The purpose of this paper is to see whether this hypothesis is analytically and empirically valid. It is devided into two major sections. The former is analytical and indicates the circumstances under which it might or might not be correct to make use of the concept of world money demand and expect such demand to be stable. In particular, it stresses that in a world under flexible exchange rates and with systematic deviations from PPP, one should be aware of the weakness of this concept. The latter section gives a few empirical results. It turns out that the evidence does not support the hypothesis of a well defined and stable world money demand.

Résumé

Faut-il rétablir l'hypothèse d'une demande mondiale de M1 bien définie et stable?

La substitution monétaire rendrait instable la demande de monnaies individuelles et affaiblirait les efforts des autorités monétaires nationales visant à contrôler l'économie en maintenant constante la croissance de monnaie nationale. Différents analystes sont d'avis qu'il est nécessaire dans ces circonstances de contrôler le stock de monnaie mondial.

Au centre de ces analyses se trouve l'hypothèse de l'existence d'une demande mondiale de monnaie bien définie et stable. Le présent travial examine si cette hypothèse est analytiquement et empiriquement valable. Il se divise en deux parties principales. La première partie est analytique et indique les circonstances sous lesquelles il est correct ou non d'utiliser le concept de la demande de monnaie mondiale et d'attendre de celle-ci qu'elle soit stable. Elle souligne en particulier qu'il faut être conscient de la faiblesse de ce concept dans un monde de taux de change flexibles et de déviations systématiques de PPP. La deuxième partie donne quelques résultats empiriques. Il en résulte qu'il n'est pas évident de supporter l'hypothèse d'une demande de monnaie mondiale bien définie et stable.