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Alternative Definitions of Money in an Open Economy: The Case of West Germany[1]

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I. Introduction

The existence of a stable demand for money function and control of the monetary aggregates, are the necessary conditions for the conduct of an effective monetary policy. However, if the monetary aggregates are not defined and measured properly, they cannot be used effectively as intermediate monetary targets.

In recent years, there have been continuous changes in the domestic payments mechanism which can be attributed in part to the increase in the financial interdependence among economies and the emergence of the Eurocurrency market. Consequently, foreign held demand and time deposits with the domestic banks-related to the Eurocurrency market- and domestic non-bank deposits in foreign currencies have expanded sharply. These developments have created substantial controversy as to whether the current definitions of the monetary aggregates are appropriate and whether revised defnitions and even a major reformulation of monetary analysis are warranted.[2]

By selecting the domestic monetary aggregates, rather than the total aggregates, as intermediate monetary targets the central bank could miss some of the effects of the foreign and the Eurocurrency deposits. Consequently, they may be misled into following, for instance, more expansionary domestic policies than if they had considered the total money supply.

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[2] See *Hamburger* (1977), who dealt with the issue of the demand for money in an open economy in the case of Germany and the United Kingdom.

This paper considers whether the current definitions of the domestic monetary aggregate are appropriate for an open economy or whether they should be redefined to include foreign owned deposits at domestic banks and Eurocurrency deposits of residents. This issue is given both theoretical and empirical considerations. We first review the issue concerning the concept of money in an open economy and then examine it empirically in the case of West Germany.

II. The Concept of Money in an Open Economy

In an open economy no purely domestic definition of the money stock can be completely satisfactory,[3] and there is no theory or precise empirical test to determine how useful different concepts of money are as intermediate targets for monetary policy. As the economy becomes more open, however, the significance of foreign monetary components increases and their inclusion in the domestic monetary aggregates may be warranted. Hence, the ad hoc test for inclusion or exclusion of foreign monetary components is the relative openness of the economy and its financial sector.

The definition of the domestic money supply used by most industrial countries focuses on non-bank residents' holdings of domestic bank liabilities denominated in domestic currency.[4] For instance, the most common definition of M_1 includes currency in circulation outside banks plus sight (or demand) deposits denominated in domestic currency held by non-bank residents with the commercial banks or with the banking system. The broader definition of money, M_2 or M_1 plus quasi money, is commonly composed of either M_1 plus savings and/or time deposits denominated in both domestic and foreign currencies and held by non-bank residents with the commercial and savings banks or with the entire banking system. The alternative definition includes, usually, M_1 plus all deposits with the banking system other than those included in M_1, called quasi money. All concepts of the European and the U. S. monetary aggregates exclude Eurocurrency deposits.

According to our recent survey of the definition of money by OECD countries, fourteen out of the sixteen countries surveyed require that M_1 be held by non-bank residents, while only eleven of them require de-

[3] See report of the Advisory Committee on Monetary Statistics (1976).
[4] OECD (1977).

posit denomination in domestic currency.[5] The U. S. and French definition of M_1 includes foreign held deposits at domestic banks. As far as the broader definition of money (M_2 or M_1 plus quasi money) is concerned, twelve out of the sixteen countries require non-bank holding of the money supply while only three of them require denomination in domestic currency. Four major countries, the U. S., Japan, France and Spain, include in their broader definition of money foreign held deposits with the domestic banks, while thirteen out of the sixteen countries surveyed include foreign domestic deposits in their domestic money supply.

1. The Hypothesis

We hypothesize that the current definitions of the domestic money supply are inappropriate for an open economy and they should be redefined in two ways, otherwise they cannot be used effectively as intermediate monetary targets:

> First, by including in the domestic money supply foreign non-bank holdings of domestic deposits denominated in both domestic and foreign currencies (i. e., foreign holdings of deposits in foreign currency are Eurocurrency components). Second, by including in the domestic money supply domestic non-bank deposits denominated in foreign currency (i. e., Eurocurrency deposits).

Methodologically, this hypothesis can be substantiated in several ways:

a) one method would be identifying similar characteristics between foreign non-bank owned domestic and Eurocurrency deposits of non-bank residents, and domestic money.

b) Alternatively, by making the case for their inclusion in the domestic money stock using similar arguments and procedures for the empirical selection of various financial assets for inclusion in the domestic money supply in a closed economy, or

c) by showing empirically that the inclusion of foreign non-bank domestic held and Eurocurrency deposits satisfies the criteria for the most appropriate definition of domestic money supply.

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[5] Own survey of OECD (1977).

2. *Foreign Owned Deposits*

The most common definition of the narrow money supply concept used by the OECD countries excludes foreign held deposits with domestic banks. Such deposits in German banks may be denominated either in foreign currency (Eurocurrency deposit) or in domestic currency (the "monetary base" on which the Euro-DM expands) and held by either banks or non-bank public. It is evident from the data presented below that these components are particularly significant in Germany (as opposed to the U. S.), where foreign held deposits are relatively large.

For instance, in West Germany in July 1976 sight deposits due to the foreign banks and non-bank public reached DM 12.8 billion, or 7.14 percent of M_1, while sight and time deposits amounted to DM 20.5 billion, or 8.6 percent of M_2.[6] However, at the end of June 1976, U. S. commercial banks' demand and time deposits due to foreign banks and non-bank public were $ 8.1 billion or 2.67 percent of M_1, while demand and time deposits were $ 20.4 billion or 2.91 percent of M_2.[7]

The impact of foreign held deposits on the domestic monetary aggregates and on monetary conditions can be demonstrated when it is considered within the context of the balance of payments. A basic balance-of-payments deficit that is offset by an equal inflow of funds in the form of foreign deposits reduces domestically held deposits, and thus the money supply. Total reserves and deposits in the banking system are unchanged, unless the reserve requirement ratio on foreign deposits differs. If it is higher, total reserves required to support deposits decline, but if it is lower, it expands. In the case of foreign non-bank deposits denominated in foreign currency, the bankings system's reserves do not increase, unless the banks convert these deposits at the central bank.

Hence, the exclusion of foreign held domestic deposits denominated in the domestic currency from the common definition of the narrowly defined domestic money supply raises a question concerning the difference between total and domestically owned money stock. While there is no change in the monetary base or total bank reserves and bank deposits, the domestic money supply, defined as the sum of currency in

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[6] Calculated from the Monthly Report of the *Deutsche Bundesbank*, December, 1976.

[7] Calculated from the *Federal Reserve Bulletin*, May, 1977.

circulation and residents deposits, declines. This might lead to an increase in the velocity of money and interest rates.

3. *Eurocurrency Deposits and Their Characteristics*

A case can be made for treating non-bank Eurocurrency deposits as money on the ground that these deposits fit into a broader definition of the money supply. Eurocurrency deposits are defined as bank deposits denominated in other currencies than that of the country in which the issuing banks are located. Accordingly, foreign held deposits denominated in foreign currency in West Germany can be considered as part of the Eurocurrency market and can be analyzed in this context.

The narrowly defined Eurocurrency market reached $ 310 billion at the end of 1976, of which $ 230 billion were denominated in U. S. dollars and $ 80 billion in other foreign currencies.[8] Following the U. S. dollar the German mark was the second most significant currency in the market amounting to $ 47 billion.

The Eurocurrency market is primarily an international interbank deposit market, of which only a small portion is transacted with the non-bank public. For instance, in 1976 about 12.8 percent und 11.1 percent of the market liabilities denominated in United States dollars and in European currencies, respectively, were due to the non-bank public, while over $ 50 billion or over 20 percent of the aggregate sources of funds were used by the non-bank public.[9]

Whether the Eurocurrency market consists of banks or of financial intermediaires which do not create money, but only increase the efficiency with which it is used, they offer assets which are near money. Eurocurrency liabilities are interest bearing and they are issued by banks to banks and non-bank residents and non-residents and their maturities are accomodated to depositors needs.

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[8] According to the Bank for International Settlements (BIS) definition, the narrowly defined market includes Eurocurrency assets and liabilities of eight reporting European countries: Belgium - Luxembourg, France, Germany, Italy, Netherlands, Sweden. Switzerland and the United Kingdom.

The broadest definition of the Eurocurrency market is measured by the external assets or liabilities denominated in foreign currency of banks in ten reporting countries and the U.S., as well as the foreign branches of U.S. banks in the Caribbean and the Far East. This market reached about $ 427 billion in December 1976.

For a thorough treatment of the Eurocurrency market see *Poniachek* (1979).

[9] Our estimates are based on the Bank for International Settlements, 1978.

Table I shows the maturity profile of the Eurocurrency market in London (the London market accounts for about half of the entire market). As of November 1976, over 68 percent of the deposits matured in less than three months (over 21 per cent of the deposits matured in less than 8 days, over 18 percent matured between 8 days to less than one month and about 28 percent matured between one month to less than 3 months). In addition, about 18 percent matured between 3 months to less than 6 months, about 8 percent matured between 6 months to less than 1 year, about 7 percent had a maturity of one year or more.[10]

Regardless of the maturity date and unlike demand deposits in domestic currency, Eurocurrency deposits cannot be used directly as a payment medium. In fact, the same qualification about the degree of moneyness of domestic time and savings deposits and money market paper applies to Eurocurrency deposits. These assets have to be liquidated first to facilitate a payment, i. e., in the case of the Eurodollars they have to be converted into a demand deposit with a bank in the United States to facilitate a payment. These characteristics make Eurocurrency deposits more likely candidates for inclusion in the broader monetary aggregates like M_2 and M_3 than in M_1.

Interbank deposits should be excluded from the relevant money supply statistics, however, since they are not directly related to economic activities. Thus, we maintain that only deposits held by non-bank public should be included in the domestic money supply of the respective countries, which amount to a fraction of the gross size of the Eurocurrency market. In the case of the eight European countries, total deposits due to non-bank public amounted at the end of 1976 to a total of $ 39 billion out of a market size of $ 310 billion.[11]

The Euromarkets may have led to an increase in the measured velocity of, for example, M_1 or M_2 in at least two different ways. First,

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[10] Calculated from the Bank of England (1977).

[11] According to *Mayer* (1976) on balance what would have to be added to the domestic monetary aggregates, expressed as a percentage of total world financial assets, would amount to 2 - 3 percent. He adds, however, that the economic impact of the Euromarket cannot be analyzed by mechanically applying the analogy of a relatively closed national commercial banking system. The Eurocurrency market derives its economic importance mainly from its role as a channel for international money and capital flows which links the various national financial markets and intensifies their national interaction.

the existence of the Euromarkets and their improved facilities for borrowing may have reduced the demand for domestic money by reducing the precautionary demand for money balances. This could cause an increase in velocity of domestic balances and hence in prices, unless it is offset by a tightening of monetary policy. Second, it is possible that some part of the Eurocurrency aggregates may play the same role as national money supplies. Therefore, the failure to count these Eurocurrency items in national monetary statistics would show up as an increase in measured velocity, as calculated relative to the domestic money stock, and hence as an increase in prices.

The domestic banking system (say, the West German banks) that acquires Eurocurrency deposits cannot increase its central bank reserves or the monetary base unless it is able to convert it at the central bank. By conversion of foreign deposits the banking system obtains an additional and autonomous source to expand its reserves. This in turn would have an expanding impact on domestic money and credit, unless the central bank offsets it.

In addition, by acquiring Eurocurrency deposits, the banking system can accomodate credit requests related to foreign trade. In this case the banks do not have to convert (at the central bank) domestic funds into foreign exchange, thereby causing a contraction of bank reserves. Further, if domestic lending can be made in foreign currencies, domestic credit may be expanded with foreign deposits. In this case the link between domestic credit and the monetary base declines.

III. The Empirical Selection of Money in a Closed Economy

The controversy on the alternative definitions of the domestic money stock is based primarily on two approaches; one is theoretical and the other is empirical. According to the theoretical definition, money includes those assets which have characteristics consistent with the theoretical definition of money as a means of payments — which correspond to the narrow definition of money, M_1 — or as a temporary abode of purchasing power — which corresponds to the broader definition of money supply.

The empirical approach estimates demand for money functions with alternative definitions of the money stock. The assets selected as the money stock satisfy one or more of the following criteria:

a) stability of demand for money function;

b) a high degree of substitutability among its financial assets; and

c) ability of the selected money stock to explain or predict changes in variables of policy concern, e. g., GNP, or the ability of the estimated function to predict money stock.

Estimates of money demand functions for alternative definitions of the money stock have been used primarily to determine whether time deposits at commercial banks should be included in the definition of money.[12] The most important criterion as far as the empirical definition of money is concerned has been the identification and measurement of a stable aggregate demand for money function.[13] The best money-demand function is expected to have fewer independent variables than alternative definitions. In addition, the selected money stock should be able to explain statistically variations in aggregate nominal income or some other significant aggregate indicator. A broader money concept that includes time deposits and/or other assets of financial intermediaries is not useful unless it is more stable than a narrower definition in terms of interest rates and income.

To determine the substitutability between M_1 and liabilities of non-bank financial intermediaries, the yields on the latter's liabilities are used as explanatory variables in the demand for M_1. The selected assets of the money stock should have a high degree of cross-elasticity of substitution. Accordingly, the criterion in defining alternative money concepts is whether time deposits or some other assets of financial intermediaries are sufficiently close substitutes for demand deposits to warrant inclusion in the domestic money stock.[14]

In their study for the Commission on Money and Credit, *Friedman* and *Meiselman* (1963) have estimated money-demand functions under alternative definitions of the money stock. They selected the financial assets to be included in money supply according to two criteria:

a) If the sum of these assets yields the highest correlation with income, and

b) if the correlation of the sum with income is higher than that of any of the components separately.

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[12] See D. *Laidler* (1969).
[13] *Ibid.*
[14] *Ibid.*

Empirical findings indicate that although inclusion of savings-type deposits beyond time deposits at commercial banks satisfies the dual *Friedman - Meiselman* criteria for the definition of money, most frequently it adds relatively little explanatory power to the definition of money.[15]

Further, all evidence suggests that a highly stable demand for money function can be identified whether time deposits are included in the definition of money or not.[16] Therefore, the conclusion is warranted that the liabilities of other institutions do not appear to have been such close substitutes. *Laidler* claims that although some intermediaries' assets have become important substitutes for money, this substitutability relationship appears to be stable. Hence, it is not more difficult to predict commercial bank liabilities, and control of the narrowly defined money stock can be maintained. In sum, the conclusion that emerges is that the stability of the demand function for money is largely independent of whether money is defined to include or exclude time deposits.[17]

Other empirical methods to select the most appropriate definition of money involve estimations of demand functions with alternative definitions of the money stock and applications of selected criteria based on:[18]

a) their in-sample and/or out-of-sample predictive performance;

b) the aggregate ability of the components of the money stock to predict the money supply, however defined; and

c) their relative stability.

In comparing the definitions of M_1 and M_2, for instance, the choice of the latter requires that the M_2 equation produces:

a) smaller prediction errors than the M_2 equation, and

b) a more accurate prediction of M_2 than the predictions derived from separate equations for M_1 and other time and savings deposits at commercial banks.

Tobin and *Brainard* claim that the existence of the intermediary does not mean that monetary control is ineffective.

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[15] G. G. *Kaufmann* (1969).
[16] *Laidler* (1969), *op. cit.*
[17] *Ibid.*
[18] L. H. *Meyer* (1976).

... it normally means that control is less effective, in the sense that a dollar reduction in the supply of currency brings about a smaller increase in interest rate when it can be counteracted by expansion of the intermediary. The possibility of substituting the intermediary's liabilities for currency offers a partial escape from the monetary restriction. But so long as the intermediary's liabilities are an imperfect substitute for currency, the escape is only partial.[19]

IV. Empirical Evidence

To examine the appropriate definitions of the domestic money supply in an open economy we apply two empirical methods. Both methods estimate demand for money functions under alternative definitions of the money stock, applied to the case of West Germany.

The first method applies *Friedman - Meiselman's* dual criteria based on money-income correlation. Accordingly, the best definition of money must have the highest correlation with income than any of the components separately. The second method estimates demand functions for alternative definitions of the money stock and compares their in-sample and out-of-sample predictive performance.

1. Income as a Function of Money

The first empirical method applies regression analysis of quarterly data from 1968 IV to 1976 IV, where GNP (denoted by Y) is regressed on the money supply, however defined

$$Y = a_o + a_1 M_i, \qquad i = 1, 2, \ldots, n \tag{1}$$

Four definitions of money supply are analyzed, of which the first two are the common concepts of the money stock currently used in Germany, whereas the latter two were constructed for testing purposes. The definitions are as follows:

M_1 = the conventional definition of M_1

M_2 = M_1 plus time deposits with maturities of less than four years

$M_1 + FSD$ = M_1 plus foreign sight deposits (FSD)

$M_2 + FSD + FTD$ = M_2 plus foreign sight deposits (FSD) and foreign time deposits (FTD)

[19] J. *Tobin* and W. C. *Brainard* (1963).

FSD and FTD include residents' deposits in domestic banks denominated in foreign currency and non-residents' domestic deposits in both domestic and foreign currency. These deposits are components of the Eurocurrency market.

The degree of correlation between income and money, inclusive or exclusive of foreign owned deposits, is examined by equation (1).

2. *Demand Function*

The second empirical method for selecting the most appropriate definition of money estimates demand functions for money in logarithm forms as allows:

$$\log M_i = b_0 + b_1 \log R + b_2 \log Y + u, \; i = 1, 2, \ldots, n \tag{2}$$

where M_i is one of the four measures of the money supply, as defined above. Y is nominal GNP and R is the domestic three month loan rate. This equation is the convential demand for money function and the expected coefficient signs are as follows:

$$b_1 < 0, b_2 > 0$$

The estimated equations for the various definitions of the money supply are then simulated for the in-sample and out-of-sample periods. The predictive performance of alternative equations for M_1, M_1 + FSD, M_2 and M_2 + FSD + FTD are determined by using both in-sample and out-of-sample dynamic simulations.

More specifically, in the case of in-sample simulation the demand for money functions are estimated for the various definitions of money over the period 1968 IV - 1976 IV, and then simulated over the above period, thereby producing money stocks forecasts.

In the case of the out-of-sample dynamic simulation, the demand for money functions for the alternative definitions of money are estimated over 1968 IV to 1975 IV. The estimated equations are then simulated over four quarters from 1976 I to 1976 VI, thereby predicting the various money stocks for this period.

In comparing the definitions of M_1 and M_2, for instance, the choice of the latter requires the M_2 equation: a) to yield smaller root-mean-square errors (RMSE) of prediction than the M_1 equation, and b) to produce more accurate prediction of M_2 than the predictions derived from se-

parate equations for M_1 and other time and savings deposits at commercial banks, i. e., smaller RMSEs.[20]

3. *Estimates*

Quarterly estimates of equation (1) — GNP as a function of alternative definitions of money supply — are recorded in Table II. The estimates indicate that while there is no statistical advantage in redefining M_1, a redefinition of M_2 marginally increases R^2 (from $R^2 = 0.954$ in the M_2 equation to $R^2 = 0.958$ for M_2 + FSD + FTD).

The empirical evidence supports the argument for a redefinition of the broader money supply (M_2) concept to include the foreign components (FSD + FTD), while the current definition of the narrow money supply (M_1) concept seems to be superior to or as good as an alternative definition which includes foreign deposits (M_1 + FSD).

Hence, the income money correlation tests (*Friedman - Meiselman* criteria) show, however, that the broader definition of the money supply, inclusive and exclusive of foreign components, is superior to the narrowly defined money supply. It seems that the foreign components (Eurocurrency components) are related to the West German economic activity in the same manner as other components of the broadly defined money supply.

The quarterly regressions of equation (2) for alternative definitions of money supply, and in-sample and out-of-sample prediction statistics are presented in Table III. The R^2 is marginally higher in the M_1 regression ($R^2 = 0.978$) than in the M_1 + FSD ($R^2 = 0.967$). However, in the case of M_2 and M_2 + FSD + FTD regressions the coefficients of determination are the same ($R^2 = 0.971$), but they are lower than in the M_1 regression.

The most widely used criterion for selecting the most appropriate definition of money involves comparison of in-sample and/or out-of-sample predictive performance of money demand equations for alternative definitions of money. This comparison supports the M_1 definition, which yields the best predictive performance among all four types of equations and for both in -sample and out-of-sample tests. Whereas the comparison of the results for M_2 versus M_2 + FSD + FTD yields superior results for the latter on the basis of both in-sample and out-of-sample estimates.

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[20] See for instance H. *Theil* (1961, 1966).

The in-sample predictions show that the root-mean-square error for the M_1 equation (RMSE = 4.0107) is marginally superior to M_1 + FSD (RMSE = 4.1666), whereas M_2 + FSD + FTD (RMSE = 8.6379) is only marginally superior to M_2 (RMSE = 8.6400).

The out-of-sample results show that while M_1 is only marginally superior to M_1 + FSD (FMSE = 3.39315 versus RMSE = 3.41882), M_2 + FSD + FTD is substantially superior to M_2 (RMSE = 18.5404 versus RMSE = 15.2844).

These results suggest that the appropriate comparison is, on the one hand, between M_1 and M_1 + FSD and between M_2 and M_2 +FSD + FTD on the other hand, rather than between M_1 and M_2, inclusive and exclusive of the relevant foreign deposits. These results imply that while the current definition of M_1 is more appropriate than M_1 + FSD, in the case of the broader definitions of the money supply, a redefinition of M_2 to include FSD + FTD is warranted.

In summary, the empirical evidence (based on both the correlation of income with the money supply and the prediction performance) on the alternative definitions of money in an open economy using four alternative definitions of money supports in part our hypothesis:

a) the narrow definition of money seems to be marginally superior to, or as good as an alternative definition of it;

b) the redefinition of the broader money supply, M_2 + FSD + FTD, is superior to the current definition of M_2; and

c) the increase in international financial interdependence through capital flows affects the broader definition of the money supply and may have already undermined the continued usefulness of the M_2 definition.

Table I

Maturity Profile of Eurocurrency Assets and Liabilities in the London Market as of November 16, 1976

Maturity	Percent of Total Liabilities	Percent of Total Claims
Less than 8 days	21.74	16.82
8 days to less than 1 month	18.47	14.53
1 month to less than 3 months	27.95	22.63
3 months to less than 6 months	17.59	14.84
6 months to less than 1 year	7.55	7.18
1 year to less than 3 years	4.95	9.65
3 years and over	1.75	14.35
	100.00	100.00

Source: Percentages were calculated from Bank of England, *Bank of England Quarterly Review*, Vol. 17, No. 3 (December 1977) Table 21.

Table II

Definition of Money in an Open Economy
GNP as a Function of Alternative Definitions of Money Regression Results
Quarterly Estimates, 1968 IV to 1976 IV

	F	R^2	PSER	DW
GNP = 14.6647 + 1.5557 M_1 (1.74) (24.48)	6.E02	0.951	4.73	0.67
GNP = 15.3836 + 1.5197 (M_1 + FSD) (1.83) (24.44)	6.E02	0.951	4.74	0.68
GNP = 26.5468 + 0.875 M_2 (3.47) (25.40)	6.E02	0.954	4.56	1.05
GNP = 28.8288 + 0.8455 (M_2 + FSD + FTD) (3.99) (26.28)	7.E02	0.958	4.26	1.19

Comments: The *t* statistics are shown in parentheses. Goodness-of-fit Statistics are R^2 — the coefficient of determination adjusted for degrees of freedom, *DW* — is the Durbin-Watson statistic, the *F* statistic is given for the number of observations and degree of freedom. *E* denotes an exponential of degree 10.

Table III: **Money Demand Functions for Alternative Definitions of Money Supply**
Quarterly Estimates, 1968 IV - 1976 IV

Definition of Dependent Variables	Estimated period	Constant	Independent Variables log GNP	Independent Variables log R	Goodness of Fit Statistics F	Goodness of Fit Statistics R^2	Goodness of Fit Statistics DW	Root-mean Square Error of Predictions In-sample error[a]
log (M_1)	1968IV - 1976IV	—0.1911	0.9716	—0.0886	7E02	0.978	1.85	4.01077
		(—1.23)	(34.85)	(—5.76)				
log (M_1 + FSD)	1968IV - 1976IV	—0.1907	0.9750	—0.0881	6E02	0.977	1.84	4.166624
		(—1.20)	(34.20)	(—5.61)				
log (M_2)	1968IV - 1976IV	—0.7262	1.1160	0.0524	5E02	0.971	1.19	8.6408
		(—3.67)	(31.41)	(2.68)				
log (M_2 + FSD + FTD)	1968IV - 1976IV	—0.7414	1.263	0.0429	5E02	0.971	1.28	8.63795
		(—3.70)	(30.98)	(2.20)				Out-of-sample error[b]
log (M_1)	1968IV - 1975IV	—0.1792	0.9689	—0.0876	4E02	0.968	1.70	3.39315
		(—0.17)	(34.00)	(—5.70)				
log (M_1 + FSD)	1968IV - 1975IV	—0.1735	0.9712	—0.0867	4E02	0.967	1.78	3.41882
		(—0.94)	(34.20)	(—5.61)				
log (M_2)	1968IV - 1975IV	—0.9045	1.1586	0.0307	4E02	0.970	1.17	18.5404
		(—4.25)	(28.61)	(1.43)				
log (M_1 + FSD + FTD)	1968IV - 1975IV	—0.8532	1.1528	0.0295	4E02	0.969	1.16	15.2844
		(—3.85)	(26.80)	(1.30)				

Comments: The t statistics are shown in parentheses. Goodness-of-fit Statistics are: R^2 is the coefficient of determination adjusted for degrees of freedom, DW is the Durbin-Watson staistic, the F statistic is given for the number of observations and degree of freedom. E denotes an esponential of degree 10.

Notes: a) Root-mean-square (RMSE) for simulation of the estimated equations over the estimated period, 1968 - 1976IV. Errors are in billions of dollars. — b) Root-mean-square error (RMSE) for extrapolation over the period 1976 I - 1976 IV. Errors are in billions of dollars.

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Zusammenfassung

Alternative Gelddefinition in einer offenen Wirtschaft: Aufgezeigt am Beispiel Westdeutschlands

Die Existenz einer stabilen Geldnachfragefunktion und die Kontrolle der monetären Aggregate sind die notwendigen Bedingungen für die Durchführung einer wirksamen Geldpolitik. Jedoch, wenn die monetären Aggregate nicht exakt definiert sind und gemessen werden, können sie nicht wirksam als geldpolitische Zwischenzielgrößen eingesetzt werden. Die Konzepte des binnenwirtschaftlichen Geldangebotes können entweder theoretisch oder empirisch definiert werden.

Veränderungen im inländischen Zahlungsverkehr sowie wachsende finanzielle Verflechtungen zwischen den Ländern durch das Aufkommen des Eurowährungsmarktes führten zu einem starken Anwachsen der Devisenguthaben von Inländern bei inländischen Banken und von ausländischen Nichtbankguthaben inländischer Gelder, die sowohl auf inländischen als

auch auf ausländischen Währungen lauten, von denen manche Bestandteile der Eurowährungen sind. Obgleich es für eine offene Wirtschaft keine exakte Gelddefinition gibt, kann der Ausschluß dieser Bestandteile von den inländischen Geldkonzepten ihren Nutzen für die Geldpolitik verringern, indem sie den Behörden die wirksame Durchführung ihrer Politik erschweren.

Dieser Beitrag prüft die Hypothese, ob die üblichen Definitionen inländischer Geldaggregate für eine offene Wirtschaft geeignet sind oder ob sie neu definiert werden sollten, so daß Auslandsguthaben sowie Eurowährungsguthaben eingeschlossen wären. Dies wurde sowohl theoretisch als auch empirisch analysiert. Stellt man ähnliche Charakteristika zwischen diesen Komponenten und dem Inlandsgeld fest, so kann die Möglichkeit ihrer Aufnahme in das Inlandskapital in Betracht kommen.

Zur empirischen Überprüfung dieser Hypothese wurden für Westdeutschland zwei Methoden angewandt. Geschätzt wurden Geldnachfragefunktionen für alternative Geldvolumendefinitionen, die auf Quartalsdaten IV 1968 bis IV 1976 basieren, wobei das am besten passende Konzept gewählt wurde.

Die erste Methode bedient sich Friedman-Meiselmans Dualkriterium auf der Grundlage der Geld-Einkommens-Korrelation. Entsprechend diesem Kriterium weist die beste Gelddefinition eine höhere Korrelation mit dem Einkommen auf als jede einzelne Komponente für sich. Es wurden vier Definitionen der Geldmenge untersucht, von denen die ersten beiden die gängigen Konzepte des Geldvolumens sind, welche gegenwärtig in Westdeutschland angewandt werden. Die letzten beiden wurden zu Testzwecken entworfen, sie schließen die ausländischen Devisenguthaben von Inländern bei inländischen Banken sowie die inländischen Guthaben von Nichtansässigen ein, wobei diese Guthaben sowohl auf Inlands- als auch in Auslandswährungen lauten können. Die zweite Methode schätzt die Nachfragefunktion für alternative Geldvolumendefinitionen, simuliert sie dann für repräsentative und nicht repräsentative Perioden und vergleicht deren voraussagbare Resultate.

Das Ergebnis unterstützt die Hypothese, daß eine offene Wirtschaft eine Neudefinition der Geldmenge verlangt. In dem Maße wie die Wirtschaft offener wird, wächst die Bedeutung der ausländischen Geldkomponente und berechtigt ihre Einbeziehung in inländische Geldaggregate. Das Resultat zeigt, daß die Eurowährungs-Komponente in der gleichen Beziehung zur westdeutschen Konjunktur stehen wie andere Komponente der weit definierten Geldmenge. Zusammenfassend kann man sagen, daß die wachsende internationale Geldverflechtung durch Kapitalbewegungen eine breitere Definition der Geldmenge begünstigt und damit eine wichtige Kanalisierung für das Inlandsgeld und für die Kreditversorgung bereitstellt.

Summary

Alternative Definitions of Money in an Open Economy: The Case of West Germany

The existence of a stable demand for money function and control of the monetary aggregates, are the necessary conditions for the conduct of an effective monetary policy. However, if the monetary aggregates are not defined and measured properly, they cannot be used effectively as intermediate monetary targets. The concepts of the domestic money supply could be defined either theoretically or empirically.

Changes in the domestic payments mechanism and increased financial interdependence among economies, through the emergence of the Eurocurrency market, led to a sharp expansion of residents' foreign currency deposits at domestic banks and of foreign non-bank holdings of domestic deposits denominated in both domestic and foreign currencies, of which some are Eurocurrency components. Although there is no precise definition of money for an open economy, the exclusion of these components from the domestic money concepts could reduce their usefulness for monetary policy, thereby making it more difficult for the authorities to implement effectively their policies.

This paper examines the hypothesis whether the current definitions of the domestic monetary aggregate are appropriate for an open economy or whether they should be redefined to include foreign owned deposits and Eurocurrency deposits. This is given both theoretical and empirical considerations. By identifying similar characteristics between these components and domestic money, a case can be made for their inclusion in the domestic stock.

To examine the hypothesis empirically, two methods are applied to the case of West Germany, whereby demand for money functions are estimated for alternative definitions of the money stock, based on quarterly data from 1968 IV to 1976 IV, and the most appropriate concept is selected. The first method applies Friedmann-Meiselman's dual criteria based on money-income correlation. Accordingly, the best definition of money must have the highest correlation with income than any of the components separately. Four definitions of money supply are tested, of which the first two are the common concepts of the money stock currently used in Germany, and the latter two were constructed for testing purposes and they include residents' foreign currency deposits in domestic banks and non residents' domestic deposits denominated in both domestic and foreign currency. The second method estimates demand functions for alternative definitions of the money stock, then simulated them for the in-sample and out-of-sample periods, and compares their predictive performance, based on the size of the root-mean-square error (RMSE).

The evidence in the case of Germany supports our hypothesis that a redefinition of the money supply is warranted in an open economy. Hence, as the eocnomy becomes more open, the significance of foreign monetary components increases and their inclusion in the domestic monetary aggregates

may be warranted. The evidence shows that the Euro-currency components are related to the West German economic activity in the same manner as other components of the broadly defined money supply. Additional findings suggest that the narrow definitions of money seems to be marginally superior to or as good as an alternative definition of it: the redefinition of the broader money supply, by including foreign non-bank holdings of deposits in domestic banks and non-bank domestic deposits, is superior to the current definition. of M_2. In summary, it seems that the increase in international financial interdependence through capital flows affects the broader definition of the money supply and provides a significant channel for domestic money and credit substitution.

Résumé

Les définitions alternatives de la monnaie dans une économie ouverte: démonstration pour l'Allemagne fédérale

L'existence d'une fonction stable de demande monétaire et le contrôle des agrégats monétaires sont les conditions indispensables de l'application d'une politique monétaire efficace. Cependant, si les agrégats monétaires ne sont pas définis et mesurés avec exactitude, ils ne peuvent pas être efficacement utilisés comme grandeurs monétaires d'objectifs intérimaires. Les concepts de l'offre monétaire intérieure peuvent se définir tant théoriquement qu'empiriquement.

Des variations dans la circulation domestique des payements et l'interdépendance financière croissante des Etats initiée par le marché des euromonnaies ont provoqué une forte augmentation des avoirs en devises de nationaux auprès des banques domestiques et d'avoirs domestiques non bancaires de non résidents libellés tant en monnaies nationales qu'en monnaies étrangères, qui sont souvent des euro-devises. Même s'il n'existe pas de définition monétaire exacte dans une économie ouverte, l'exclusion de ses composantes des concepts monétaires domestiques peut réduire l'utilité de ceux-ci pour la politique monétaire, puisqu'elle rend aux autorités l'application efficace de leur politique plus malaisée.

L'étude examine l'hypothèse de l'adéquation des définitions usuelles des agrégats monétaires intérieurs à une économie ouverte ou de la nécessité de les redéfinir à l'effet d'y inclure les avoirs à l'étranger et les avoirs en euro-devises. L'on procède à une analyse tant théorique qu'empirique. Si l'on constate des caractéristiques similaires entre ces composantes et la monnaie domestique, l'on pourrait envisager leur intégration au capital domestique.

En vue d'un test empirique de cette hypothèse, l'on a appliqué deux méthodes à l'Allemagne fédérale. L'on a procédé à l'estimation de fonctions de demande monétaire pour des définitions alternatives de volume monétaire qui se basait sur les données trimestrielles IV 1968 à IV 1976, tout en choisissant le concept le plus adéquat.

La première méthode utilise le critère dualiste de Friedman-Meiselman fondé sur la corrélation monnaie-revenu. Selon ce critère, la meilleure défini-

tion monétaire établit avec le revenu une plus haute corrélation qu'avec chacune des composantes. L'on a étudié quatre définitions du volume monétaire dont les deux premières sont les concepts courants de ce volume qui sont actuellement d'application en Allemagne de l'Ouest. Les deux dernières furent élaborées aux fins de l'analyse et elles incluent les avoirs en devises étrangères de résidents auprés de banques domestiques et les avoirs domestiques de non résidents, ces derniers avoirs pouvant être libellés en monnaies domestique et étrangères. La deuxième méthode estime la fonction de demande de définitions alternatives du volume monétaire, en effectue la simulation pour des périodes représentatives et non représentatives et en compare les résultats prévisionnels.

La conclusion soutient l'hypothèse qu'une économie ouverte exige une nouvelle définition de la masse monétaire. A mesure que s'ouvre davantage une économie croît l'importance des composantes monétaires étrangères et se justifie leur inclusion dans les agrégats monétaires domestiques. Les résultats montrent que les composantes euro-devises entretiennent les mêmes relations avec la conjoncture ouest-allemande que les autres composantes de la masse monétaire largement définie. Pour résumer, on peut dire que l'interdépendance monétaire internationale croissante créée par des mouvements de capitaux favorise l'élargissement de la définition de la masse monétaire et offre ainsi une importante canalisation au service de la monnaie domestique et du crédit.