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CURRENCY SUBSTITUTION AND THE DEMAND FOR MONEY IN FIVE EUROPEAN UNION COUNTRIES

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The high degree of economic integration has led to an increased degree of currency substitution in the EU countries, which could bring instability in national money demand functions while an EU-wide money demand function could be more stable. Currency substitution usually takes the form of cross border deposits (CBD), which are not included in the traditional monetary aggregates. Thus, extended monetary aggregates that include the relevant CBDs are defined in this study. In order to investigate the implications of currency substitution for the stability of the demand functions, the traditional and extended monetary aggregates for five EU countries are defined in addition to EU-wide monetary aggregates. The estimated EU-wide demand for extended money appears to be stable suggesting that there is scope for monetary policy at the European level. However, the stability of the area-wide aggregate has been impaired when the relevant CBDs are not included.

JEL classification codes: E41, F33, E52, E47

Key words: currency substitution, cross border deposits, extended monetary aggregates, demand for money, vector autoregression

I. Introduction

The issue of currency substitution has attracted a lot of attention in recent years, as the intensity and rapidity of the transmission of monetary impulses across countries have increased due to the high degree of economic integration

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within the EU, and progressive lifting of constraints on capital flows. Currency substitution implies that individuals in each country allocate their total holdings of money across several countries' currencies, including their domestic currency. This allocation of money balances usually takes the form of cross border deposits (CBD) which can be expected to be sensitive to expected changes in exchange rates, foreign economic variables or banking regulations.

Even though cross border banking activities and their effects on monetary aggregates have increased considerably, especially in the EU countries, they are not included in the traditionally defined monetary aggregates and these monetary aggregates cannot fully reflect the effects of currency substitution. Thus it is proposed to redefine the monetary aggregates, as extended monetary aggregates, so that they include the relevant cross border deposits.

When there is currency substitution in any economy, monetary policy will be affected by foreign economic variables, which may lead to the loss of monetary independence and instabilities in the national demand for money functions. Thus the domestic economy may no longer have monetary autonomy even under flexible exchange rates. Miles (1978) and McKinnon (1982, 1985) argue that although currency substitution may lead to instability in national money demand functions, a global money demand function could still be expected to be more reliable.

Therefore, it is suggested that individual countries, which are financially closely linked, should give up controlling their own monetary aggregates, but should pursue a joint monetary policy targeting an area-wide monetary aggregate. This issue has a great importance in the context of European Union countries and for countries which are candidates for European Union, as well as high inflationary countries that experience currency substitution. Generally, the closer substitutes the European currencies become, the stronger the expected shifts in national money demand functions should be. Because when financial instruments become more identical, small changes in risk-return profiles or expected exchange rates will induce significant currency substitution effects. "So increased exchange rate stability among the ERM currencies, itself strongly desired and necessary to the final stage of the EMU, will certainly augment the instability of the national money demand ..." (Sardelis 1993, p. 24), but an EU-wide money demand function could be stable. In that case, conducting a common monetary policy could be a feasible

alternative and the area-wide monetary aggregate would be expected to be more stable than national aggregates. Then the European Central Bank would be able to use this broad monetary aggregate for the EU as an intermediate target variable for a European money supply policy.

In this study the implications of currency substitution for the stability of national and area-wide money demand function are examined. The extended monetary aggregates for five EU countries, namely France, Germany, Italy, the Netherlands and the UK, are defined and then an area-wide extended monetary aggregate is obtained.¹ After estimating the demand for money functions for each country in addition to an area-wide demand for money function, the economic and stability properties of these estimates are examined. Moreover, the demand for traditional monetary aggregates as well as an area wide demand for traditional money are also estimated in order to compare their stability properties with that of the extended monetary aggregates. The structures of the estimates of the long-run extended and traditional demand for money functions in the five EU and the area-wide monetary aggregates are similar to each other except that of the Netherlands. Moreover, they are all homogenous of degree one in prices and have unitary income elasticities with the exception of Germany and the area-wide aggregates. The basic difference between the traditional and extended monetary aggregate estimates emerges when their stability properties are examined. Even though the extended monetary aggregate estimates are stable, the traditional monetary aggregates of Germany and Italy as well as the area wide traditional monetary aggregates exhibit instabilities.

The paper is organised as follows. The issue of currency substitution is analysed in the following section. The derivation of extended monetary aggregates is discussed in section III. Section IV offers a brief account of the economic model and the estimation method. Estimation results are given in Section V. Finally Section VI concludes.

II. Currency Substitution

Even though the implications of currency substitution have been

¹ Even though a large number of EU countries were considered initially, the absence of data on CBs for other EU countries restricted our analysis.

investigated both theoretically and empirically, there is no agreement concerning the concept and the precise definition of currency substitution in the literature. The term currency substitution may be interpreted in two ways: firstly, that foreign money is used along with the domestic currency in transacting; secondly, that a change in relative cost of holding one currency induces a change in the ratio of domestic to foreign money holdings demanded.² Under the presence of currency substitution, the level of foreign currency balances changes in response to domestic economic variables. In that sense currency substitution refers to the substitution between two monies, which is due to any change in domestic and/or foreign economic variables, or institutional changes. This is consistent with the usage of the term in Cuddington (1983, 1989) and Miles (1978).

McKinnon (1982, 1985, 1996), on the other hand, distinguishes between direct and indirect currency substitution. Direct currency substitution means that people switch between two or more currencies, which compete as a means of payment within the same commodity domain. Indirect currency substitution refers to investors switching between currencies and non-monetary financial assets, such as bonds, denominated in different currencies, which in turn indirectly influences the domestic demand for transaction balances. According to Mizen and Pentecost (1996) direct currency substitution refers to switching between domestic and foreign currencies, whereas indirect currency substitution takes place when domestic residents attempt to become more or less liquid. McKinnon (1996) argues that the process of indirect currency substitution suggests the need for greater international coordination of domestic and foreign monetary policies to stabilize their common price level.

Even though direct and indirect currency substitution can be distinguished in theory, in practice the two processes may occur simultaneously. Then it will be very difficult to distinguish between the concepts of capital mobility and direct and indirect currency substitution. Mizen and Pentecost (1996) argue that this practical ambiguity underlies McKinnon's definition of indirect currency substitution. Cuddington (1989) argues that the concept of currency

² See Lamdany and Dorlhiac (1987) for an early distinction between asset substitution and currency substitution. Calvo and Végh (1996) and Giovannini and Turtelboom (1994) provide surveys for the currency substitution issue.

substitution should focus on the transactions demand for monies, not solely assets and portfolio balances motives. Only this feature of money makes the phenomenon of currency substitution separate from the more general phenomenon of capital mobility.

Giovannini and Turtelboom (1994) distinguish between currency substitution, which is a complete replacement of one currency with another, and currency substitutability, which is the process of one currency becoming a substitute for another. According to Giovannini and Turtelboom (1994) it is not clear from the term substitution whether it refers to a characteristic of currencies, in which case substitutability is to be preferred, or to an equilibrium outcome in which case substitution could be acceptable.

Mizen and Pentecost (1996) add further to the definitions of currency substitution by distinguishing between currency substitution as an equilibrium state, where one currency is substituted, either partially or completely, for another, and currency substitution as a dynamic process, which represents the adjustment of portfolios between equilibria. They argue that there are two ways in which currency substitution can exist: either as a stock of wealth in foreign currency held in the portfolio, or as a flow of wealth into the foreign currency as portfolios are adjusted.

III. Extended Monetary Aggregates

As capital markets have become more integrated and exchange controls have been phased out, the amount of deposits held by EU residents denominated in foreign currency, either held with domestic banks or banks abroad has increased dramatically. Such cross-border deposits can be regarded as reflecting currency substitution. The proportion of these deposits to national broad monetary aggregates has grown very fast for most EU countries.

The extended monetary aggregates, which include the relevant CBDs, can be defined based on one of the following criteria: a) Currency of denomination: the aggregates should include monetary assets denominated in domestic currency; b) Residence: the aggregates should include monetary assets held by the residents of one country; c) The location of the intermediary service: the aggregates should include monetary assets issued by the intermediaries in the country.

Angeloni et al. (1991) summarise all possible combinations of CBDs by means of an eight-cell diagram, which is produced as Table 1. In this table CBD1 (AAA) refers to the deposits held by residents of country A (first index), in their own currency (second index) and in their own country (third index); while CBD6 refers to the deposits held by residents of country A in the currency of country B and in foreign country. Deposits represented by CBD1 are always included in the money stock and are normally by far the largest component. Conversely, CBD8 is always excluded, since the corresponding deposits are money of the rest of the world. Thus, according to the previous definition, the term cross border deposits refers to all deposits included in cells CBD2-CBD7.

Table 1: CBDs in a Two-Country Example

	Residents with domestic banks	Residents with banks abroad	Non-residents with domestic banks	Non-residents with banks abroad
In national currency	CBD1 AAA	CBD2 AAB	CBD3 BAA	CBD4 BAB
In foreign currency	CBD5 ABA	CBD6 ABB	CBD7 BBA	CBD8 BBB

The traditional monetary aggregates of countries considered in this paper, except that of the UK, include only holdings of foreign currency deposits held by domestic residents in domestic banks (CBD5), which is one of six possible component parts of what could be considered currency substitution. Furthermore, none of them contains non-residents deposits either in domestic or foreign currency. But they neglect other types of CBDs, which could reflect currency substitution, such as foreign currency deposits held by domestic residents held abroad (CBD6).

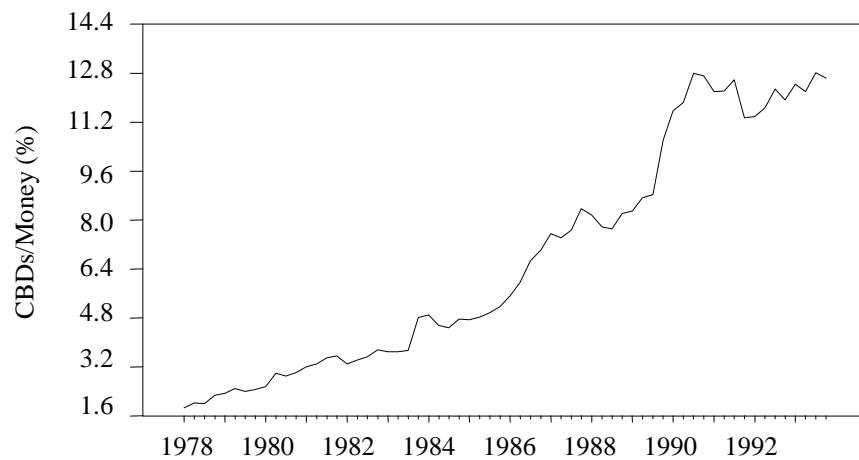
The sum of different combination of CBDs in Table 1 gives rise to various definitions of extended monetary aggregates based on the three different criteria mentioned above. If the extended monetary aggregate is defined on the basis of the criterion of the holder's residence, the relevant aggregate

should include CBD1, CBD2, CBD5 and CBD6. The extended monetary aggregate based on the currency of denomination comprises of CBD1, CBD2, CBD3 and CBD4. Finally, the third extended monetary aggregate based on the bank's location should include CBD1, CBD3, CBD5 and CBD7.

As regards the choice of the most significant concept of money with respect to currency substitution, aggregates defined according to currency of denomination and location of the intermediary service are not relevant (Giucca and Levy, 1992; Monticelli and Papi, 1996). The definition based on the issuer's location relates to the expansion of bank credit and is likely to be difficult to interpret from an economic point of view, especially when international financial centres attracting deposits from abroad are located within the country. The monetary aggregate based on currency of denomination criterion might be related to the potential pressure on the exchange rate of the country in question. It excludes foreign currency deposits held by domestic residents with domestic banks, which reflects pure currency substitution. The monetary aggregate based on the residency of holder criterion, on the other hand, includes this component as well as foreign currency deposits of residents with banks abroad. This aggregate reflects residents' total amount of demand for money, either in domestic or foreign currency. Thus any currency substitution by domestic residents between domestic and foreign money will be accounted for, so that any change in expected interest or exchange rates, resulting in currency substitution, will not lead to fluctuations in this monetary aggregate. As a consequence, the EU central banks appear to be oriented in favour of adopting the definition of money based on the concept of residency of holder criterion, as economic agents cannot be residents in more than one country and there is no risk of double counting of their holdings (Giucca and Levy, 1992). Therefore, in this study the extended monetary aggregate based on residency of holder criterion is chosen as the appropriate monetary aggregate, when estimating demand for money for five EU countries as well as for an area-wide demand for money. Extended monetary aggregates for each country are obtained by adding cells CBD2 and CBD6 to the traditionally defined monetary aggregates. In case of the UK CBD5 is also added, as the traditionally defined monetary aggregate does not contain it. Figure 1, presenting the developments of CBDs included in the extended monetary aggregate based on the residency of holder criterion, suggests that the degree

of currency substitution has increased considerably during the time period considered. The ratio of CBDs to the traditional area-wide monetary aggregate has increased from 1.4 per cent in 1978 to over 13 per cent in 1993. Ignoring CBDs, which are almost 15 per cent of monetary aggregate and sensitive to changes in exchange rates or interest rates, may render money demand functions unstable.

Figure 1. CBDs Relative to the Traditional Monetary Aggregate



Furthermore, harmonisation of national monetary aggregates by using one criterion in obtaining the national extended monetary aggregates has important implications for the conduct of an area-wide monetary policy that can be implemented by the European Central Bank. The one criterion principle ensures that double counting or omissions are avoided when obtaining a reliable area-wide monetary aggregate. Then the European Central Bank would be able to use this broad monetary aggregate for the EU as an intermediate target variable for a European money supply policy, if it chooses to do so.

IV. The Economic Model and the Estimation Method

Alternative theories of money demand lead to a long-run specification of the form:

$$\frac{M^d}{P} = f(I, R, \dot{P}) \quad (1)$$

where M^d denotes money demand, P price level, I real GDP or another scale variable, R a vector of interest rates on alternatives for money and a dot denotes the percentage change in the variable. The function $f(\cdot)$ is increasing in I , and decreasing in inflation and elements of R . If equation (1) is rewritten in logarithms (lowercase variables denote the logarithms), it reduces to a convenient linear form particularly suitable for estimation by way of regression analysis:

$$m_t^d - p_t = \alpha + \gamma i_t + \gamma' R_t + \eta \Delta p_t + u_t \quad (2)$$

where Δp denotes inflation, u_t is a random variable and $u_t \sim N(0, \sigma^2)$. In equation (2) γ measures the long-run elasticity of money demand with respect to the scale variable, generally real GDP, while γ' and η are the long-run semi-elasticity with respect to the rate of interest on alternative assets and the inflation rate, respectively. Equation (2) assumes long-run price homogeneity of money demand, which can be empirically tested.

Conventional demand for money functions are generally in the form of single equation models and include lagged values of the dependent variable either because of adjustment costs or the role of expectations or both.³ Employing expected values of income and interest rates, approximated by geometrically declining lags on present and actual past values, a money demand equation with lagged monetary variables could be obtained. Although the adjustment cost hypotheses start the analysis by modelling the behaviour of the representative agent, and then generalise it to the whole economy, it could be possible to commit fallacies of composition. For an individual, the desired short-run demand can always be achieved and in empirical work it is often assumed that the short-run desired demand for money equals the actual real money stock in all time periods. When aggregate data are considered, the partial adjustment model assumes that the money supply always passively responds to any change in the short-run desired demand for money. But

³ For a discussion of functional forms of conventional money demand functions, see Artis and Lewis (1991), Cuthbertson (1985) and Laidler (1993).

nominal money cannot simultaneously be a variable that is exogenous to the arguments of the aggregate demand for money function and a variable that responds endogenously to variations in them. Thus the short-run demand for money function may not be properly identified and the procedures that might help with this problem may render any study of the demand for money vulnerable to problems arising from specification errors.

Recent empirical studies of money demand employ cointegration and error correction analysis, thereby avoiding the problems created by distinguishing short-run and long-run demand for money functions *a priori*. This approach enables the researcher to estimate long-run money demand functions without simultaneously making strong assumptions about the short-run dynamic processes. Error-correction approach assumes that while the demand for money will be evolving as income, interest rate and inflation evolve, it will also be responding to past disequilibria, which are errors that remain uncorrected. Engle and Granger (1987) propose a two step procedure where the first step is to estimate that long-run money demand function in a cointegrating regression. In the second step the lagged residuals from this estimation are entered as an error correction term in a dynamic error-correction mechanism formulation, which captures the short-run dynamics.

Although the cointegration analysis provides a more general approach to modelling the dynamics of the demand for money, it does not solve all the problems. In the Engle-Granger modelling approach, it is assumed that there can be only one cointegrating relation. However, if there are more than two variables there may be more than one cointegrating relation.

Johansen (1988) suggests a method of estimating all distinct cointegrating relationships that exist within a set of variables, employing an unconstrained vector autoregression (VAR). Charemza and Deadman (1992) argue that testing and analysing cointegration in a VAR model is superior to the Engle-Granger single equation method. Moreover, specific restrictions brought by economic theory can be tested in this framework. The first one of the restrictions is the price homogeneity. The second concerns the unit income elasticity of the demand for money. The third is that income, inflation and interest rates should be weakly exogenous for the parameters of money demand function. Otherwise they should be jointly modelled. This study

employs Johansen's approach to cointegration taking these issues into consideration.⁴

V. Estimation Results

In order to examine the stability properties of the national extended and traditional money demand functions, four equation VAR models are estimated for Germany, France, the United Kingdom, the Netherlands and Italy, using PcFiml version 8.00 (See Doornik and Hendry, 1994). The variables used are extended (traditional) money, real GDP, the consumer price index or GDP deflator and the long-term interest rates in each country.⁵ Then, an area-wide demand for extended and traditional money is estimated, where the variables are obtained by aggregating national figures.⁶ Two alternative conversion methods are used in aggregating national variables. Quantity variables are converted using: a) fixed base-date exchange rates, where the base period is the fourth quarter of 1989, and b) moving average current exchange rates. For interest rates and prices, the income shares of each country in the aggregate income are used as the weights. Income shares are also calculated by the two methods mentioned above. One of the objectives of using two different aggregation methods was to determine if the results are sensitive to the aggregation method.⁷

Table 2 summarises our estimates of the long-run demand for extended money functions in five EU countries as well as for the aggregate estimate using both aggregation methods. Whereas Table 3 provides estimates of national traditional money demand functions and aggregate traditional money demand functions.⁸ In all cases, the seasonally adjusted quarterly data are

⁴ For an extensive analysis of VAR analysis, see Hendry (1995) which also provides a significant literature on estimating money demand.

⁵ In order to achieve constancy in our estimations, we used the broadest monetary aggregate for each country. See appendix for exact definitions and sources of variables.

⁶ Throughout the paper the term area-wide refers to the aggregate of five countries considered in the paper, rather than the Euro Area which does not include the United Kingdom.

⁷ See Yildirim (1998) for a discussion of aggregation methods and the estimation of an EU-wide money demand function.

⁸ The results of unit root tests, Johansen procedures, VAR estimations and diagnostic statistics are not reported here to conserve space. But they can be provided upon request.

available for the time period 1978:1-1993:4. The estimation period varies according to the lag-length of the VAR model: 1978:3-1993:4 for France, the UK, the Netherlands, and 1979:1-1993:4 for Germany.⁹ A slightly shorter sample period is preferred for Italy (1980:1-1993:4), and the area-wide estimation, (1979:3-1993:4). In addition to the four stochastic variables mentioned above, a dummy variable representing German unification, which takes the value of 1 starting from 1991:1, is included in the German, the Dutch and the area-wide money demand estimates. This assumes that German unification would have long-run effects on the demand for money functions. Furthermore, a trend is constrained in the long-run dynamics of the model on the assumption that it would capture the financial innovation that occurred in the estimation period. In Table 2 and Table 3, ECM denotes the adjustment coefficient in the short-run demand for money function. Moreover, in order to test the constancy of the model one-step ahead forecast analysis is performed for the time period 1992:1-1993:4 for each VAR estimation. The F test of Chow parameter constancy is provided for each case.

A comparative analysis of the estimates presented in Table 2 indicates that all the extended money demand functions are homogeneous of degree one in prices. With the exception of Germany and the two aggregate estimations, all demand for money functions have unitary income elasticities. For single country estimates the long-run interest rate semi-elasticity ranges from -0.002 for Italy to -0.035 for Germany. The inflation elasticity in these country estimates ranges from -0.035 for France to -3.13 for Italy. However, surprisingly, the Dutch demand for extended money does not appear to depend on changes in the long-term interest rate. The trend variable, which is supposed to capture financial innovation over the sample period, has a positive sign for all estimations and ranges from 0.0017 for France to 0.015 for the Netherlands. In the case of the Netherlands, the money stock grew at high rates, possibly due to low and decreasing inflation. This would seem to be due to the combined effects of the policy of pegging the Guilder to the DM, deregulation of the Dutch financial markets, and the abolition of exchange controls and this is reflected in a comparatively high trend coefficient.

⁹ For each case the initial estimation has started with a four lags for each variable. Then the appropriate lag length has been chosen according to the Akaike Information Criterion.

Table 2. Estimates of the Long-Run Demand for Extended Money

Countries	Aggregation method	Long-run elasticities							
		Price level	Real income	Long-term interest	Rate of inflation	Trend	Unification dummy	ECM	Stability F test
Germany		1	2.21	-0.035	-0.035	0.0018	-0.028	-0.09	1.45 (0.11)
France		1	1	-0.008	-0.67	0.0017	---	-0.13	1.46 (0.11)
UK		1	1	-0.013	-0.31	0.012	---	-0.16	0.99 (0.48)
The Netherlands		1	1	---	-0.77	0.015	-0.019	-0.08	0.49 (0.94)
Italy		1	1	-0.002	-3.13	0.005	---	-0.24	1.78 (0.04)
Aggregate	Fixed-base exch. rates	1	1.44	-0.003	-0.74	0.006	-0.071	-0.25	1.17 (0.30)
	Moving-aver. exch. rates	1	1.77	-0.015	-0.05	0.005	-0.033	-0.21	1.43 (0.13)

Note: p-values are in parentheses

Estimates of German and Dutch demand for money functions include a unification dummy variable. It is assumed that German unification could have long-run effects on both countries' demand for money functions as their monetary policies are closely linked. Even though the short-run demand for money functions report an increase due to German unification, in the long-run demand for money functions the unification dummy has a negative coefficient for both countries.¹⁰

When the structures of the demand for money functions for individual countries are considered, it can be argued that apart from the Dutch money demand function, which does not have any significant response to the long-term interest rates, other estimates show similarities. Even though the German money demand function has an income elasticity which is greater than one, it would not matter greatly because VAR estimation and hypothesis testing in the context of cointegration analysis would allow the data to determine the structure of the demand for money functions. Thus the aggregation bias, which stems from assuming the same money demand structure for individual countries, is expected to be small.

Examination of the area-wide demand for money estimates reveals the dominance of Germany. In terms of share in the total income of these five countries, Germany has the largest share. The area-wide demand for money functions have income elasticities greater than unity, though not as large as that of Germany. In both equations the coefficients of the unification dummy variable are greater than that in the equation for Germany and with negative signs. Furthermore, there is no substantial difference, except for the inflation coefficient, between the area-wide demand for money estimates obtained using the two different aggregation methods. However, earlier studies, which generally use fixed-base period and current exchange rate methods, report that estimates are sensitive to aggregation methods. It would seem that usage of the moving average current exchange rates instead of actual current-exchange rates makes our estimates more reliable.¹¹

¹⁰ German unification caused a sharp jump in population, thus leading to a change in GDP per capita. The negative coefficient of the unification dummy may reflect the effects of changes in per capita income on money demand.

¹¹ In order to compare the area-wide extended monetary aggregate with that of the European

Table 2 also reports the adjustment coefficients of the short-run money demand functions, ECM, reflecting the speed of adjustment to any long-run disequilibrium. The adjustment coefficients of country money demand estimates range from 0.08 for the Netherlands to 0.24 for Italy. The area-wide demand equations have high adjustment coefficients, 0.25 and 0.21 for fixed base period and moving average weight models, which are very close to that of Italy, but higher than the remaining adjustment coefficients. This has important implications. Firstly, a higher adjustment coefficient for the area-wide demand for money indicates that deviations of the demand for money from its long-run equilibrium are eliminated faster compared to individual country demand for money functions. This could make monetary policy implementation easier on an area-wide level, because it implies that impulses coming from monetary policy instruments are quickly transmitted to economic activity. This could also justify the argument that countries whose economies are closely linked should pursue a joint monetary policy rather than pursuing national monetary policies. Secondly, a high value of the adjustment coefficient would suggest that the area-wide approach is an effective solution to internalise the spillover effects between these countries, which could otherwise result in specification errors. Furthermore, stability F-tests presented in Table 2, indicate that all demand for money functions, country as well as area-wide, are stable at the 5 per cent level, as expected.

When the traditional money demand estimations are considered, Table 3 suggests that even though individual money demand estimates show similarities to the extended money demand estimates, stability properties of German, Italian and area-wide money demand functions have been impaired. This strengthens our hypothesis that exclusion of CBDs from the monetary aggregates may bring instabilities to the national and area-wide money demand functions. However only two of the national money demand functions are found to be unstable. Even though German residents' foreign currency deposits

Central Bank aggregate, a new extended monetary aggregate excluding the UK is calculated. Even though there are two cointegrating vectors in the fixed-based period model, the weak exogeneity hypothesis is rejected. The moving average exchange rate model, on the other hand, yields a unit income elastic money demand function with a high ECM term though it is not stable.

are a small fraction of the national money, the volume of Deutsche Mark (DM) deposits held abroad by residents have shown an increasing trend, which could be related to the changing banking regulations in Germany, such as the introduction of withholding tax on interest income. Thus it is reasonable to have a stable extended demand for Germany. For Italy foreign currency deposits held abroad by residents has the largest share among the CBDs. With the removal of the foreign exchange control this component has increased nearly four times, whereas Lira denominated deposits held abroad by residents has increased by eightfold. This comparatively rapid increase in cross border deposits might have brought instabilities to the Italian traditional monetary aggregate. The traditional money demand estimates of France, the UK and the Netherlands seem to be stable, in contrast to our expectations. This could be due to the fact that, even though there is currency substitution in these countries, this may not be as severe as in Germany and Italy to affect the stability properties of the money demand functions.

Moreover, there has been a reduction in the error correction terms, except those of France and Italy. This is especially important for the aggregate estimates, as they have the greater reduction in ECMs. For fixed-based estimates, it has decreased to 0.10 from 0.25, and, for moving average exchange rate model, it has decreased to 0.16 from 0.21, indicating a slower adjustment to any shock than that of the extended monetary aggregates. Even though for the extended money estimates the adjustment coefficient of the aggregate model was higher than those of individual country money demand estimations, the traditional money demand estimates do not have this property anymore. This suggests that targeting a traditional area-wide monetary aggregate may not be favourable, as it slowly responds to the shocks compared to the countries concerned.

Table 3 also reveals that even though the extended monetary aggregate of the Netherlands is insensitive to the interest rate changes, its traditional money is interest elastic. That is, the extension of traditional monetary aggregate renders the demand for the extended money insensitive to interest rate changes when the Dutch traditional money is extended by the relevant CBDs. This could be reasonable as the ratio of CBDs to the national monetary aggregate is the greatest in the Netherlands, among five countries considered, which reflects the fact that the Netherlands has a well developed and

Table 3: Estimates of the Long-Run Demand for Traditional Money

Countries	Aggregation method	Price level	Long-run elasticities						Stability F test
			Real income	Long-term interest	Rate of inflation	Trend	Unification dummy	ECM	
Germany		1	1.85	-0.060	-0.060	-6.336	0.055	-0.07	10.56 ** (0.00)
France		1	1	-0.005	-0.005	0.003	---	-0.24	1.38 (0.16)
UK		1	1	-0.014	-0.014	0.003	---	-0.04	0.87 (0.63)
The Netherlands		1	1	-0.021	-0.021	0.015	-0.389	-0.06	0.58 (0.78)
Italy		1	1	-0.003	-3.328	0.005	---	-0.36	2.04 ** (0.01)
Aggregate	Fixed-base exch. rates	1	1	-0.003	-0.651	0.014	-0.050	-0.10	3.91 ** (0.00)
	Moving-aver. exch. rates	1	1.80	-0.021	-0.022	0.004	-0.048	-0.16	2.31 * (0.03)

Note: p-values are in parentheses, * and ** denote significant at 5 % and 1% level, respectively.

sophisticated financial market which has traditionally been open to the rest of the world.

VI. Conclusion

Our conclusions may now be summarised. We have provided the first study which investigates stability of the demand for extended money for five EU countries, and for an area-wide extended monetary aggregate in addition to the traditional monetary aggregate estimates. Our findings indicate that the demand for extended money in the five EU countries, as well as in the area as a whole, appears to be stable whereas the stability of German, Italian and the area-wide monetary aggregate has been impaired when the CBDs are not included in the monetary aggregate. Previous empirical studies in the five EU countries generally report instabilities in traditional money demand functions. The existence of apparently stable demand for extended money functions, thus, may indicate that including relevant cross border deposits in traditionally defined monetary aggregates improves the stability properties of the demand for money functions. This, in turn, strengthens the argument that currency substitution is likely to be one of the main reasons causing instabilities in the traditionally defined monetary aggregates.

The fact that the adjustment coefficient in the area-wide demand for extended money function is found to be greater than those of country estimates leads to several policy implications in the EU context. As the adjustment to any long-run disequilibrium will be faster on an area-wide level, it would be more effective to pursue an area-wide monetary policy rather than pursuing national monetary policies. This is an important issue for the establishment of the European Monetary Union, which necessarily involves a common monetary policy in the EU. The process of financial integration and the increased degree of currency substitution appear to make a common monetary policy feasible for EU countries from an economic point of view. Thus the European Central Bank may realistically target an area-wide extended monetary aggregate as an intermediate target variable for a European money supply policy.

This study has investigated the monetary policy implications of currency substitution. Overall, we can plausibly argue that the integration of national

and international financial markets, financial innovations and currency substitution lead to an even more integrated Europe, where a common monetary policy could be optimal.

Appendix: Data Definitions and their Sources

Table A.1. Monetary Aggregates

Country	Definition of broad money	Source
France	M3	OECD Quarterly Statistics
Germany	M3	Deutsche Bundesbank Monthly Bulletins
Italy	M2	Banca d'Italia Quarterly Bulletins
The Netherlands	M3H	The Nederlandsche Bank Quarterly Bulletins
UK	M4	Office of National Statistics

Note: All quantity variables are seasonally adjusted.

Table A.2. Other Data for all Countries

Variable	Definition	Source
Real income	Real GDP/GNP (1985) Prices	IMF Int. Financial Statistics
Price index	Consumer Price Ind. (1985 = 100)	IMF Int. Financial Statistics
Long-term interest rate	Gov. Bond Yield with 10 year maturity	IMF Int. Financial Statistics

Note: All quantity variables are seasonally adjusted.

Table A.3. Cross-border Deposits (CBDs)

CBD	Definition	Source
CBD1	National currency deposits of residents with domestic banks	Already included in national definitions of the monetary aggregates
CBD2	National currency deposits held by non-bank residents with banks abroad	BIS Table 5b External Positions of Reporting Banks vis-a-vis Individual Countries vis-a-vis the Non-bank Sector (Liabilities), figure corresponding to bracketed country entry
CBD3	National currency deposits of non-bank non-residents with domestic banks	BIS Table 4b Currency Breakdown of Reporting Banks' Cross Border Positions vis-a-vis Non-banks, domestic currency liabilities or Table 2d External Positions of Banks in Individual Reporting Countries in Domestic Currency vis-a-vis the Non-bank Sector. The figures from these two tables are identical
CBD 4	National currency deposits of non-bank non-residents with banks abroad	BIS Table 4b Currency Breakdown of Reporting Banks' Cross Border Positions vis-a-vis Non-banks, foreign currency liabilities + Table 4d Currency Breakdown of Reporting Banks' Local Positions in Foreign Currency vis-a-vis the Non-bank Sector – Table 5b External Positions of Reporting Banks vis-a-vis Individual Countries vis-a-vis the Non-bank Sector (Liabilities), figure corresponding to bracketed country entry
CBD5	Foreign currency deposits of non-bank residents with domestic banks	BIS Table 3b Local Positions in Foreign Currency of Banks in Individual Reporting Countries vis-a-vis the Non-bank Sector

Table A.3. (Continued) Cross-border Deposits (CBDs)

CBD	Definition	Source
CBD6	Foreign currency deposits of non-bank residents with banks abroad	BIS Table 5b External Positions of Reporting Banks vis-a-vis Individual Countries vis-a-vis the Non-bank Sector (Liabilities), difference of main figure given and the figure corresponding to bracketed country entry
CBD7	Foreign currency deposits of non-bank non-residents with domestic banks	BIS Table 2f External Positions of Banks in Individual Reporting Countries in Foreign Currencies vis-a-vis the Non-bank Sector
CBD8	Foreign currency deposits of non-bank non-residents with banks abroad	None of the extended monetary aggregates consider this component, as it covers all deposits in the rest of the world

Notes: All quantity variables are seasonally adjusted; extended monetary aggregates for any country can be obtained by adding and/or subtracting relevant CBDs to the published monetary aggregates; tables are from the BIS quarterly *International Banking and Financial Market Developments*, Statistical Annex.

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