NBER WORKING PAPERS SERIES

THE PRIVATE ECU: A CURRENCY FLOATING ON GOSSAMER WINGS

David Folkerts-Landau

Peter M. Garber

Working Paper No. 4017

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1992

Prepared for a Conference on "Monetary and Financial Instruments in ECU: Statistical Aspects." Sponsored by Eurostat, Commission of the European Communities, Luxembourg Luxembourg, 23 and 24 September 1991. The authors are grateful for information and data received from the Kredietbank N.V. the Bank for International Settlements, and Eurostat. This paper is part of NBER's research program in International Finance and Macroeconomics. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research or of the International Monetary Fund.

NBER Working Paper #4017
March 1992

THE PRIVATE ECU: A CURRENCY FLOATING ON GOSSAMER WINGS

ABSTRACT

Today's value of the private ECU is driven by expectations that a European monetary authority will at some future date declare itself willing to convert the private ECU into the official basket at par. Until then, its value is not limited by any existing institutional arrangements in the European Communities, such as the Exchange Rate Mechanism of the European Monetary System. We address the question of what determines the exchange rate between the private ECU and the official Basket, and what determines ECU interest rates. The Bank for International Settlements sets the ECU overnight interest rate on clearing balances as a weighted and lagged average of the money-market rates in the EC currencies, thereby fixing a point on the ECU term-structure. This exogenous fixing of the ECU interest rate and the expectation of a future fixing of the exchange rate satisfy the fundamental requirements for a obtaining a determinate real value of what is otherwise an undefined private ECU unit of account.

David Folkerts-Landau
International Monetary Fund
700 19th Street, NW
Washington, DC 20431

Peter M. Garber
Department of Economics
Brown University, Box B
64 Waterman Street
Providence, RI 02912

I. Introduction

At this time there does not exist a mechanism that ties the value of the private ECU--the unit of denomination of more than $250 billion of financial assets--to the value of the official basket of ECU currencies. Instead, as we show in this paper, today's value of the private ECU is determined by expectations that a European monetary authority will at some future date, on the way toward an Economic and Monetary Union (EMU), declare itself willing to convert the private ECU into the official basket at par.

Until then the holder of ECU assets and the issuer of ECU liabilities is exposed to volatility in the rate at which the private ECU can be exchanged in the market for the official basket. Such volatility is primarily due to changes in market expectations regarding the prospects for EMU, and it is not limited by any existing institutional arrangements in the European Communities (EC), such as the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS).

In a decade that was marked by extraordinary developments in financial markets, the evolution of the private ECU markets, together with the growth of exchange-traded derivative products, can be counted among the great success stories, but not without posing serious challenges for financial policy in the EC and for the transition to Stage III of EMU. From a definition contained in a resolution of the European Council of December 5, 1978, the ECU grew to be the unit of denomination for about 70 billion ECU of bonds and bills, and 160 billion ECU of bank assets (each representing approximately 5 percent of EC totals at current exchange rates). By the first quarter of 1991, ECU-denominated bonds came to comprise more than 5 percent of total international bonds outstanding and accounted for more than 15 percent of total secondary market turnover in the international bond market, thereby providing evidence of a successful transition from retail to institutional market. The growth in the size of issues, the development of benchmarks, and

the increase in liquidity also made it possible for the two largest European futures exchanges--LIFFE in London and MATIF in Paris--to launch successfully a short- and a long-dated ECU interest rate contract. Although the growth in ECU-denominated assets was initially due to the opportunity to circumvent exchange controls, it was later driven predominantly by the possibility of achieving lower costs of diversifying across EC currencies or of taking positions in EC currencies by non-EC investors or issuers.

The official ECU is a composite currency unit consisting of fixed amounts of the currencies of all 12 member states of the EC. Its value in terms of another currency can be calculated by converting the fixed amounts of constituent currencies into a common currency at prevailing bilateral exchange rates. The official ECU is created as a liability of the European Monetary Co-operation Fund (EMCF) by swapping such ECUs for about 20 percent of the gold and gross U.S. dollar reserves held by central banks participating in the EMS. The EMCF has currently about 50 billion official ECUs outstanding. Official ECUs can be used only in transactions with EC central banks and a limited number of monetary institutions designated as Other Holders of ECUs. Private ECUs, on the other hand, are ECU-denominated liabilities of the banking sector. The proceeds from issuing obligations in the form of private and public sector bonds, notes, futures contracts, and bank loans are payable in ECU-denominated deposit liabilities of designated banks. Similarly, these obligations must be serviced in such deposits.

Although there never existed any official mechanism or guarantee to convert private ECUs one for one into the Basket of ECU currencies corresponding to the definition of the official ECU (the Basket), the value of the private ECU was, until the Fall of 1988, fixed in terms of the Basket by a group of major European banks (the ECU clearing banks), who stood ready to convert private ECUs into the Baskets at par. A growing concern in these institutions about their increasing net ECU exposure led them to discontinue fixing the

ECU/Basket exchange rate by acting as a currency board, and the era of the floating ECU/Basket exchange rate arrived. Private ECUs can now be purchased and sold in exchange for some of the major currencies or the Baskets at market-clearing rates of exchange in a market made by some of the major ECU clearing banks.

From mid-1990 onward the ECU began to command a significant exchange rate premium over the Basket, which reached a peak of 100 basis points in January 1991. The value of a private ECU in terms of any given currency had come to exceed the value of a Basket in terms of the same currency. Similarly, the interest yield on assets denominated in private ECU began to deviate from the theoretical or synthetic yields, i.e., the weighted average of yields on comparable instruments denominated in the basket currencies. In particular, over the same period the yield on three months Euro ECU deposits developed a discount of up to 1 percentage point against the theoretical Basket yield. Since then the exchange rate premium has turned into a modest discount, while the interest rate discount has declined but remained of substantial magnitude (Chart 1). Thus the ECU-denominated financial instruments have started to behave like financial instruments denominated in non-EC currencies: Their values in terms of the Basket are subject to exchange rate uncertainty without being restrained by the ERM.

This development has raised questions of what determines the value of the private ECU in terms of any other currency or in terms of the Basket? We shall use an analogy to clarify further the current status of the private ECU. Consider a country called ATLANTIS with a currency called the Atlantis Currency Unit (ACU). The monetary policy of the Central Bank of Atlantis determines the price level of goods and services in Atlantis in terms of ACU, i.e., it gives the currency unit real value, by controlling the supply of reserves that Atlantis banks are required to hold at the central bank against their

monetary deposit liabilities, and by setting the interest rate on reserves at, say, zero. 2/ In addition, the central bank pegs the ACU to the 12 EC currencies, with the weights the same as the share of each currency in the Basket. This pegged exchange rate regime, in turn, provides the stability necessary for international markets to use the ACU as a currency of denomination for some fraction of financial transactions among participants in financial markets outside Atlantis, i.e., purely non-Atlantis financial transactions. In accordance with mythology assume that Atlantis vanishes into the oceans. If the net-foreign asset position of Atlantis residents was zero, so that all cross-border claims can be netted, then the only remaining legacy is the ACU-denominated financial claims on, and held by, residents outside Atlantis. However, the mechanism whereby the monetary authority of Atlantis used to determine the value of an ACU in terms of Atlantis goods and foreign exchange has vanished, and there is no agency or mechanism to tie the value of the ACU to any other currency. A question then arises about what determines the value of the ACU that is still used as the unit of denomination of some fraction of financial assets held in the non-Atlantis world after Atlantis has vanished.

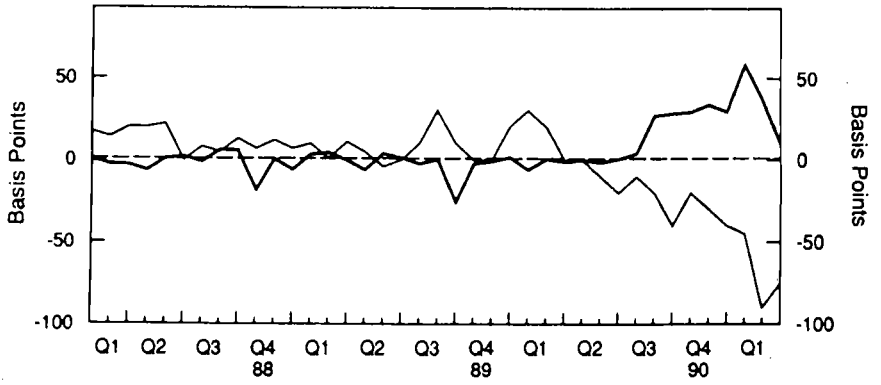
We suggest that the current situation of the private ECU is strictly analogous to the Atlantis Currency Unit after Atlantis has vanished: Until 1988 one ECU of bank deposits was pegged at one official basket of EC currencies. However, the abandoning of this mechanism at that time made the private ECU a unit of denomination for a substantial stock of financial assets without an apparent monetary authority or mechanism to tie down its value in terms of any other currency or in terms of the Basket. In this paper we

---

2/ Since reserves at the central bank are financial assets of the banking system, there exist many possible combinations of interest rates payable on reserves, i.e. coupons, and price levels that produce the same real holding period yield. To remove this commonly found indeterminacy it is necessary to set exogenously either the interest rate on reserves or the price level, with the remaining variable to be determined by the demand and supply of reserves. In practice the central bank sets the interest rate on reserves, while the price level is determined by the demand and supply for reserves.

Chart 1. Divergence of Private ECU from Basket

---- Divergence of ECU/Basket exchange rate from parity.
---- Divergence of 3-month ECU deposit rate from comparable synthetic Basket rate.



Source: Bank for International Settlements; Salomon Brothers.

address the question of what determines the exchange rate between the private ECU and the official Basket, and what determines the ECU interest rates, i.e, what determines the real value of the private ECU as a unit of account or equivalently what determines the value of the private ECU in terms of the official Basket of ECU currencies.

We show that in order for the private ECU to have a determinate value in terms of the official basket it is necessary that market participants expect that at some future date the ECU will be pegged to a specific basket of EC currencies (not necessarily with the current composition). Such well-defined expectations regarding the future value of the private ECU allow us to derive an uncovered interest parity condition of the private ECU against the Basket. This interest parity condition then yields all equilibrium combinations of ECU interest rates and ECU/Basket exchange rates. Hence well-defined expectations regarding the future value of the private ECU are not sufficient by themselves to determine the ECU/Basket exchange rate. In fact, it is necessary to set an ECU interest rate exogenously to tie down the term-structure of ECU interest rates. With the indeterminacy thus removed the ECU foreign exchange market can then establish the ECU/Basket interest rate. 3/ The two conditions--well-defined expectations regarding a future fixing of the ECU/Basket exchange rate and an exogenously set ECU interest rate--together are sufficient to produce a determinate ECU/Basket exchange rate.

Are these conditions met in practice? Two factors suggest that they are. Although there is yet no statistical evidence that ECU market participants expect a future fixing of the ECU/Basket exchange rate, it is plausible that progress toward EMU has created such expectations. Second, the Bank for International Settlements (BIS), acting as agent for the

---

3/ The existing literature on this subject has sought to explain the divergences of the value of the ECU exchange rate and interest rates from the corresponding Basket rates with recourse to an implicit interest parity condition, without recognising the exogenous interest rate setting mechanism, and thus falling short of resolving the indeterminacy inherent in the interest parity condition.

private ECU clearing and settlement system, sets the ECU overnight interest rate on clearing balances as a weighted and lagged average of the money-market rates in the EC currencies, thereby fixing a point on the ECU term-structure. Thus the fundamental requirements for a obtaining a determinate real value of the private ECU as unit of account have been met. Once the ECU term-structure is determined then the exchange rate can be obtained from the interest parity condition.

It is apparent, therefore, that the risk of a depreciation/appreciation of the private ECU against the Basket comes from three sources of uncertainty: a reconstitution of the Basket, changes in the bilateral exchange rates among Basket currencies, and changes in the expectations regarding the timing of the future fixing of the ECU/Basket exchange rate. The contribution of the first two factors is limited by the existing ERM arrangements, but the last factor can exert a large and lasting effect on the ECU/Basket exchange rate.

To support the ECU/Basket exchange rate in the context of current exchange rate arrangements has the same monetary consequences as fixing the exchange rate between any two currencies, i.e., central banks have to stand ready to convert ECU-denominated liabilities of banks into claims on themselves. Since there is currently no effective way to control the expansion of such ECU-denominated bank liabilities, any attempt to fix the ECU/Basket exchange rate would result in a serious loss of monetary control. In addition, a policy to fix the ECU/Basket exchange rate would mean that central banks in effect agree to underwrite the assets backing the ECU-liabilities of banks, including those of banks well beyond their borders. Consequently, the fixing of the ECU/Basket exchange rate will require the establishment of a European Central Bank to implement it. The ongoing negotiations in the Intergovernmental Conferences will, therefore, have a direct bearing on the current ECU/Basket exchange rate, and hence on the value of ECU-

denominated financial instruments in terms of the Basket, and hence in terms of any other currency.

An adequate understanding of the determination of the ECU/Basket exchange rate is essential for an assessment of the foreign exchange risk associated with the holding of ECU-denominated instruments. This is essential for the pricing of ECU assets and risk-management products. Bank supervisors, moreover, need to be able to assess the foreign exchange risk of open positions in private ECU if they are to manage the systemic risk in the banking system. The three components--expectations about the future fixing of the ECU/Basket exchange rate, the exogenous determination of the ECU overnight interest rate, and the interest parity condition--together provide a complete explanation of the determination of the real value of the ECU. Furthermore, the available theoretical and statistical literature on the formation of expectations, the term-structure of interest rates, and risk-premia in forward foreign exchange markets can now readily be applied to obtain a quantitative approach to the pricing of ECU-denominated assets. There is the possibility that the foreign exchange risk associated with the private ECU, which has come to light only recently and is still not widely understood, has not yet been fully reflected in the yields on ECU instruments. This raises the possibility of a devaluation of existing assets. In particular, uncertainty generated by the changing prospects of an agreement among the EC Member States to adopt the ECU as the single European currency at the par exchange rate, may translate into rising yields and a depreciating exchange rate. Such a development may then impede the further growth of the private ECU market.

II. The Private ECU: A Unit of Account with Uncertain Real Value

Until October 1987 the value of the private ECU--ECU denominated bank liabilities--in terms of any other currency was firmly tied to the value of the officially defined Basket.

Such a pegging of the private ECU/Basket exchange rate was implemented by the ECU clearing banks who stood ready to exchange private ECU for the Basket at par. In particular, clearing banks that emerged from the daily ECU-clearing owing ECUs were permitted to deliver the Basket. Hence any movement of the ECU/Basket exchange rate from par, say in the direction of an ECU premium, would have provided an opportunity for some banks to earn arbitrage profits by buying the Basket with private ECU and then using the Basket to settle any negative clearing balances in private ECU clearing and settlement system at par. 4/

This mechanism for fixing the value of the ECU in terms of the Basket broke down in October 1987 because the increased reluctance of some clearing banks to accept Baskets in settlement for large ECU debit clearing balances frequently put a day's clearing at risk. 5/ The ECU Banking Association (EBA) had failed to reach a legally binding agreement among its members to accept Baskets in settlement for ECU debit balances.

From October 1987 to November 1988, a single bank, the Kredietbank N.V. of Belgium, continued to exchange private ECU for Baskets at par. During this period the non-bank sector's holding of ECU bank loans continued to grow faster than its ECU bank deposits, and the ECU banks passed on their long ECU positions to the sole remaining bank prepared to exchange ECU against the Basket at par. This bank was soon forced to discontinue exchanging the ECU against the Basket at par. Thus, from November 1988 onwards, there has not existed any official or private institutional arrangement or

---

4/ The ability to settle interbank clearing balances in either private ECUs or Baskets also meant banks with short or long positions in private ECU did not incur an exchange risk by making a two-way market in ECU against the basket.

5/ A further technical difficulty contributed to the breakdown of the clearing arrangements, namely, the delivery of component currencies occurred too late during the clearing day to be lent out overnight.

commitment to exchange the private ECU for the Basket at par. Instead, the ECU/Basket exchange rate has fluctuated 6/ freely.

Furthermore, there exists no riskless arbitrage possibility that could move the ECU/Basket exchange rate toward parity. If, for example, the private ECU trades at a discount against the Basket a bank might fund ECU assets with Basket liabilities. While such a transaction may temporarily be successful in affecting the exchange rate it cannot, in the long run, counteract changing market expectations regarding the future value of the ECU in terms of the Basket.

The earlier arrangements under which the EBA pegged the value of the private ECU in terms of the Basket fully determined the real value of the private ECU, i.e., it gave the ECU as unit of account determinate prices in terms of real goods and services. But the absence of a commitment by a monetary authority to fix the foreign currency value of the ECU or an arrangement by ECU banks to fix the rate at which private ECU can be exchanged for the Basket 7/ raises the question of what now determines the ECU/Basket exchange rate, or equivalently what determines the real value of the private ECU? 8/

Some basic monetary concepts

To shed light on the nature of this problem, it is helpful to review the basic monetary theory regarding the determination of the real value of a unit of account. 9/ Consider

---

6/ There are currently two banks that make a two-way market in ECU against the Basket and a further three banks make a two-way market in ECU against single currencies. Most other banks have a matched ECU book.

7/ The private banking sector alone can not fix the ECU/Basket exchange rate credibly.

8/ If the real value of the ECU is determinate, then so is its foreign exchange value and vice versa.

9/ See Patinkin (1961), Fama (1980).

first a real economy 10/ to which is added a nominal commodity--currency yielding zero interest--measured in a unit of account, say the DM.

In order to ensure that the DM unit in which the currency is measured, has determinate prices in terms of goods and services, it is necessary that there be well-defined demand and supply functions for the currency. The use of currency, for example, might lower the cost of making transactions, and thus, generates a real demand for currency. The monetary authority can then exogenously set the supply of DM currency in order to ensure a well-defined equilibrium in the DM currency market which yields the price of a DM in terms of goods and services.

Alternatively, bank deposits can also be used to define the real value of a nominal DM unit of account. In particular, the monetary authority can require that banks hold reserves against deposits, in the form of non-interest-bearing central bank obligations, denominated in DM. As long as deposits have attributes that make them a low-cost transaction medium, there will exist a real demand for deposits (despite the reserve requirement tax) and hence for reserves at the central bank. By controlling the nominal supply of reserves and by setting the interest rate on these reserves, say at zero, the monetary authority determines the real value of the DM unit of account 11/ i.e., it has solved the problem of "giving content to a pure nominal unit of account (a DM) as a separate, well-defined economic good." 12/13/

10/ A real economy is without a pure nominal commodity or unit of account to serve as numeraire, instead prices are stated in terms of a real good numeraire, e.g., in terms of steel ingots.

11/ In actual practice, the monetary authority controls the sum of currency and reserves, allowing banks to exchange currency for reserves on demand.

12/ See Fama (1980).

solved the problem of "giving content to a pure nominal unit of account (a DM) as a separate, well-defined economic good." 12/13/

When applying this analysis to the private ECU it becomes apparent that there does not exist a monetary mechanism that imparts the private ECU unit of account with a determinate real value. In particular, ECU-denominated bank liabilities do not possess attributes, such as being a low-cost transaction medium, that could produce a well-defined stable demand. Furthermore, and to some extent more importantly, there does not exist a mechanism, such as a reserve requirement and a limited supply of ECU-denominated instruments for final settlement, 14/ to control the growth of the ECU-denominated monetary liabilities of the banking system.

We are thus left with the conclusion that in the absence of any commitment by a monetary authority to peg its value in terms of the Basket, or in terms of any other currency, the real value of the private ECU unit of account is indeterminate. Hence in the absence of a mechanism to give content to the private ECU as a nominal unit of account by turning it into a well-defined economic good, it is necessary to rely on the commitment of one or several monetary authorities to fix the nominal foreign exchange value of the private ECU. Such an intervention need not take place at present, it is sufficient that it is expected to take place some time in the future. For example, the transition to Stage III of EMU is expected to lead to the irrevocable fixing of the ECU in terms of national currencies. Thus, the ongoing negotiations in the Inter-Governmental Conferences should be expected

---

12/ See Fama (1980).

13/ It should be noted that in order to get a determinate real value of currency or reserves, it is necessary for the monetary authority to fix exogenously the interest rate on currency and reserves. Otherwise, no determinate price of reserves in terms of goods emerge, since a continuum of interest rates and price levels could serve to equate demand and supply in the market for reserves.

14/ This presupposes that some ECU deposits to which such a reserve requirement would be applied are demanded because their use results in real savings when executing ECU-denominated transactions.

to have a direct bearing on the expectations regarding the future pegging of the ECU to the Basket.

III. The First Step Toward Determining the Real Value of the ECU: An Interest Parity Condition

Although the existence of well-defined expectations about the future pegging of the ECU/Basket exchange rate by a monetary authority is a necessary condition in determining the real value of the private ECU unit of account, such expectations are not sufficient to determine both the ECU/Basket exchange rate and the ECU interest rate today. In fact a continuum of combinations of exchange rates and interest rates are consistent with any given future expected of the ECU. To lend analytical content to this result, we derive an ECU interest parity condition in this section, and then show in the next section how the ECU interest rate is determined. We shall then have shown that expectations regarding the future pegging of the ECU/Basket exchange rate, together with a mechanism for setting ECU interest rates, determine the ECU/Basket exchange rate today via the parity conditions.

In addition to uncertainty regarding the future fixing of the ECU/Basket exchange rate, there exists uncertainty about the future currency composition of the Basket and about the future spot bilateral exchange rates among the 12 ECU currencies.

To represent these results analytically, let

$$W(t) = [W_1(t),\ldots, W_{12}(t)] \qquad (1)$$

represent the official currency composition of the ECU at time t. For example, let the first entry $W_1(t)$ represent the quantity of DM in the official ECU Basket at time t. W(O) is the official current composition of the ECU. The future composition of the Basket at time

t, i.e., W(t), is uncertain. Let the spot exchange rates between the DM and the currencies in the Basket be represented by

$$e(t) = [1, e_2(t),..., e_{12}(t)] \tag{2}$$

in the same order as the currency shares in W(t). Thus

$$B(t)_{DM} = e(t)\cdot W(t) \equiv \sum_{i=1}^{12} e_i(t)\, W_i(t) \tag{3}$$

is the DM value of the Basket at time t.

As a first approximation, assume that it is expected with certainty that the exchange rate between the private ECU and the Basket, as officially defined at that time will be fixed at par at the known time t = T, i.e., a promise to deliver one ECU at time T is equivalent to a promise to deliver W(T) at time T. The DM value of one ECU at time T will then be equal to the DM value of the Basket at time T, i.e., equal to e(T) W(T).

Since at time T both the composition W(T) of the Basket and the future spot exchange rates, e(T), are uncertain, the DM value of the private ECU at time T is uncertain. The present DM value of a private ECU deliverable at time T can be found by discounting the expected DM value E[e(T) W(T)] by the appropriate risk-adjusted DM discount rate $i(T)_{DM}$ applicable to payments that mature at time T:

$$E[e(T)\, W(T)]/(1+i(T)_{DM}) \tag{4}$$

Alternatively, if $i(t)_{ECU}$ is the ECU discount rate now applicable to ECU deliverable at time t, then the present value of one ECU deliverable at time T is

$$\frac{1}{(1+i(T)_{ECU})} \tag{5}$$

The current market spot rate of ECU in terms of DM (DM per ECU) is given by 15/

$$S(0)_{ECU} = \left(\frac{1+i(T)_{ECU}}{1+i(T)_{DM}}\right) E(e(T)\ W(T)) \tag{6}$$

This expression for the ECU spot rate applies to the case where the ECU/Basket exchange rate is fixed at parity at the known time T. If the fixing can occur at any time t, between now and time T, with probability $\Pi(t)$ then the ECU spot exchange rate in terms of DM is the probability weighted average of the solutions for the certain future fixing:

$$S(0)_{ECU} = \sum_{t=1}^{T} \left(\frac{1+i(t)_{ECU}}{1+i(t)_{DM}}\right) E[e(t)\ W(t)]\Pi(t). \tag{7}$$

The current spot exchange rate between the official Basket, as currently defined, and the DM (DM per Basket) is

$$B(0)_{DM} = e(0)\ W(0) \tag{8}$$

The current spot price of the ECU in terms of the Basket is then given by

---

15/ Instead of explicitly discounting the expected future DM value of one ECU by the risk-adjusted DM interest rate to obtain the present DM value of an ECU deliverable at time T, we could have replaced E (e(T) W(T)) with the ECU/DM Forward exchange rate and discounted by the observable DM interest rate of appropriate maturity. In this case, the risk-premium generated by the uncertainty about e(T) and W(T) would have been embedded in the forward rate.

$$\frac{S(0)_{ECU}}{B(0)_{DM}} = \left[\frac{1+i(T)_{ECU}}{1+i(T)_{DM}}\right] \cdot \frac{E\ e(T)\ W(T)}{e(0)\ W(0)} \quad 16/ \qquad (9)$$

The cross-market arbitrage conditions in (6) or (9) resemble the traditional uncovered interest parity condition--i.e., it determines the relationship among spot and future expected exchange rates and discount rates. 17/ However, these condition do not produce a solution for the private ECU/DM nor for the ECU/Basket spot exchange rate in terms of individual currency exchange rates and interest rates. Rather, we have an expression for how the private ECU/DM spot rate and the interest rate of the private ECU should align in equilibrium. Any combination of $S(0)_{ECU}$ and $i(T)_{ECU}$ satisfying (6) defines a market equilibrium. Hence the market equilibrium ECU/DM exchange rate, $S(0)_{ECU}$, as well as the market equilibrium ECU/Basket exchange rate, $S(0)_{ECU}/B(0)_{DM}$, are indeterminate. The conclusion of Section 2 and equations (6) and (9) point clearly toward the need to determine the ECU interest rate if we want to obtain a determinate ECU/Basket exchange rate. We shall describe in the next section the mechanism which exogenously determines

---

16/ If the time of fixing is uncertain, then as before

$$\frac{S(0)_{ECU}}{B(0)_{DM}} = \sum_{t=1}^{T} \left[\frac{1+i(t)_{ECU}}{1+i(t)_{DM}}\right] \cdot \frac{E\ e(T)\ W(T)}{e(0)\ W(0)} \cdot \Pi(t).$$

17/ The uncovered interest parity condition is given by

$$e = \left[\frac{1+i_d}{1+i_f}\right]^2 Ee_f$$

where e is the spot rate of exchange of domestic money exchange for foreign money, i_d and i_f are domestic and foreign interest rates and Ee_f is the expected future spot exchange rate.

the ECU interest rates and thus remove the indeterminacy of the equilibrium spot exchange rates in equation (6) and (9).

Some alternative approaches

Current ECU research efforts have either relied on observed shifts in the flow demand and flow supply for ECU-denominated bank assets and liabilities or on market imperfections to explain simultaneously historical deviations from parity of the ECU/Basket exchange rate and the deviations of the ECU yields from the synthetic Basket yields. 18/

The demand and supply arguments consider two scenarios. In the first scenario the ECU assets of the banking sector grow faster than its ECU liabilities. The small group of core ECU banks willing to run net positions in ECU will lend ECU to the rest of the banking system while funding themselves by selling Basket liabilities. The yield at which the core banks are prepared to lend ECU to the rest of the ECU banking system must exceed the yield they pay on their Basket liabilities. Thus during such periods the ECU yield will exceed the synthetic Basket yield. 19/

It is also correctly noted that in this scenario, where total bank ECU assets rise faster than bank ECU deposits, the non-bank sector recipient of ECU bank credit must also be a net seller of ECU against currency on the ECU/Basket exchange market. Hence, the core bank becomes a net buyer of ECU and a net seller of the Basket. Thus it is concluded that the ECU should be at a discount against the Basket.

In the second scenario, which has prevailed since 1988 (Table 1) the ECU liabilities of the banking system grow faster than its ECU assets. Core ECU banks borrow ECU

18/ Louw (1991), Bishop (1991), Girard and Steinherr (1989), Lund (1991).
19/ In other words, when ECU bank assets exceed ECU bank liabilities, then the marginal funding cost for ECU assets is the Basket interest rate.

Table 1. Size of ECU Markets 1/

(In billions of ECU; outstanding at end-of-period)

	1985	1986	1987	1988	1989	March 1990	1991
Total ECU bank assets	63.9	70.3	80.7	100.6	128.2	148.4	161.7
Interbank	49.7	53.8	59.2	74.2	97.4	114.3	124.2
Non-bank	14.2	16.5	21.5	26.4	30.8	34.1	37.5
Total ECU bank liabilities	58.1	60.4	66.5	88.3	116.9	147.0	166.9
Interbank	49.7	52.9	57.2	75.5	91.7	115.8	129.8
Non-bank	7.4	6.4	7.4	9.1	18.5	22.3	26.7
Official deposits	1.0	1.1	1.9	3.7	6.0	8.9	10.4
Net bank assets	5.8	9.9	14.2	12.3	11.3	1.4	-5.2
Interbank	0	0.9	2.0	-1.3	5.7	-1.5	-5.6
Other	5.8	9.0	12.2	13.6	6.3	2.9	0.4
Total ECU bonds							
International	19	25	31	40	46	55	66
Domestic	6	7	9	16	24	35	36
ECU Euro notes	--	--	--	--	3	6	6
ECU domestic notes			1	7	10	8	8
Memorandum							
U.S. dollar per ECU	0.888	1.070	1.303	1.173	1.197	1.363	1.200

Source: BIS.

1/ Includes all banks in BIS reporting countries.

deposits from the rest of the ECU banking system, and lend Baskets of deposits of the currencies. Thus ECU yields will be below Basket yields. Furthermore, in this scenario the non-bank sector is a net ECU buyer on the ECU/Basket exchange market, rather than a net ECU seller, as in the previous scenario. The core banks sell ECU to the other ECU banks against the Basket. Hence the ECU/Basket exchange rate should show a premium in favor of the ECU.

This literature suffers from the shortcoming of trying to explain movements in the ECU/Basket exchange rate and in the ECU interest rates with recourse to only one equation--the interest parity condition. To see this let i_b be the Basket interest rate, i_{ECU} the ECU interest rate, $x = B(t)_{DM}/S(t)_{ECU}$, the ECU/Basket exchange rate (ECU per Basket) at time t, and Ex the expected future ECU/Basket exchange rate. Then

$$1 + i_b = x(1+i_{ECU})/Ex \tag{10}$$

is a simplified version of the uncovered interest parity condition in equation (9). The observed interest phenomenon $i_b < i_{ECU}$ is associated with flow borrowing of Baskets and flow lending of ECUs by the banking sector. This portfolio behavior of the banking sector is consistent with the usual arbitrage activities that bring about the interest parity result, i.e., if $i_b < i_{ECU}$ then the arbitraging bank will sell Baskets liabilities and buy ECU assets until $i_b = i_{ECU}$, providing that $x = Ex = 1$. The observed exchange rate phenomenon $x > 1$ is associated with the selling of Basket liabilities and the buying of ECU assets. Again, this behavior is the result of arbitrage supporting the interest parity until $i_b = i_{ECU}$ and $Ex = 1$. Thus while the explanation for the movement in ECU interest rates and the explanation for the movement in the ECU/Basket exchange rate are

each consistent with maintaining the interest parity condition, they cannot determine both variables--ECU/Basket exchange rate and ECU interest rate--simultaneously.

Thus the approach taken in the literature falls short in two ways. First, it fails to recognize that current institutional arrangements in the private ECU markets are not sufficient to establish a determinate real value for the private ECU. Second, even if there were an implicit recognition that an anticipated future pegging of the private ECU to the Basket is a necessary condition to obtain a determinate ECU/Basket exchange rate today, in light of the parity condition (6) or (9), this would only determine a relation between the ECU/Basket exchange rate and the ECU interest rate. 20/ In order to obtain the ECU/Basket exchange rate it is still necessary to identify the mechanism that exogenously sets the interest rate on the private ECU. Although the demand and supply approach reviewed above appears to produce independent conclusions about the movement of ECU yield and the ECU exchange rate, these are, only two different ways of expressing the same phenomenon, i.e., the movement of interest rates and spot exchange rates as constrained by the interest parity equation on the assumption that expectations about the future spot ECU/Basket exchange rate remain unchanged.

IV. The Second Step Toward Determining the Real Value of the Private ECU: Setting the ECU Interest Rates

This section explores the mechanism for setting interest rates for the private ECU. We showed in Section II that in order to obtain a determinate, albeit uncertain, real value for the private ECU unit of account, it is first necessary to transform the private ECU into a real economic good by ensuring that it is subject to sufficiently well-defined demand and

---

20/ Lund (1991) explicitly recognizes that expectations about a future pegging of the ECU rate influence the pricing of the ECU today. But he relies on the demand/supply argument to explain immediate fluctuations in the ECU/Basket exchange rate.

supply functions, as is generally achieved through a reserve requirement and exogenous control over the supply of reserves. It was also shown that, in addition, it is necessary to set independently the interest rate on required reserves. We then showed that in the absence of such a mechanism in the private ECU markets, the private ECU could only be given determinate real value through the anticipation of a future pegging of the private ECU to the Basket by a credible monetary authority. The interest parity condition derived in the previous section yields all possible equilibrium combinations of ECU/Basket exchange rates and ECU interest rates. It remains now to devise a mechanism that exogenously sets ECU interest rates, equation (6) will then fully determine the private ECU/Basket exchange rate. Such a mechanism to set the ECU interest rates, in fact, currently exists as part of the ECU Clearing and Settlement System, and we shall review first the clearing and settling of ECU interbank balances and then discuss the rate setting mechanism.

The ECU clearing system, centered around 45 ECU clearing banks, is organized by the ECU Banking Association (EBA). Same day clearing of ECU payments orders on this system has been in effect since March 28, 1988. The ECU clearing and settlement system is unusual in the sense that it does not permit the settling of clearing balance in a medium external to the banking system, such as reserves held at a central bank. Since the right to settle in the Basket was denied in November 1988, settlement has consisted of converting daylight net credit settlement positions into overnight interbank ECU loans. Any ECU obligations among banks are therefore settled with the delivery of further ECU obligations.

The daily ECU clearing operation proceeds in three separate stages. Until the preliminary cut-off time of 2 p.m. (Brussels time) all payments messages between the

clearing banks go through the SWIFT network and a netting computer 21/ provides each bank with its own preliminary debit or credit netting balance, and it makes available to each bank also the nature (debit/credit) of the balance of every other clearing bank. 22/ The netting center also transmits these final netting balances to the BIS. The BIS maintains a daily clearing account for each clearing bank which is credited or debited with the final netting balances of each bank. If at 3:15 p.m. some bank's net positions still exceed 1 million ECU, a further half-hour is allowed for an interbank market among the reduced set of participants--so-called special transfers. 23/ In order to deal with the remaining "small change" transactions required to bring the clearing accounts to a zero balance, the BIS, acting as an agent, automatically on its own accord, arranges loans from the net credit banks to the net debit banks. 24/

Since there are no private ECU other than bank IOU's, there is no way to settle a net debit position in the day's payments other than by converting it into an interbank overnight loan, i.e., the debit bank remains a debtor to the remaining banks in the system. The prearranged credit lines in the ECU system appear to be sufficiently extensive to avoid problems in effecting this kind of settlement. In practice there appears to be a balanced distribution of ECU payments, so that no group of banks will continue to acquire claims on

---

21/ Managed by SSP (SWIFT Service Partners) in La Hulpe, Belgium.

22/ This qualitative information regarding the nature of the clearing balances is also enter into a Reuters page by the BIS.

23/ Such special transfers have at times been quantitatively important.

24/ Explicitly, to do this the BIS maintains an ECU "sight account" for each clearing bank with a balance that cannot exceed 1 million ECU. These accounts pay zero interest and no overdrafts are permitted. The BIS can, at its discretion, transfer up to 1 million ECU in any one day from the account of one bank to the account of the other banks and log the transfer as an interbank loan between the two banks at the BIS overnight interest rate. Effectively, this is a housekeeping operation to eliminate frictional ECU clearing balances. If a clearing bank is unable to obtain sufficient ECU credit to settle its clearings balance, then the day's clearing will be unwound and all payments orders given and received by the non-performing bank will be canceled. The remaining payment orders are automatically value-date adjusted to the next day.

other banks, otherwise there would need to exist a mechanism to settle claims in some other medium, such as ECU-denominated securities.

Since the total net debit position of the clearing banks is always equal to their total net credit position on payments it has been argued 25/ that any overnight interest rate will clear the interbank market and that, therefore, the interest rate must be set externally. However, since no actual ECU for settlement exist, such as the ECU obligations of a European monetary authority, a net creditor bank cannot demand delivery of "ECU"--it must accept settlement in interbank ECU debt for the clearing to succeed. The net credit bank can always attempt to squeeze the net debit banks by refusing to make ECU loans, thus threatening the clearing. Similarly, a net debit bank can settle its accounts only by borrowing from a net credit bank. If it refuses to acquire a loan at a rate deemed unreasonable it can also cause the settlement to fail. In this sense any one bank can cause a settlement failure and can squeeze the others to the extent that they wish to avoid the cost of such a failure. As a result, it has generally been accepted that the interest rate payable on overnight loans arising out of the clearing operation should be set externally to the ECU banking system. The BIS, as agent of the private ECU clearing and settlement system, sets this overnight interest rate according to well-defined rules. In doing so it has also removed the indeterminacy of the ECU/Basket exchange rate in the interest parity equation. 26/27/

Overnight ECU Rates

25/ Jean (1980).

26/ The exogenous interest rate setting rule also satisfies the requirement that the interest rate of some nominal commodities, such as required reserves, be set exogenously for the unit of account to have determinant real value.

27/ That the banks must occasionally clear this position through "special transfers," however, indicates that either there are some additional rate payments or that a set of unwritten rules exists for allocating risks among the creditor banks that are reluctant to lend to the debit banks.

Suppose that an ECU clearing takes place on day D. To set the interest rate to be charged on overnight ECU lending between day D and day D + 1, the BIS acquires data on EIBOR (ECU Inter Bank Offer Rates) and EIBID (ECU Interbank Bid Rate) interest rates from the 45 clearing banks as of about 12:00 p.m. on day D - 1. The BIS eliminates the high and low EIBOR rates supplied by the banks and takes an arithmetic average of the remaining rates to determine the EIBOR rate applicable for interbank loans between day D and day D + 1. A similar procedure is used to determine the EIBID rate.

To construct the EIBOR rate information that it supplies to the BIS, an individual bank collects its Basket currency tomorrow/next (interest rate on overnight loans made tomorrow and repayable the next day) offered rates at 12:00 p.m. on day D - 1. It then computes the weighted average of these rates, using the current weights of the currencies in the official ECU. The bank's EIBID rate is similarly computed using the tomorrow/next bid rates for the Basket currencies.

The actual rate that applies to debit balances on Day D depends on the BIS's sense of the "imbalance" between the supply and demand of the ECU on the exchange market between ECU and official ECU Baskets of currencies. Since the exchange market between ECU and Baskets operates as a standard foreign exchange market with two business days until settlement, the imbalance is determined on day D - 2. If the ECU banking system is in an aggregate net short position in ECU exceeding 100 million ECU--that is, it has sold more than 100 million ECU against official Baskets of currency for delivery on day D--the BIS sets EIBOR as the day D overnight interest rate. If the ECU banking system is in an aggregate net long position in ECU exceeding 100 million ECU, the BIS sets EIBID as the day D overnight interest rate. Otherwise, it sets the overnight interest rate at the arithmetic mean between EIBOR and EIBID. Fixing the overnight rates effectively fixes $i(t)_{ECU}$

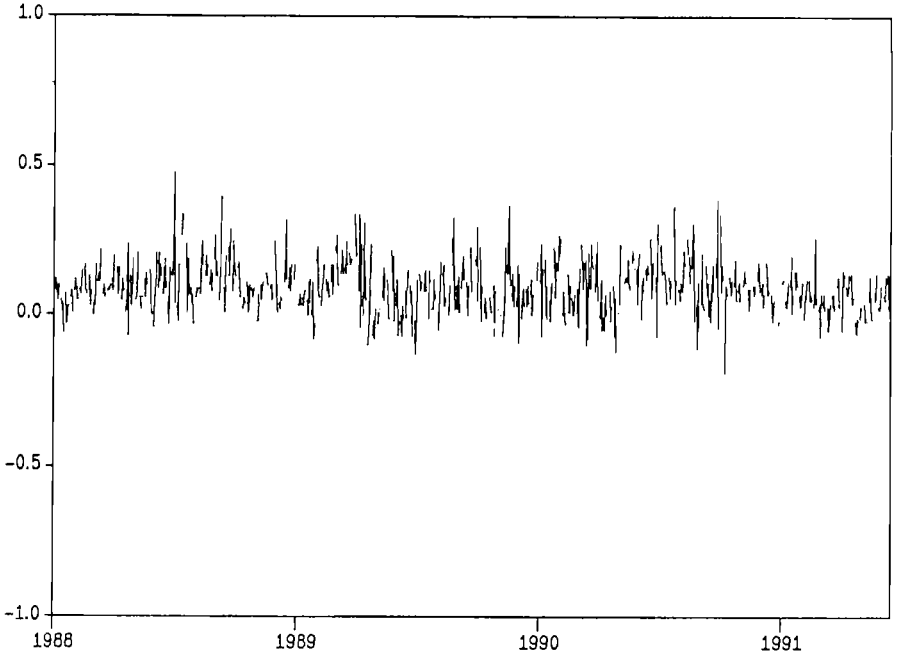
through the term structure 28/ and makes $S(0)_{ECU}$ a determinate function of the present and future underlying Basket composition, cross-currency exchange rates, individual currency overnight interest rates, and the BIS's weighing scheme for fixing the interbank ECU rates. The fact that the difference between the BIS determined interest rate on overnight ECU clearing balances and the Paris ECU overnight ECU money rate has remained within 20 basis points provides convincing empirical evidence for the proposition that the ECU term-structure is tied down by the BIS ECU rate (Chart 2).

Since EIBOR always exceeds EIBID this interest rate setting rule has certain equilibrating properties. For example, if the banking system moves from an aggregate flow short to an aggregate flow long position in the ECU exchange market 29/ then the overnight rate would decrease from EIBOR to EIBID thus decreasing the return to the non-bank sector from holding ECU, i.e., holding ECU bank deposits. It can be seen from equation (6) that such a change from EIBOR to EIBID in the overnight rate has the effect of depreciating the ECU against the Basket. If the market anticipates a permanent long ECU position for the banking sector, so that the lower overnight rate will continue to apply, then this would be reflected in the entire ECU interest rate term structure and the depreciation would be more marked. It is important to realize that the equilibrating features of this rule for the setting of the overnight interest rate applies only to the flow disequilibrium in the exchange market during the day. It is likely that there will be occasions when the banking sector has a positive net asset position in ECU while there exists an excess supply of ECU in the exchange market.

28/ For example, in the simplest case, if the expectations hypothesis of the term structure is valid, $i(t)_{ECU}$ is the arithmetic average of future expected bank ECU tomorrow/next rates through time t. More generally, the expectations hypothesis yield would be adjusted by liquidity premia and discounts.

29/ The selling of ECU by the banking system results in a reduction of basket deposit liabilities and an equivalent increase in ECU deposit liabilities held by the non-bank sector.

Chart 2. The Difference Between the BIS and the Paris ECU Overnight Rate 1/



Source: Eurostat and Data Resources, Inc.

1/ The BIS ECU overnight rate is the rate payable on ECU clearing balances, and the Paris ECU overnight rate is an interbank rate in the Paris ECU market.

The choice of the rule for setting the ECU interest rate is arbitrary, in the sense that any rule would result in an equilibrium ECU/Basket exchange rate. As an example of the arbitrariness in the choice of the bank ECU own interest rate, suppose that the BIS's current method of setting interest rates in overnight bank ECU loans generates an interest rate of 7 percent for bank ECU deposits maturing at time t. $i(t)_{ECU}$ is then 1.07. This establishes a spot exchange rate between bank ECU and DM of

$$S(0)_{ECU} = i(t)_{ECU}\, E[e(t)W(t)] / i(t)_{DM} = 1.07\, E[e(t)W(t)] / i(t)_{DM} \qquad (11)$$

Suppose that today the EBA and the BIS suddenly decide permanently to calculate the overnight bank ECU rate by multiplying its previous calculation by two. This would also double the interest rates in the rest of the term structure, changing $i(t)_{ECU}$ to 1.14, and increasing $S(0)_{ECU}$ by 6.5 percent. Note that the time t expected DM value of the bank ECU is unchanged in this exercise. The increase in the bank ECU own interest rate increases the amount of DM equivalent that a depositor expects to have at time t. Therefore, a depositor will pay more DM now for a bank ECU.

For any bank whose ECU position is balanced, it does not matter what own rate is established by the BIS for interbank overnight loans. The choice affects only the bank ECU spot exchange rate. For a borrower or lender with an unbalanced ECU position, however, such shifts in convention would create an exchange risk.

V. Deviations of the Private ECU/Basket Exchange Rate From Parity and of the Private ECU Yields From Synthetic Basket Yields

We have shown that expections regarding the future pegging of the ECU/Basket exchange rate is taking the place of the traditional monetary control mechanism in

determining the real value of the ECU. The relation between the ECU/Basket exchange rate and the ECU interest is then defined by an interest parity condition. Finally, the ECU overnight interest rate is exogenously determined and thus positions the ECU term-structure.

Spread between ECU interest rates and synthetic rates

We showed in the previous section that the ECU overnight interest rate is set by the BIS as EIBID or EIBOR depending on whether there is excess supply or excess demand in the ECU-Basket exchange market. Thus a change in market conditions in the ECU-Basket exchange market will move the ECU overnight rate by the spread between EIBID and EIBOR, or by about 25 to 35 basis points, and a sustained change in the ECU-Basket exchange market conditions will shift the term-structure by the bid-ask spread. These changes will then also appear as changes in the spread between ECU interest rates and synthetic rates. Hence, developments in EC money markets and in the ECU/Basket exchange market thus determine the short ECU interest rates and the premium/discount against the Basket: Knowledge of D - 1 tomorrow/next Euro-deposit rates in national currencies and knowledge of the demand and supply imbalance in the ECU bank market on D - 2 implies knowledge of the ECU rate for overnight loans from D to D + 1 .

Divergences of the ECU term-structure from the synthetic term-structure are also due to uncertainty regarding future reconstitutions of the Basket (see Girard and Steinherr, 1989), greater liquidity of the ECU than some constituent currencies, and anticipated shifts in the overnight interest rate setting convention.

Deviations of the ECU/Basket exchange rate from parity

Once the term-structure of ECU interest rates has been determined, then expectations concerning the future value of the ECU, the term E[e(T)W(T)] in Equation (8) determine

the spot ECU/Basket exchange rate. Three sources of uncertainty affect the future value of the private ECU:

(a) the composition of the Basket at the time of the fixing,

(b) the future bilateral spot exchange rates, and

(c) the timing of the future pegging of the ECU to the Basket.

The first and second type of uncertainty are to some extent limited by the existing institutional arrangements. In particular, as long the ERM is in effect, movements in spot exchange rates are limited to less than 6 percent against any member currency, unless there is a realignment; and the composition of the Basket is not likely to change radically. Although the uncertainty surrounding the timing of the fixing is being reduced as the Intergovernmental Conferences progress, there is, as of now, no institutional limit on the timing.

The ECU/Basket exchange rate will also be affected by changes in risk regarding its future DM value. Greater risk will increase the risk-adjusted DM discount rate and cause a depreciation of the ECU against the Basket. Changes in the expected composition and in future spot exchange rates will also result in changes in the ECU/Basket exchange rate. If weights are expected to remain constant ($W(0) = W(t)$), then the ECU can be perfectly hedged in DM at pre-determined forward exchange rates.

Uncertainty regarding the future fixing itself will be reflected in the expectations about the future value of the ECU. This has potentially the largest effect on the exchange rate. Doubts about a successful outcome of the current Intergovernmental Conferences will be translated into a lower expected value of the ECU and into a discount against the Basket. In this regard it is important to note that it is unlikely that a single country or a subset of the EC Member States would want to accept the monetary implications of fixing the ECU/Basket exchange rate in the absence of an EC-wide agreement.

VI. Summary and Conclusion

Since November 1988 there has not existed any official or private institutional arrangement or commitment to exchange private ECU, i.e., ECU- denominated liabilities of the banking sector, for the official ECU-Basket at par. Instead, the ECU/Basket exchange rate has fluctuated freely, with the private ECU trading at times at a premium or discount against the Basket in excess of a 100 basis points. The value of ECU-denominated financial assets (in excess of $ 250 billion ECU) is uncertain not only in terms of single currencies, but also in terms of the Basket. Since the traditional monetary mechanism that gives real value to a currency has not yet evolved for the private ECU, the real value of the private ECU, i.e., the value of the private ECU in terms of the Basket, can only be determined by the market's expectations about a future fixing of the ECU/Basket exchange rate in the context of EMU or otherwise. An interest parity condition, based on the expectations regarding the future fixing of the ECU's value then determines possible combinations of ECU/Basket exchange rates and ECU interest rates. The ECU term-structure in turn is tied down exogenously by the BIS as part of the private ECU payments clearing mechanism. In particular, the BIS sets the overnight rate as a weighted average of overnight rates in constituent currencies. The term-structure and the expectations regarding a future fixing of the exchange rate are then combined in the interest parity condition to yield the current ECU/Basket exchange rate.

A commitment by individual central banks, or a group of central banks, to fix the ECU/Basket exchange rate would require that such central banks stand ready to convert ECU-denominated bank liabilities into liabilities of central banks. In the absence of a mechanism to control the expansion of ECU-denominated bank liabilities, e.g., through a reserve requirement on ECU deposit liabilities, such a policy could have serious adverse consequences for monetary control. A successful adoption of a fixed ECU/Basket

exchange rate regime, therefore, appears possible only under some form of EMU, e.g., by replacing the 12 EC currencies with the private ECU such that the growth of ECU monetary assets of the banking system is governed by a European monetary authority. Hence any uncertainty concerning the creation of a single European currency translates directly into exchange rate uncertainty for the private ECU.

The most important question to emerge from the analysis is whether the current yields on financial instruments denominated in private ECU, as determined by expected changes in the ECU/Basket exchange rate and the ECU term-structure, already fully reflect all exchange rate uncertainty generated by uncertainty about the future fixing of the ECU/Basket exchange rate in the context of a monetary union. If the foreign exchange risk of the private ECU against the Basket is not yet fully reflected in the current discount of the private ECU against the Basket or in the ECU yields, then the losses that such a devaluation would produce may impede the further development of the private ECU market.

References

Bishop, G., "ECUland--The Thirteenth Member of the EC?," Salomon Brothers, European Business Analysis, (11 April 1991).

Chaphekar, Prem, Giles Keating, and Richard Mason, "ECU Recomposition and the True Synthetic Yield," CSFB Research, (September 1988).

Committee of Governors of the Central Banks of the Member State of the European Economic Community, "Recent Developments in the Use of the Private ECU: Statistical Review," (February 1991).

Fama, Eugene F., "Banking in the Theory of Finance," Journal of Monetary Economics 6 (1980), 39-57.

Girard, J., and A. Steinherr, "The ECU: A Currency Unlike Any Other," EIB Papers, (June 1989).

Jean, Alain, "The ECU Clearing System," translated from "L'ECU, le SME et les Marches Financiers," Les Editions d'Organisation, (Paris, 1990).

Louw, A., "The ECU and the Basket: exchange rate premium/discount and interest rate differential," ECU Banking Association, (draft, 1991).

Lund, T., "European Monetary Union: what value ECU bonds?," Credit Suisse First Boston Research, (London, 1991).

————, "ECU and the Basket: reasserting the fundamentals," Credit Suisse First Boston Research, (London, 1991).

Patinkin, Don, "Financial Intermediaries and the Logical Structure of Monetary Theory," American Economic Review, (March 1961), 95-116.

Steinherr, A., "EMU--Scenarios for Stage Two," ECU Newsletter, No. 35, (January 1991).