The Private Ecu's Potential Impact on Global and European Exchange Rate Stability *

1. Introduction

At present there exist conflicting views between the EMS member countries regarding the further development of the European Currency Unit (Ecu). A number of these countries is inclined to strive for a strengthening of the Ecu by improving its liquidity in the official sphere and by increasing the amount of Ecus. This idea has the support of, in particular, the debtor countries in the EMS credit mechanism. The creditor countries are opposed to these changes because they are concerned about the domestic monetary consequences of the EMS intervention and financing operations. They fear being obliged to accumulate an excessive amount of Ecus. Therefore they stress the temporary character of using Ecus and advocate realistic interest rates on Ecu credit balances. Notwithstanding this dispute, a package of measures has recently been introduced to improve the characteristics of the official Ecu. The amendments of the original EMS agreement became effective on July 1, 1985.[1]

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[1] A major novelty in the regulations is the enlarged opportunity for the participating central banks to mobilise their Ecu holdings in the event of a need for intervention currencies. EMS central banks have committed themselves to cover such mobilisation operations by providing one another U.S. dollars within specified limits and only for a maximum period of six months. The dollars thus provided may be exchanged for participating EMS currencies with the approval of the issuing central banks. Another improvement is that the Ecu's acceptability has been somewhat extended as far as settlements of obligations arising out of the use of what is called very short term financing are concerned. In addition, the renumeration of the Ecu credit positions has been brought up to money market levels, while it is also possible for certain institutions to become 'third holders' of Ecus since June 1985.

Agreement on these changes could, of course, only be reached because they apparently preserve the balance of interests of potential creditors and debtors in the system. In fact, the package of July 1985 contains mainly measures of a secondary nature. The creditor countries emphasise that the discussion on an essential increase of the Ecu's role must be preceded by a discussion of the fundamental question why this enlargement should take place. An answer requires at least an enumeration of the consequences.

This paper deals with one important potential, but under-exposed, consequence of a fundamentally enlarged role of the Ecu. In particular, it discusses the possible beneficial effects of the private use of the Ecu on exchange rate stability.[2] The current view is that a fully developed Ecu in the private sphere will foster exchange rate stability (cf. Sarcinelli, 1986, p. 66 and Reynolds Allen, 1986, p. 36). We will argue that the theoretical basis of this proposition is not complete. When the reasoning is improved, the outcome becomes inconclusive, however. General conclusions appear impossible, and even case studies require an empirical approach, as will be demonstrated in the present study.

In fact, the private Ecu's effect on exchange rate stability is the only consequence of the introduction of a fully developed Ecu for we do not know *a priori* whether it must be classified as a cost or as a benefit. This is made clear in a theoretical examination of the Ecu's potential costs and benefits in Section 2. Section 3 contains a justification and description of the method to be applied, while the proper purpose of the present analysis is addressed in Sections 4 and 5. Section 6 provides a brief summary and a discussion of the results.

2. Costs and benefits of a fully developed Ecu

An answer to the question whether or not the Ecu must be promoted is not limited to the Ecu in the official sphere, but refers also and even mainly to the Ecu in the private circuit. The advancement of the private Ecu's position is, of course, primarily the responsibility of the private banks. Nonetheless, central banks are capable of influencing this process by their power to vary the room for manoeuvre for banking operations in Ecu-denominated assets and liabilities. It is, for instance,

[2] The IMF also points to the relevance of the question as to whether the private use of the Ecu contributes to international financial stability (cf. IMF, 1987, p. 41).

the central bank that allows residents to issue Ecu-denominated liabilities and hold Ecu accounts and that assigns to the Ecu the status of foreign currency[3] — with repercussions for the international mobility of Ecu-denominated financial assets. The central bank can also exert its influence by accepting a lender-of-last-resort function for Ecus and by setting and changing the reserve requirements for banks which attract Ecu deposits. In particular, the introduction of official interventions in Ecus in the foreign-exchange markets will probably promote the Ecu's expansion in the private circuit substantially. In such ways, a further development of the Ecu in the official sphere will entail incentives for the private use of Ecus.

In determining its attitude with respect to a larger role for the Ecu, a central bank is confronted with the potential danger that Ecu creation undermines national monetary policy. An extension of officially held Ecus implies that the EMS member countries are able to intensify their uses of the official credit mechanisms of the EMS. This may stimulate a potential debtor country to carry out an expansionary monetary policy. Its achievements will, normally, be transmitted to the other member countries and may be considered there as an exogenous disturbance with all its undesired consequences. The lack of any effective check on the total amount of Ecu creation in the private sector is still more threatening.

Well-developed Ecu deposit and credit markets existing alongside the traditional financial markets in domestic currency could, moreover, lead to increased capital flows between EMS member countries (Mayer, 1986, p. 20). A change in monetary policy in one of these countries would in this event tend to exert a stronger influence on intra-EMS exchange rates and monetary conditions in other EMS member countries. In sum, both a higher speed of Ecu creation and of intra-EMS movements of Ecu deposits may intensify and propagate policy disturbances, and in so doing reduce the scope for independent monetary policies.

Monetary authorities will weigh these two potential disadvantages for intra-EMS exchange rates and policy independence against the potential advantages of a larger role for the Ecu. There are three advantages associated with the introduction of the private Ecu. First, it is a financial innovation and, thus, it apparently fosters a good adaptation of the supply side to the demand side of the money markets. Second,

[3] These are precisely the features that the Ecu presently lacks in Germany. It is to be expected, however, that these restrictions on the use of the Ecu will soon be eliminated. The Bundesbank's opposition to the Ecu has been based on Germany's currency law, which forbids indexed liabilities (see *inter alia*, *The Economist*, May 23, 1987, p. 92).

just because of the potential disadvantages mentioned above, the creation of private Ecus is in fact an indirect stimulus of greater monetary and economic integration in the EMS. The reduced scope for an independent monetary policy will force the policy-makers to be more amenable to the arguments in favour of economic policy convergence. Particularly, the inflation-shy countries, which are emphasising the importance of policy coordination, may welcome the indirect pressure in that direction. There is, of course, still no guarantee that the greater willingness to seek policy convergence is, in effect, accompanied by the acceptance of low inflation and low money growth targets.

Third, the growth of a private Ecu market will promote the official role of the Ecu. Until now, the Ecu is not functioning as an intervention currency in the foreign exchange market. Its medium-of-exchange function in the official sphere is, consequently, restricted to the use as a means of payment between monetary authorities. A substantial growth of the private Ecu market will enlarge pressures to link the official and private Ecu and, subsequently, to stimulate an intervention function for the Ecu. The addition of this function will help to transform the Ecu into a more complete international reserve currency. The advantages which are traditionally associated with this position are then likewise brought nearer. An advantage, frequently mentioned in this respect, is the seignorage that can be earned on newly issued Ecus. The possibility to obtain automatically foreign credits in the case of balance-of-payments deficits — since third countries will accept the Ecu as an international means of payments — is also a benefit. The same holds for the fact that a full-fledged common currency tends to transform the EMS from an exchange rate agreement into a monetary zone of its own (Sarcinelli, 1986, p. 65). In this sense the Ecu is a public good.

Finally, there is a consequence of the adoption of Ecus in the private sector which cannot be considered *a priori* either as a cost or as a benefit. It concerns the effect of the growth of the Ecu market on exchange rate stability. This effect encompasses two aspects. A first aspect is that a fully developed private Ecu could play a role in the *global* capital flows. The addition of a reserve currency to the current multi-reserve currency system might have a stabilising effect on the mutual exchange rates of the major currencies in the world. The introduction of a new currency could divert speculative capital flows between the established reserve currencies, and hence stabilise their exchange rates. This applies particularly to the introduction of the Ecu with its moderate portfolio characteristics consequent on its basket

structure. On the other hand, the addition of an investment currency extends the latitude for impetuous speculative capital flows.[4] This may well promote unstable exchange rates.

A second aspect of the Ecu's effect on exchange rate stability relates to the currencies included in the *EMS*. At first glance, the presence of private Ecus may foster the stability of intra-EMS exchange rates.[5] An important part of this stability aspect refers to the influence of a fluctuating dollar value on the intra-EMS exchange rates. In particular, it is often suggested that, in a systematic way, a weak U.S. dollar leads to a capital flow towards especially the Deutsche Mark and the other way around when the dollar is considered to be strong. (*Inter alia*, Giavazzi and Giovannini, 1985, p. 77, and 1986, p. 460; Sarcinelli, 1986, p. 62.[6]) The idea underlying the stability argument involved is that the introduction of the Ecu may remove this dollar effect to a certain extent and in so doing stabilise the mutual rates of the EMS currencies.[7] By introducing this alternative investment opportunity, the tensions in the international monetary system which arise from a weak dollar can then in effect be spread over an extra currency. It is, nevertheless, premature on this basis to conclude in favour of stability. Two counter-arguments can be advanced to show that the introduction of the Ecu can also lead to a *loss* of exchange rate stability.

The first counter-argument relates to the Ecu's characteristic that it is a basket of currencies, namely of the EMS currencies. That is why, unlike purely national currencies, the Ecu allows its supply and demand to be not necessarily balanced by only a change in its price. Banks are able to cover an open position in Ecus in several ways. All these ways have the feature that a net demand for, or supply of, Ecus is spread over the currencies which are components of the Ecu basket (cf. Mayer, 1986, pp. 11-12).

Even in the event that the balance between the supply of and demand for Ecus is initially restored by only a suitable change in the Ecu's price, arbitrage activities will realise a value change of the component currencies of the Ecu basket in the same direction. As a

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[4] This view is, for example, expressed by ROOSA (1982, p. 12).

[5] This consideration is seemingly in conflict with one of the disadvantages mentioned before. There the relevance of the private Ecu to the degree of capital mobility was essential, however, whereas now the exchange rate stability is meant in the context of a *given* degree of capital mobility.

[6] See also the references in GIAVAZZI and GIOVANNINI (1986, p. 458, note 1).

[7] SARCINELLI (1986, p. 66), MICOSSI (1985, p. 342).

result of the arbitrage, a net supply of or demand for Ecus is always transferred to the markets of the component currencies. The dispersion of these volume effects on these markets will correspond to their currencies' shares in the Ecu basket. The consequence of the volume effects will normally be diverging mutual exchange rates in the EMS. Since the EMS currencies include major global currencies such as the Deutsche Mark and the pound sterling, the arbitrage concerned also induces divergent impacts on the major currencies in the world. In this way it may undermine global exchange rate stability.

The second counter-argument emerges from the fact that it is essential to distinguish two effects of the introduction of the Ecu. First, a once-and-for-all portfolio adjustment in immediate response to this introduction can be distinguished and the once-and-for-all consequential shift in exchange rates. Second, there may be changes in the sensitivity to exogenous shocks of the new portfolio composition, including the Ecu, relative to the old one. The difference in sensitivity leads to different impacts on the exchange rates of the currencies in the portfolio. It is precisely these impacts that are in fact meant in discussions of the Ecu's effect on exchange rate stability.

In the portfolio reallocation consequent upon temporary exogenous shocks, the change of a particular currency's portfolio share will depend on the degrees of substitutability between the currencies involved. The introduction of the Ecu as an investment currency will contribute to the stabilisation of exchange rates if it results in a reduction of these *changes* in the shares. A change of a particular share is, of course, determined by the values of that share both before and after the occurrence of the shock. The introduction of the Ecu may exert an influence on these two values. For that reason, it does not suffice to look only at the effect of the Ecu on the share *after* the exogenous shock arises, because the starting portfolio may also be affected by the possibility to invest in Ecus. Nonetheless, it seems to be quite usual in studies with a comparable object such as ours to omit the latter effect on the initial portfolio. Then, the authors in fact implicitly carry out an analysis of the first mentioned, once-and-for-all effect on the exchange rates mixed up with the occurrence of an exogenous shock.

The next example will illustrate our viewpoint. The dollar, for instance, exhibits alternate periods of weak and strong tendencies. Normally, these exogenous shocks give rise to upward and downward shifts in the portfolio shares of all the other currencies. The portfolio share of a particular currency essentially depends on the variances and

mutual covariances of the investment yields in the other investment currencies. The structure of this dependence varies with the currency involved as well as with the kind of tendency in the dollar value and the set of competing investment currencies. The addition of the Ecu will thus normally influence the shares of all the currencies involved in different intensities in the two kinds of period. Hence, the Ecu will also evoke divergences in the exchange rate changes that arise.

The foregoing analysis implies that in an analysis of the Ecu's effect on exchange rate stability, one has to take notice of a large quantity of statistics. It concerns the mean values, variances and covariances of all the currencies involved, and moreover for different periods as well as for the two situations excluding and including the Ecu. For that reason, it is impossible to deduce a general conclusion with respect to the Ecu's effect on exchange rate stability independent of empirical analysis. In the next section therefore, an attempt is made to gain this insight by means of an empirical *quantitative* analysis.

3. The method

We start from the hypothetical situation that there is a well-developed and generally accessible Ecu market with clearing mechanisms and efficient forward markets available. Private Ecus are traded in a parallel market alongside the markets in domestic currencies. It is assumed, moreover, that Ecu business is accorded the same regulatory treatment as other foreign currency business and that there are virtually no exchange controls on the investment currencies involved. Finally, it is assumed that switches between domestic currency and Ecus do not influence banks' lending behaviour and, consequently, monetary policy and money supply,[8] and also do not affect the degree of capital mobility. As a result, the existence of a well-developed private Ecu market might only alter exchange rate stability by affecting the geographical pattern of international capital flows (cf. Mayer, 1986, p. 19). In effect, these assumptions create a hypothetical situation, but also a situation which

[8] The consequences of disposing of this assumption are analysed in MAYER (1986, pp. 5-10).

resembles the proposal of the Commission of the European Community regarding the future position of the private Ecu.[9]

The existence of an all-encompassing Ecu market parallel to the markets in domestic currency deposits and credits would make it extremely easy to switch between domestic currencies and Ecus. The desire to hold Ecus will then only depend on their attractiveness as an investment and transaction currency. The demand for Ecus resulting from the investment function is, in essence, dependent on the Ecu's risk-return characteristics relative to those of competing currencies. The determining factors for the Ecu's transactions function are, in fact, not different. The need to have assets in a certain currency that is used for future payments of goods transactions is likewise stimulated by the strength and interest rate of the currency in question and is counteracted by erratic movements in its value compared with other potential transaction currencies.[10]

These determinants of the desire to hold Ecus point unequivocally to the application of the mean-variance analysis for examining optimally composed currency portfolios. A second argument for preferring a portfolio-balance model, and not for example a monetary model, is that one of the issues in our problem is an asymmetrical behaviour emerging from differences in the degree of currency substitution (cf. Frankel, 1985, p. 111). A monetary model is based on perfect substitutability.

Giavazzi and Giovannini (1985) and Frankel (1985) also use a portfolio model. They interpret substitutability by means of the single covariance or coefficient of determination. In our opinion, that approach is only partial and not realistic. It is essential to consider the entire grid of mutual degrees of substitutability between all the assets involved. Relevant information is excluded when one only takes into account the extent to which the asset with a changing mean or variance is a substitute for each of the other assets separetely. The application of Markowitz' mean-variance analysis resulting in a set of efficient portfolio compositions employs all this information and is for that reason used in the present analysis.

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[9] As presented in *e.g.* COMMISSION OF THE EUROPEAN COMMUNITIES, *Communication from the Commission to the Council on the promotion of the international role of the Ecu*, COM (83) 274, Brussels, 24-5-83.

[10] Only transaction costs may act as an impediment to holding transaction balances in currencies which are different from those eventually required for payments.

The determination of the set of efficient compositions and the subsequent question of the detection of the composition to be preferred in that set are closely bound up with the choice of the *numéraire*. This choice is a fundamental problem in applied mean-variance analysis because it strongly influences the variability of the assets' yields. The use of one of the investment currencies under examination for this aim would give a downward bias to the variability of investments in the currency chosen. It is preferable to get round such biased results if the choice of the *numéraire* is not determined by the purpose of the analysis and thus can be made completely arbitrary. An example of such an arbitrary choice, which leads to the bias in question, is observable in Makin (1974) where the U.S. dollar is used as *numéraire*.

The same problem, although in a somewhat weaker form, applies to the choice of the denominator in Giavazzi and Giovannini (1985, p. 80). They introduce the assumption that investors in the major currencies in the world consume a common basket of goods, with identical weights of goods produced in the United States, United Kingdom, Germany and Japan. In our view this is not a reasonable assumption because inhabitants of different countries consume nontraded goods and, most likely, different proportions of internationally traded goods. Since the relative prices of traded and nontraded goods used to fluctuate significantly, real returns on any particular asset, in fact, depend upon which investor's perspective is taken. (See *e.g.* Stulz, 1985.)

In order to circumvent the disadvantages of the previous two *numéraires*, in the present study the domestic currency of the investor or trader has been chosen as the *numéraire* of the portfolio. This currency is normally the unit of account of the gains and losses of the domestic private sector. That feature makes the domestic currency a plausible *numéraire*. This choice has both an advantage and a disadvantage compared to the selection of a *numéraire* that is not specific for a country.

The advantage is that the capital asset pricing model (CAPM) can be applied for determining the optimal portfolio composition from the set of efficient compositions. In this approach the optimal portfolio of international investments will be the one that is indicated by the point of tangency between the efficient frontier — that is the representation of the set of efficiently composed portfolios of risk-bearing assets — and the straight line (the capital market line) which passes the point that represents the riskless asset. In the event of investing internationally, it is reasonable to consider a domestic investment as the only possible

riskless asset, that is free of exchange rate risk. By using the home currency as the *numéraire*, the home currency investment indeed emerges as riskless. All other potential *numéraires* include foreign currency investments as riskless and make it thus impossible to determine unambiguously the optimal international portfolio composition (cf. Jager and de Jong, 1986, pp. 420-422).

The choice of the home currency as the *numéraire* has, on the other hand, a drawback also. Contrary to the choice of one of the foreign investment currencies — or a basket of these currencies — the optimal portfolio to be determined for one country will now not be representative of the position of the foreign currencies in other countries and therefore in the world. As a logical implication, all countries with a considerable contribution to international investments have to be considered simultaneously in order to get a representative reflection of the world-wide optimal portfolio composition. This is what happens in the present study, which includes in the analysis a selection of 15 countries, namely the Group-of-Five countries, to which 10 West European countries are added. In view of the central position of precisely the Ecu in the present analysis, it is relevant that the collection comprises all countries participating in the EMS exchange rate arrangement.

For each country, the effective yields of three-month investments in the currencies included in the international portfolio are determined, expressed in the home currency and on a monthly basis. The choice of the portfolio currencies is made dependent on the kind of exchange rate stability that is examined. In the global case, the U.S. dollar, the Japanese yen, the Deutsche Mark, the British pound sterling and the Ecu are distinguished. In the event of EMS exchange rate stability the portfolios may consist of the currencies mentioned, supplemented by the French franc, the Italian lira, the Dutch guilder and the Belgian franc. In the global approach, investments in the latter currencies are not allowed. The economic interpretation is that in that approach investors avoid these currencies because of capital restrictions or because the markets are considered to be too thin or illiquid.

The optimal portfolios are determined for three successive periods of either two or three years, which are characterised by diverging developments in the dollar's exchange rate. In the first one, October 1976-September 1979, the dollar displays a downward trend, whereas the third period, October 1981-September 1984, is marked by an upward trend in the dollar. The two-year period in between is a kind

of transition period with less clear tendencies in the values of the portfolio currencies. Precisely as a result of the diverging exchange rate tendencies, it is not likely that the variances and covariances of the rates of return are constant over time during the entire period. This stationarity nonetheless is a requirement for carrying out portfolio analysis. Distinguishing the three subperiods has therefore the additional merit that the likelihood of stationarity will undoubtedly have been increased.

The effective yield encompasses the interest rate of the investment and the capital gain, *i.e.* the exchange rate gain, on the asset considered. The latter component also includes the exchange rate gain on the interest yield. The yield of the Ecu has been calculated during the entire period under examination as if the Ecu had the composition and method of interest rate determination following the last adjustments in these respects in September 1984 and July 1985.[11]

It is assumed, finally, that the investors do not exhibit speculative behaviour to the effect of building up a debt position in some asset — *i.e.* a negative portfolio share, with the obligation of paying interest — in order to be able to create a credit position in another asset. On that basis a quadratic programming algorithm has been used. By permitting negative shares in the portfolios, we would have met the problem that, at the other extreme, investors are able to invest an infinite amount in the currency preferred. In our calculations this would have made unavoidable the choice of a very arbitrary upper limit for that amount. The assumption regarding speculative behaviour implies that we restrict the empirical analysis to the investment side and neglect the borrowing side of the markets.

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[11] The representative money market rates used for calculating the Ecu's interest rate are: the three-month interbank deposit rates in Belgium/Luxembourg, Germany and the Netherlands; the three-month interbank rate in Ireland; the three-month interbank money rate against private paper in France; the three-month market rate in Denmark; the rate for three-month interbank deposits in convertible drachmae for Greece; the tender rate for three-month treasury bills in Italy; and the market yield for three-month UK treasury bills in the United Kingdom. The short term interest rates in the remaining countries are yields on comparable three-month investments. The portfolio characteristics have been calculated from monthly data of three-month investments. Sources for the data including those for the exchange rates: IMF, *International Financial Statistics*, MORGAN GUARANTY TRUST, *World Financial Markets*, and De Nederlandsche Bank, private correspondence.

4. The results: the global perspective

Table 1 is the outcome of the optimal portfolio calculations and the starting point of our analysis of global exchange rate stability as well as of the Ecu's influence upon it. The table's vertical entries indicate the currencies which are allowed as investment currencies, while the currencies in the horizontal entries are successively used as *numéraire*. They are split up into three categories: first the currencies of the five small EMS countries, followed by those of five other small European countries and the Group-of-Five currencies.

The last three rows of the table display averages of the results shown in the preceding rows. In determining these averages, weights were required representing the relative importance for the world financial markets of foreign investment expenditures in the countries involved. We decided to utilise weights derived from the countries' GNPs in 1983, expressed in dollars. At first glance, it seems more natural to use weights based on national financial wealth. They have the drawback of reflecting in several cases different definitions of the compounding parts adopted by the countries involved. Another problem is that some parts of wealth are actually not measured. This further undermines the sense of using wealth as an indicator. There may also be national differences in the extent to which national wealth is invested abroad. Unfortunately, it is impossible to quantify these differences. But this drawback of using weights based on wealth also holds for the GNP weights.

In table 1 the numbers without brackets indicate currency shares which are obtained from calculations where the Ecu is left out of consideration. If the Ecu is allowed to take part in the portfolios, it may have an effect on the shares originally calculated. That effect has been determined and is presented in table 1 between the brackets which are placed after the shares calculated originally. This means in the case of, for example, the Italian investors that, when investments in a well-developed Ecu are allowed, its share in the Italian portfolios becomes 47% in the first period distinguished. This percentage would have been realised at the cost of the shares of the Deutsche Mark, the pound sterling and the yen. These currencies appear in table 1 to experience falls of respectively 14, 25 and 9 percentage points.

It is in effect in accordance with expectations — based on the criterion used for the division into periods — that the dollar exhibits a

TABLE 1

OPTIMAL MONEY MARKET PORTFOLIOS:
CURRENCY SHARES EXCLUDING THE ECU AND EFFECT OF INTRODUCING THE ECU[a]

Period	1976 (IV) - 1979 (III)						1979 (IV) - 1981 (III)						1981 (IV) - 1984 (III)					
Reserve currency / Numéraire	Deutsche Mark	Pound sterling	U.S. dollar	Yen	Ecu		Deutsche Mark	Pound sterling	U.S. dollar	Yen	Ecu		Deutsche Mark	Pound sterling	U.S. dollar	Yen	Ecu	
Dutch guilder	67	(0) 29	(0) 0	(0) 4	(0)	– (0)	78 (−64)	21 (−21)	1 (−1)	0 (0)	−(+87)		74 (0)	0 (0)	16 (0)	10	(0)	– (0)
Belgian franc	9	(0) 78	(0) 0	(0) 13	(0)	– (0)	55 (−5)	19 (−17)	16 (−1)	9 (−2)	−(+76)		5 (0)	0 (0)	34 (0)	61	(0)	– (0)
Danish krona	0	(0) 100	(0) 0	(0) 0	(0)	– (0)	56 (−46)	0 (0)	14 (+3)	30 (−7)	−(+50)		36 (0)	0 (0)	24 (0)	40	(0)	– (0)
Irish pound	0	(0) 86	(0) 0	(0) 14	(0)	– (0)	51 (−51)	24 (−17)	18 (−2)	6 (−2)	−(+72)		41 (0)	0 (0)	37 (0)	22	(0)	– (0)
Italian lira	14	(−14) 65	(−25) 0	(0) 21	(−9)	−(+47)	43 (−43)	30 (−18)	18 (−4)	8 (−2)	−(+68)		2 (0)	0 (0)	53 (0)	45	(0)	– 1 (0)
Portuguese escudo	50	(0) 50	(0) 0	(0) 0	(0)	– (0)	1 (−1)	51 (−3)	48 (−2)	0 (0)	– (+5)		27 (0)	0 (0)	35 (0)	38	(0)	– (0)
Swiss franc	0	(0) 74	(0) 0	(0) 26	(0)	– (0)	60 (0)	0 (0)	21 (0)	19 (0)	– (0)		15 (0)	0 (0)	22 (0)	63	(0)	– (0)
Austrian Schilling	83	(−13) 11	(−10) 0	(0) 3	(−3)	−(+26)	97 (−11)	3 (−3)	0 (0)	0 (0)	−(+14)		88 (0)	0 (0)	4 (0)	8	(0)	– (0)
Norwegian krona	58	(−35) 39	(−6) 0	(0) 3	(−3)	−(+44)	34 (−22)	33 (−5)	53 (0)	0 (0)	−(+27)		0 (0)	4 (4)	50 (0)	46	(0)	– (0)
Swedish krona	42	(−42) 53	(−19) 0	(0) 5	(−5)	−(+66)	24 (0)	37 (0)	31 (0)	8 (0)	– (0)		0 (0)	0 (0)	85 (0)	15	(0)	– (0)
Deutsche Mark	–	(0) 73	(−52) 0	(0) 27	(−22)	−(+74)	– (0)	46 (−46)	46 (−36)	8 (−8)	−(+90)		– (0)	0 (0)	46 (−24)	54	(−27)	−(+51)
U.S. dollar	25	(−25) 59	(−38) –	(0) 16	(−14)	−(+77)	0 (0)	0 (0)	100[a] (0)	0 (0)	– (0)		0 (0)	0 (0)	100[a] (0)	0	(0)	– (0)
Japanese yen	0	(0) 100	(0) 0	(0) –	(0)	– (0)	0 (0)	0 (0)	100 (0)	– (0)	– (0)		0 (0)	0 (0)	100 (0)	–	(0)	– (0)
British pound	0	(0) 100[a]	(0) 0	(0) 0	(0)	– (0)	0 (0)	– (0)	20 (+1)	80 (+)	– (0)		0 (0)	– (0)	100 (0)	0	(0)	– (0)
French franc	10	(−10) 56	(−24) 0	(0) 34	(−9)	−(+45)	68 (−68)	22 (−22)	5 (−3)	5 (−5)	−(+98)		24 (0)	0 (0)	27 (0)	49	(0)	– (0)
Averages:																		
Group of Five	15	(−15) 71	(−28) 0	(0) 14	(−10)	−(+53)	6 (−6)	7 (−7)	80 (−4)	7 (−1)	−(+18)		2 (0)	0 (0)	88 (−3)	10	(−3)	– (+5)
Other countries	29	(−12) 38	(−12) 0	(0) 13	(−4)	−(+28)	52 (−35)	23 (−12)	17 (+)	8 (−1)	−(+49)		22 (0)	0 (0)	40 (0)	38	(0)	– (0)
Total	17	(−14) 69	(−26) 0	(0) 14	(−10)	−(+50)	12 (−10)	9 (−8)[b]	72 (−4)	7 (−1)	−(+22)		5 (0)	0 (0)	81 (−2)	14	(−3)	– (5)

Notes: [a] The numbers between brackets represent the change (in percentage points) of the share as a result of the introduction of the Ecu. A "–" indicates that, in principle, the asset concerned is not allowed to take part in that portfolio. A few portfolios do not add up to 100 percent as a consequence of rounding off.

[a] This number arises because both mean and variance of the home currencies are better than those of all foreign currencies distinguished. The CAPM is then, in fact, useless because the home currency is preferred unambiguously to foreign currencies.

rising share moving through the three periods. This process of a growing share is substantially fostered in the second period by the behaviour of the American investors themselves. The calculations prove that during that period the dollar possesses both a higher average rate of return and a lower variance relative to all other currencies when the dollar itself is used as *numéraire*. This makes the capital market line useless for American investors. The economic interpretation of this situation is that these investors unambiguously prefer domestic to foreign investments. From the U.S. point of view the optimal portfolio consists, for that reason, of 100% dollars. The same outcome appeared for the British portfolio in the first and the American portfolio in the third period.

Table 1 suggests, moreover, that in the small EMS countries the Ecu is only attractive for investment purposes in so far as no clear up-and-downward trends in exchange rates can be perceived. The second period satisfies this condition. In the two other periods the Ecu is even completely absent in the small EMS countries' portfolios. For the other European countries distinguished, besides those of the Group of Five, it is the first period that is the most favourable one for the Ecu. The equable valued Ecu, with its moderate yields apparently, suffers severely from an upward movement of the dollar which manifests itself in the third period. On the other hand, the Ecu is apt to gain in situations which are initially characterised by substantial shares for the Mark and pound sterling. The addition of the Ecu as a portfolio currency then allows it to take over a substantial part of these shares. However, counterexamples can also be observed, as the guilder and escudo show in the first period. The broad tendency described is not surprising. An ample 47 percent of the Ecu basket consists of marks and pounds, so that the Ecu is a rather close substitute for these currencies.

A permanently dominating position for the Deutsche Mark can be observed in table 1 in the portfolios of the Dutch and Austrian investors. The Japanese portfolios do not display diversification features: in the first period the pound sterling is the only asset included, whereas in the second and third period only the dollar is present in the Japanese portfolios. All these country-specific portfolio characteristics make clear that there is no general picture; the countries experience considerable differences in their optimal portfolio compositions.

In order to get an idea of the impact of alterations in the trend of the dollar and the Ecu's introduction as well, we must therefore have recourse to the determination of country *averages* for the portfolio compositions. For that purpose the last three rows of table 1 are added.

In interpreting their elements, it is important to emphasise that the exchange rate is a relative price between two currencies. This implies that exchange rate effects arise from diverging changes in the portfolio shares of the two currencies involved. These relative changes are represented in table 2.

For example, the first entry in table 2 — the number 77 — indicates that the transition from the first to the second period is associated with a net demand for dollars relative to the mark to the amount of 77 percentage points of the total international portfolio size in the 15 countries involved. This outcome has been built up by a rise in the dollar share of 72 percentage points and a fall of 5 percentage points for the mark component. These changes can be observed in the last row of table 1. Assuming in practice optimal portfolio behaviour, the shift of 77 percentage points in the relative positions of dollar and mark is an *ex post* shift. The original *ex ante* shift induced an exchange rate tension and, actually, a subsequent exchange rate change to the benefit of the dollar's value will have been perceptible. The latter change will not have failed to affect the relative portfolio position of the dollar against the mark. The mutual effects of portfolio adjustments and exchange rate changes on each other have ultimately resulted in the optimal portfolio shift to the amount of 77, that was mentioned above.

If complete freedom to demand Ecu-denominated assets is introduced, this will influence the divergences in international portfolio shares. The *direct* consequences, which are presented in table 1 by means of changes placed between brackets, result in table 2 in the rows "Including Ecu". At present, a full-fledged Ecu is still far from reality. Therefore, the direct consequence of introducing such an Ecu on exchange rate changes and a second round of portfolio adjustments are not now observable in practice. For that reason the direct consequence which we calculate will only result in exchange rate tensions, in an impetus to exchange rate changes, rather than in actual exchange rate adjustments in the periods examined.

As explained in Section 2, net demands for Ecus lead to covering operations of banks through the unbundling of the Ecu basket and/or arbitrage activities between the Ecu and its component currencies. The outcome is a net demand for the latter currencies that is coupled with the net demand for Ecus. This *indirect* consequence of the introduction of the Ecu explains, in table 2, the difference between the row "Including Ecu" and the corresponding row "Ditto with arbitrage". Since this indirect consequence has proved to be a realistic behaviour of

TABLE 2

DIVERGENCES IN OPTIMAL SHARES OF THE DOLLAR AGAINST OTHER CURRENCIES

	Differences in changes of portfolio shares [a]								
	TOTAL OF COUNTRIES			GROUP OF FIVE			OTHER COUNTRIES		
	Dollar - Mark	Dollar - Pound	Dollar - Yen	Dollar - Mark	Dollar - Pound	Dollar - Yen	Dollar - Mark	Dollar - Pound	Dollar - Yen
Period 1 to 2									
Excluding Ecu	+77	+132	+79	+89	+144	+87	− 6	+52	+22
Including Ecu	+69	+110	+66	+76	+119	+74	+16	+51	+18
Ditto with arbitrage	+78	+114	+66	+87	+124	+74	+ 8	+48	+18
Period 2 to 3									
Excluding Ecu	+16	+ 18	+ 2	+12	+ 15	+ 5	+53	+46	− 7
Including Ecu	+ 8	+ 12	+ 6	+ 7	+ 9	+ 8	+19	+35	− 7
Ditto with arbitrage	+ 9	+ 14	+ 6	+11	+ 11	+ 8	+35	+42	− 7

Notes: [a] The rows "Excluding Ecu" and "Including Ecu" have been obtained directly from table 1. The first entry, the number 77, for instance, has been derived from the last row of table 1. Labelling 1976 (IV) - 1983 (III) as period 1 and period 2, respectively, one can see in table 1 that the dollar's share from period 1 to 2 rises with 72, whereas the share of the Deutsche Mark falls with 5. The combined change of these portfolio shares consequently is 77. Including the Ecu, the changes are successively +68, −1 (from 17-14 to 12-10), and combined +69. As argued in Section 2, covering activities of banks with respect to open Ecu positions and foreign exchange arbitrage will have effects on the currencies in the Ecu basket. We will use the 1976 (IV) - 1979 (III) and 1979 (IV) - 1983 (III) as period 1 and period 2, respectively, the changes are successively +68, −1 (from 17-14 to 12-10), and combined +69. shares of these currencies in the basket as they were in September 1984, just after the revision of the basket. Then, the Deutsche Mark's share in the Ecu was 32% and that of the pound sterling 15%. By adding 32% of the increase of the Ecu's share in the periods 1 and 2 to the portfolio demand for the Mark in these periods, the entry "78" is obtained for "Dollar - Mark" and "Ditto with arbitrage".

private banks, the row that includes the covering or arbitrage results will be stressed when analysing the Ecu's relevance for exchange rate stability.

The upper part of table 2 indicates that the transition from the first to the second period encompasses the greater part of the huge portfolio shift in the direction of the dollar that characterises the entire period. This characteristic of the first transition is no doubt brought about by the reversal in the tendency of the dollar from a weakening to a strengthening currency, which took place at the end of the first period (against the yen) and in the second period.

The first case in table 2, the dollar-mark relation in the transition from the first to the second period, is interesting in that it refutes a proposition indicated at in Section 2. It is the view that the addition of an extra asset reduces the intensity of portfolio shifts and thus the sizes of exchange rate changes. According to table 2, the shift in the dollar's share relative to that of the mark increases as a result of the introduction of the Ecu. The shift concerned — from 77 to 78 percentage points — is only slight, but will produce an exchange rate pressure in favour of the dollar.

The cause emerges in the third part of table 2, which is concerned with the category "other countries". There it appears that, when the Ecu is not yet introduced, the Mark undergoes an increase in its portfolio share. This increase is substantial, to such an extent that it surpasses that of the dollar by 6 percentage points. The Ecu's introduction completely prevents that development. Then the rise in the dollar's share is 8 percentage points higher compared with that of the mark. This remarkable influence of the Ecu is the essential cause of increased exchange rate instability on the level of the aggregate portfolio of all countries involved. This enlarged exchange rate instability is permanent to the extent that it may be characteristic of the stages around the lower turning-points in the event of dollar misalignments.

Another example of a negative influence of the Ecu on exchange rate stability can be observed for the dollar-yen relation in the transition from the second to the third period distinguished. The Ecu proves to enhance the growth of the share of the dollar relative to the yen from 2 to 6 percentage points. Now the behaviour of the Group of Five appears to be the decisive factor, as table 2 shows.

Three currency relations which can also be obtained from table 1 are not represented in table 2, namely mark-yen, mark-pound and yen-pound. Likewise, they can of course easily be derived. They yield

still another negative influence of the Ecu on exchange rate stability. It occurs for the mark-yen relation in the transition from the first to the second period. Without the Ecu, the mark's share displays a relative improvement of 2 percentage points, whereas a relative deterioration of 12 percentage points results when the Ecu is included in the set of investment currencies.

It is of course important to emphasise that, in the remaining nine out of the twelve currency confrontations on the global level which are contained in table 1, the Ecu does play a stabilising role on the relative shares and thus on the corresponding exchange rates. In particular, the stability of the exchange markets for dollar-pound and dollar-yen would have benefited from the presence of the Ecu while passing from the first to the second period. Their relative changes in portfolio shares would have been reduced by, respectively, 18 and 13 percentage points. The three destabilising situations however undermine the view that the growth of the Ecu would considerably enhance the stability of today's multipolar world (Sarcinelli, 1986, p. 66; Micossi, 1985, p. 343).

In order to shed some additional light on the possible source of this destabilising influence of the Ecu, the results of one *numéraire*, viz. the Dutch guilder, are studied in more detail. The Dutch guilder has been singled out, because in this case the introduction of the Ecu has a very destabilising effect on the share of the Deutsche mark, as is shown in table 1. When the Ecu does not belong to the set of assets, the mark's share in optimally composed portfolios varies between 67 and 78, whereas after the introduction of the Ecu this share lies between 14 and 74. The small share of 14 is realised in period 2 when the Ecu's share is 87. In the two other periods the Ecu does not belong to the optimal portfolios. These developments lead to the following differences in changes in Dutch portfolio shares of dollar and mark going from period 1 to 2. Excluding Ecu: −10; including Ecu: +53; ditto with arbitrage: +24. The Dutch portfolio behaviour, therefore, gives strong incentives for an unstable dollar/mark exchange rate. This result seems very surprising in view of the close link of the guilder and mark, and the consequential slight variance of the mark's investment expressed in guilders.

In order to explain this phenomenon, we take a closer look at the assets' characteristics when the guilder is the *numéraire*. A complete description of these characteristics can be found in the Appendix. Comparing the mark and the Ecu investments, it appears that the asset with the highest mean yield is also the one with the highest

standard deviation, with the exception of period 2 however. There the Ecu completely outperforms the mark in the sense that both the mean and standard deviation of the Ecu are the most attractive. This arises because in that period the Ecu profits optimally from its basket character. Its two most important composite parts, the mark and the pound sterling, display a substantially negative correlation of −0.50 in period 2. That is the fundamental reason why the Ecu's standard deviation is very low, and thus that currency is able to take over such an enormous part of the mark's share in that period.

One could argue that the preceding analysis has been restricted to money market investments, while private capital movements between bonds denominated in different currencies are typically much larger than private banking flows (Thygesen, 1985, p. 148). This suggests that the potential for destabilisation through shifts in private capital market portfolios is much greater. Similar calculations such as those which underly the tables 1 and 2, but now applied to longer-term investments, give no support for that hypothesis and lead to conclusions similar to those obtained for money market investments.[12] Because of their only slight differences from the results in table 1, they are not presented here. They indicate that the maximum difference of the shares for the country averages in table 1 from those which emerge for the averages for longer-term investments is only 3 percentage points. Nonetheless, the unstable dollar-mark situation after the introduction of the Ecu, described above, disappears for longer-term investments. In contrast, the observed unstable dollar-yen and mark-yen relations connected with the transition from the second to the third period remain for longer-term investments.

5. The results: the European perspective

By means of table 3 the European perspective of the introduction of the Ecu is analysed. It depicts the effects of the Ecu on the relative position of eight, instead of four, national currencies in optimally composed portfolios in the private sphere. This extension of the

[12] Government bond yields are used for calculating the yields on long term investments. Sources: IMF, *International Financial Statistics*, and MORGAN GUARANTY TRUST, *World Financial Markets*.

TABLE 3

OPTIMAL MONEY MARKET PORTFOLIOS: THE EUROPEAN DIMENSION[a]

Period	1976 (IV) - 1979 (III)									1979 (IV) - 1981 (III)									1981 (IV) - 1984 (III)								
Reserve currency / Numéraire	Mark	Pound	French Franc	Lira	Guilder	Belgian Franc	Dollar	Yen	Ecu	Mark	Pound	French Franc	Lira	Guilder	Belgian Franc	Dollar	Yen	Ecu	Mark	Pound	French Franc	Lira	Guilder	Belgian Franc	Dollar	Yen	Ecu
Dutch guilder	3	9	0	0	—	83	0	5	0	16	10	32	3	—	39	0	0	0	46	0	0	39	—	9	6	0	0
Belgian franc	0	68	0	0	21	—	0	11	0	0	5	44	0	28	—	14	8	0	0	0	0	43	0	—	16	41	0
Danish krona	0	100	0	0	0	0	0	0	0	0	0	0	0	0	68	11	21	0	0	0	0	56	0	9	10	25	0
Irish pound	0	75	0	0	0	13	0	12	0	0	8	0	0	0	87	5	0	0	0	0	3	82	0	0	15	0	0
Italian lira	0	41	44	—	0	11	0	4	0	0	21	0	—	0	62	13	4	0	2	0	0	0	0	0	55	45	0
Portuguese escudo	37	49	0	0	0	14	0	0	0	0	44	0	0	0	13	43	0	0	0	0	9	45	0	0	23	23	0
Swiss franc	0	73	0	0	0	0	0	27	0	0	0	0	0	0	70	20	10	0	0	0	0	38	0	0.	10	52	0
Austrian Schilling	67	6	3	4	0	18	0	2	0	75	3	0	0	0	21	0	0	0	72	0	1	16	0	10	0	1	0
Norwegian krona	17	38	17	0	0	28	0	0	0	0	30	0	0	0	37	33	0	0	0	2	0	10	0	0	47	41	0
Swedish krona	0	36	33	0	25	6	0	0	0	0	35	0	0	0	25	33	7	0	0	0	0	0	0	0	90	10	0
Deutsche Mark	—	17	0	0	6	67	0	10	0	—	3	0	0	0	20	58	11	0	8	—	0	0	93	5	0	0	0
U.S. dollar	0	15	32	55	0	0	0	0	0	0	0	0	0	0	0	0	100*	0	0	0	0	0	0	0	0	100*	0
Japanese yen	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	100	0
British pound	0	100*	0	0	0	0	0	0	0	0	0	—	0	0	0	0	21	79	0	0	0	—	0	0	0	11	32
French franc	0	25	—	35	0	19	0	22	0	0	0	8	—	4	38	45	3	2	0	0	0	0	0	0	0	0	0
Averages:																											
Group of Five	0	39	17	31	1	9	0	3	0	0	1	0	6			10	76	6	0	0	0	15	0	0	82	3	0
Other countries	7	43	20	0	4	20	0	6	0	7	16	8	1	2	46	15	5	0	12	0	0	20	0	3	35	30	0
Total	1	39	18	27	1	10	0	3	0	1	3	1	1	5	15	68	6	0	2	0	0	16	0	0	75	7	0

Notes: [a] Some portfolios do not add to 100 percent as a consequence of rounding off.
* See table 1.

investment currencies means that now — in addition to the options in table 1 — the investors are able and willing to buy assets which are denominated in four of the less important EMS currencies. This opportunity could be the result of a liberalisation of short-term capital flows in the EMS. The willingness to hold such assets could be the consequence of an increased liquidity of such investments in their comparatively thin markets.

Table 3 gives overwhelming evidence that the Ecu is almost completely without influence on the shares of these national currencies. Only one of the 45 country portfolios that are included in table 3 proves to contain the Ecu, when Ecu investments are allowed. It concerns the portfolio of the German investors who prefer an Ecu share of 8% in the second period.

This outcome is not very surprising after all, because the 8 investment currencies distinguished comprise 6 currencies which are also included in the Ecu basket. Together they determine almost 95% of the Ecu. It is obvious that in that situation the Ecu adds little to the room for manoeuvre of international investors. The widening of the choice for international investments is still most substantial for the German investors. They do not consider the Deutsche Mark as an international investment currency. Consequently, for German investors the alternative for Ecu investments of only including foreign *national* currencies in the portfolios can only reproduce 63% of the Ecu. That is the mark's share in the Ecu's basket deducted from the aforementioned 95%.

The interpretation of the preceding negative result for the Ecu is that if the European countries liberalise their money markets and demolish their present restrictions on international short-term capital flows, the perspective of the Ecu as a private investment instrument is rather gloomy. This is caused by the Ecu's main drawback, which is precisely its basket nature. Investors always have the capability to duplicate almost completely the Ecu in an alternative way and then with the additional freedom to apply variations on the fixed weighting scheme that underlies the Ecu. It remains to be seen whether the potential advantage that the Ecu can set against this drawback, namely lower transaction costs compared with a set of individual currencies, will be sufficient to offset its disappointing outcome in table 3. An additional advantage of using the Ecu may be its deep market compared with some of its component currencies.

A comparison of the Ecu positions in tables 1 and 3 illustrates the substantial effect which a financial liberalisation in the European

countries which do not belong to the Group of Five would exert, to the detriment of the portfolio position of a fully developed Ecu. The Ecu shares of 50 and 22% in the first two periods would vanish entirely. The Ecu share in the first period is taken over by the French franc (18%), the lira (27%) and the Belgian franc (10%). In the second period Belgian francs (15%) are substituted for Ecus, while in the third period the lira realises a share of 16% at the cost of *inter alia* the Ecu.

A remarkable outcome in table 3 is the very small shares of the Deutsche Mark and Dutch guilder relative to the other EMS currencies. This holds for all three periods. In spite of these bad portfolio characteristics, in practice the Mark and guilder have substantial shares in the portfolio investments. It is plausible that the uncompetitive portfolio characteristics of the two currencies, which the market considers to be strong, originate in the presence of a risk premium for investments in the well known weak EMS currencies. This premium allows the two strong currencies to have relatively low interest rates, which even are too low to be fully offset by the expected exchange rate gains on investments in the two currencies.[13] The portfolio analysis employed is unable to incorporate the risk premia.

The tables 1 and 3, taken together, also allow us to study the consequences of dollar fluctuations for tensions within the EMS. For example Giavazzi and Giovannini (1985, p. 79) and Frankel (1985, p. 112) point to the empirical regularity that, when the dollar is strong, the mark tends to weaken against the other EMS currencies, and *vice versa*. Table 3 gives no support at all to this inclination of the mark relative to the French franc, lira and Belgian franc. The optimal shares of the latter currencies decline when moving from period 1 to 3 — from a weak to a strong dollar — while the mark's share is practically constant. The resulting impact on the exchange rates would induce a stronger mark in the EMS associated with a stronger dollar on the global level.[14]

Table 1 suggests a plausible explanation of this puzzle. There, the mark does exhibit a declining share, going from the first to the third period (and excluding the Ecu). The absence of francs and lire in the set of investment currencies is the outcome of severe restrictions on

[13] This interpretation of the optimal portfolio outcome gives support to the policy stance of the Dutch monetary authorities, which already in the 1970s argued in favour of a strong guilder, tied to the Deutsche mark. The two advantages which were expected to be realised by this policy are low inflation and a low interest rate.

[14] Only the lira in the transition from the second to the third period is to a certain extent an exception to this asymmetry.

international investments in these currencies. For that reason, their shares will not depend on the strength of the dollar. In that event, the declining share of the mark will weaken the mark's position against these three other European currencies. This defence of the empirical regularity substantiates the views of Frankel (1985, p. 115) and Giavazzi and Giovannini (1986, p. 466) that it might be the national differences in the degree of capital mobility allowed that are the cause of the empirical regularity observed. It is worth mentioning that a feeling of a lack of liquidity in the smaller European money markets can form both an alternative and an additional explanation.

6. Concluding remarks

The creation of well-developed Ecu deposit and credit markets alongside the traditional domestic markets and an extension of officially held Ecus appear to have several drawbacks and advantages in the preceding analysis. Potential negative consequences are the higher speed of Ecu creation and of intra-EMS movements of Ecu deposits. They are apt to reduce the scope for independent national monetary policy and to propagate policy disturbances. The advantages of a growth in the private Ecu market are varied. They refer to an improved adaptation of supply to demand in the money markets, an impetus to greater monetary integration and policy coordination in the EMS, and the promotion of the official role of the Ecu — including the gains for the EMS member countries of a larger role of the Ecu as a reserve asset.

We argued that it is, in fact, only possible to deduce conclusions on the effect of the Ecu upon exchange rate stability on the basis of an empirical analysis. The reason is that we judged it necessary to carry out three amendments in the method of investigation compared with preceding studies. These improvements resulted, however, in a more complicated analysis, so that the choice in favour of a quantification procedure was unavoidable.

The amendments are related to the fact that: (1) a net supply or demand position for the Ecu is always transferred to its component currencies via unbundling or arbitrage activities by banks; (2) the determination of currency substitutability by means of only the covariance of the investment yields of the two currencies involved is too

partial and therefore not realistic; and (3) the fundamental effect of the Ecu on exchange rate stability can only be measured by confronting the portfolio adjustment process excluding the Ecu with one including that currency. When the search for the Ecu's influence is restricted to the ultimate portfolio composition — after a shock has occurred — the possibility that the presence of the Ecu also affects the composition in the starting situation is neglected.

The application of an empirical optimal portfolio approach to private international investment decisions yields some interesting propositions. The most important one is that it proves to be possible that the addition of the Ecu to the investment currencies results in increased exchange rate instability. This pattern is observable for three out of twelve currency confrontations, namely the U.S. dollar against the Deutsche Mark and the mark against the yen, both in the period 1976(IV)-1981(III), and for the U.S. dollar-yen relation in the period 1979(IV)-1984(III). These results are obtained if the set of EMS currencies which are available as investment currencies is restricted to the Deutsche Mark and the pound sterling.

The extension of the investment opportunities in four other EMS currencies, *i.e.* the French and Belgian francs, the Italian lira and the Dutch guilder, results in the following proposition. Short-term capital liberalisation in Europe and a larger liquidity of EMS currency investments will exert a dramatic negative influence on the Ecu's investment position: this composite currency will, in fact, be eliminated from the optimal portfolio. It is, of course, not surprising that the Ecu as an investment currency suffers from the extension of the investment opportunities with some component currencies of the Ecu. A decline of the optimal portfolio share of the Ecu could therefore be expected. A complete elimination of the Ecu from the optimal portfolio is, however, an extreme result.

This outcome points to an impending incompatibility of the goals of the EMS, notably financial integration and the promotion of the use of the Ecu. A similar incompatibility of the EMS' goals proved to be imminent but then entirely in the official sphere, namely between the desire to arrive at an exchange rate union and the development of the Ecu (cf. Jager and de Jong, 1987).

A third proposition that results from our present analysis refers to the explanation of the empirically observed regularity that, when the dollar is strong, the Deutsche Mark tends to weaken against the other EMS currencies, and *vice versa*. Our portfolio analysis substantiates

the view that, rather than the investment characteristics of the EMS currencies, national differences in the degree of capital mobility or in the liquidity of the money markets account for the regularity observed.[15]

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[15] Another sample of plausible explanations of tensions in the EMS exchange rate arrangement which arise from dollar oscillations lies beyond the setting of the present analysis. These explanations refer to differences in national policy preferences in Europe (cf. MELITZ, 1986), the accentuation of divergences in national economic performance in Europe by the dollar oscillations (MICOSSI, 1985, p. 342), and different dynamics of inflation and wages among the EMS member countries (GIAVAZZI and GIOVANNINI, 1985, p. 80).

APPENDIX

ASSETS' CHARACTERISTICS: THE DUTCH GUILDER IS NUMÉRAIRE

Asset	Correlation matrix					Total yield	
	Deutsche Mark	Pound sterling	U.S. dollar	Yen	Ecu	Mean	Standard deviation
	Period 1: 1976 (IV) - 1979 (III)						
Deutsche Mark	1.0					1.54	.93
Pound sterling	.44	1.0				3.06	4.10
U.S. dollar	.16	.54	1.0			−.40	3.34
Yen	.33	−.02	.15	1.0		2.06	6.32
Ecu	.57	.73	.80	.43	1.0	1.80	1.52
	Period 2: 1979 (IV) - 1981 (III)						
Deutsche Mark	1.0					2.58	1.10
Pound sterling	−.50	1.0				6.03	4.98
U.S. dollar	.64	.08	1.0			8.15	6.70
Yen	.06	.58	.39	1.0		7.77	6.43
Ecu	.01	.75	.58	.84	1.0	3.27	.72
	Period 3: 1981 (IV) - 1984 (III)						
Deutsche Mark	1.0					2.10	.91
Pound sterling	−.15	1.0				1.97	4.68
U.S. dollar	−.22	.71	1.0			5.27	4.22
Yen	.01	−.14	−.10	1.0		3.80	3.93
Ecu	.18	.74	.62	.27	1.0	2.03	.78

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