Cahiers Papers

Volume 1 No1 1996 BEI EIB

Special Issue on Emu

BANQUE EUROPEENNE D'INVESTISSEMENT
EUROPEAN INVESTMENT BANK

Editorial policy

The *EIB Papers* are published twice a year by the Chief Economist's Department of the European Investment Bank. The journal is aimed at encouraging high-quality economic research and debate on matters of a European interest. As such the *Papers* are intended to be accessible to non-specialist readers and emphasise policy dimensions rather than technical issues. They present the results of research carried out by Bank staff together with contributions from external scholars and specialists. The winning essays of the biennial *EIB Prize* are also published in the winter edition during competition years.

Articles will only be accepted for publication on the condition that they have not already been published elsewhere. All articles in the *EIB Papers* may be freely reproduced and quoted; however, the Editor would appreciate an appropriate acknowledgement and a copy of the publication in question.

The views expressed in the articles are those of the individual authors and do not necessarily reflect the position of the EIB.

Les *Cahiers de la BEI* sont publiés deux fois par an par le département de l'économiste en chef de la Banque Européenne d'Investissement. Le journal a pour but d'encourager la recherche de haute qualité en économie et le débat sur des sujets d'intérêt européen. En tant que tels, il est attendu des *Cahiers* qu'ils soient accessibles aux lecteurs non spécialistes et qu'ils mettent l'accent sur les dimensions politiques plutôt que les problèmes techniques. Ils présentent les résultats de la recherche menée par le staff de la Banque ainsi que des contributions de chercheurs et de spécialistes extérieurs. Les essais gagnants du *Prix de la BEI* proposé tous les deux ans sont aussi publiés dans l'édition d'hiver les années de compétition.

Les articles ne seront acceptés pour publication qu'à condition qu'ils n'aient été publiés ailleurs. Tous les articles des *Cahiers de la BEI* peuvent être librement reproduits et cités; cependant, l'Editeur apprécierait qu'un crédit approprié leur soit donné et qu'une copie de la publication lui soit envoyé.

Les vues exprimées dans les articles sont personnelles aux auteurs et ne reflètent pas nécessairement la position de la BEI.

Cahiers Papers

BEI EIB

Special Issue on Emu

BANQUE EUROPÉENNE D'INVESTISSEMENT
EUROPEAN INVESTMENT BANK

Contents

Preface

Wolfgang Roth
Vice-President

For a decade the EIB Papers has published the occasional research of EIB staff members. In a recent review of communications policy, it was decided that it would be desirable to present a more structured EIB contribution to the EU policy debate. It is thus with pleasure that I now introduce you to the new version of the Papers.

In the future, the Papers will be published twice a year by the Chief Economist's Department. The journal will be used to publish high-quality economic analysis on a broad range of European issues. It will include the results of research carried out by Bank staff together with contributions from external scholars and specialists. As the goal is to stimulate debate in the broader community, the articles in the Papers will emphasise policy dimensions rather than technical issues.

It is intended that many of the editions will focus on a special topic. In this first issue of the new series, we develop some themes related to European Monetary Union. No single event will change our lives more profoundly than the introduction of the future single currency. As the Union's financing institution, the EIB has been furthering European integration for almost 40 years. We expect the road to an EU-wide monetary union, including future new member states, will pose special challenges to all financial institutions. However, we see EMU as only one further – and far from the final – step in the process of European economic integration.

The Papers will also be used to publish the winning essays of the biennial EIB Prize. In 1983, on the occasion of its 25th Anniversary, the Bank established a prize to be awarded every two years for a doctoral dissertation on a topic related to investment and finance. After more than ten years without a change, we have decided it is also timely to take a new direction here. As from 1997, the EIB Prize will be awarded for short essays, with the goal of stimulating new work and providing an incentive for wider research on European themes. Details of the prize, including entry conditions, are given on the next page. I encourage you to enter the competition.

1997 EIB PRIZE

The European Investment Bank invites entries for the 1997 EIB Prize, which consists of:

ECU	10 000	(first prize)
ECU	7 500	(second prize)
ECU	5 000	(third prize)
ECU	5 000	(special topic)

and three ECU 1 000 prizes for entries from persons under the age of 30.

The EIB Prize is offered for **short essays on economic and financial topics related to European affairs.**

In addition, there is a **special award** for essays on the 1997 set topic: **"In economic terms, has the nation-state become obsolete in the European Union?"**.
To qualify, all essays must be written in a non-technical style, be of a maximum length of 5 000 words and must be unpublished in the form presented.
Entries must be submitted before 1 March 1997.

The EIB Prize is open to any person under 45 years of age who has the nationality of a Member State of the EU, or a member state of EFTA, or a Europe Agreement country.

Winning entries are selected by a **Prize Jury**: Lord Roll of Ipsden (Chairman), Antonio Borges, Edmond Malinvaud, Alberto Quadrio-Curzio, Helmut Schlesinger, Jacques-François Thisse, and Alfred Steinherr, Chief Economist of the EIB.

The prizes will be presented at a conference to be held in Florence in October 1997 and the EIB will publish all winning entries.

The EIB Prize Rules may be obtained from:

The Chief Economist,
European Investment Bank,
L-2950 Luxembourg
Tel : (352) 4379-3438, Fax : (352) 4379-3492;

EUROPEAN INVESTMENT BANK

Editor's introduction

Hardly a day seems to pass without a new article being published on EMU, and so to choose this as the special topic for the first edition of the new EIB Papers may not appear particularly original. However, the launch of EMU remains the single most important issue on the European economic policy agenda, and there are two broad themes where we believe additional discussion is merited:

- *How should we interpret the convergence criteria?*
- *How do we manage foreign exchange markets between now and the irrevocable fixing of exchange rates?*

For an overview of the issues we turned to a major contributor to the EMU debate, Daniel Gros of the Centre for European Policy Studies.

Of all the Maastricht convergence criteria, it is probably the management of public finances where there are the most important outstanding issues, and it is here that Gros focuses much of his discussion. Since some countries had debt levels well in excess of the target limit at the time of signing the Treaty, the wording of this condition is very loose - only that debt should be falling towards the reference level (of 60 percent of GDP) at a satisfactory pace. If this condition is interpreted in a very flexible manner to help highly indebted countries, it could hurt the credibility of EMU and make it seem that some countries were being treated more leniently than others.

Gros notes that the figures in the Treaty are more or less consistent with each other and a reasonable economic performance. A deficit pushes the debt ratio up, while growth lowers this ratio by increasing the denominator. If, however, nominal GDP growth were 5 percent (say inflation of 2 percent and real growth of 3 percent) and the fiscal deficit were 3 percent, then the debt ratio would converge to 60 percent over the long-term (equal to the deficit divided by the nominal growth rate). Moreover, the difference between the present debt level and the 60 percent target is reduced at by a rate equal to nominal growth (or 5 percent per annum in this case).

Gros takes this observation one step further. He proposes that if excessive debt, on average, falls towards the target at a rate of at least 5 percent per annum, this should be considered as "satisfactory" in terms of the Treaty. However, in some

countries off-budget debt accumulation is continuing at some 1-2 percent of GDP per annum. Here, the permissible deficit (of 3 percent of GDP) would have to be reduced by an equivalent amount if total debt were to decrease as desired.

The problem with this approach is that the figure of 5 percent remains somewhat arbitrary. The 3 percent fiscal deficit is an upper limit, and if the average deficit were less (say 1.5 percent) a long-term equilibrium debt ratio of 60 percent would no longer be consistent with a nominal growth of 5 percent (debt would converge to only 30 percent of GDP). Equally, the future nominal growth may well be less than 5 percent - especially if the future European Central Bank (ECB) is successful at keeping low inflation rates.

However, the observation that at any one time only one of the criteria (either the deficit or debt reduction) can be driving fiscal policy is key. One could take Gros' logic to its extreme and argue that if the deficit is no more than 3 percent, then debt will, by definition, be diminishing at a satisfactory pace. In such a situation, the debt ratio should fall over the coming years (1), and it is not evident why a greater rate of decline would be needed to establish credibility on financial markets (consider the case of Belgium). A debt ratio criteria would still be needed, but it would serve another purpose - to limit the possibility of government running up excessive off-budget debt that would be converted into a liability at some future date.

After discussing a range of related issues, Gros concludes with a proposal for the management of exchange rates for those countries that do not enter EMU in the first wave. Since reduced interest rates lower debt service, and this is a major component of government expenditure, it is possible to get into a virtuous spiral: confidence that a country will enter EMU lowers interest rates (this has been very marked during 1996 for Italy and Spain (2)); this makes it easier to meet the entry requirements; confidence increases ... Conversely, countries that are thought to be making an extra convergence effort due only to Maastricht can expect a strong reaction from financial markets if they do not enter in January, 1999.

Can anything be done to limit this risk? Gros proposes a temporary "Associate Membership" of EMU. Here, countries would accept all the obligations arising from EMU membership, but would not participate in the ECB decision-making process. This should be credible if the proposal is seen as a "currency board" and the national Central Bank possesses adequate foreign currency reserves to guarantee conversion of all of its liabilities. This would be the case for most candidate

1) Strictly speaking, the debt ratio would only be falling if the deficit was less than the current debt ratio times nominal growth. If the debt ratio were 120 percent, a deficit of 3 percent would require nominal growth of more than 2.5 percent to keep debt on a downward track. With an average deficit of 1.5 percent, growth of just over 1 percent would suffice.

2) However, even within EMU more highly indebted countries can expect to pay a risk premium over the more creditworthy members. An example is given by the Provinces of Canada. Here the highest-rated Province (AA+) pays 50 bp less than the weaker-rated (BBB+).

countries. Credibility would be greatly enhanced if the country followed full EMU members in converting its public debt to Euro (if debt is Euro-denominated the cost of devaluing would be very high).

Clearly, a government could "go it alone" with a currency board. Indeed, it is not possible to exclude any country from sharing in EMU if it is ready to forego participation in ECB management. However, a formal agreement between the ECB and the country concerned could only further enhance credibility.

The Maastricht convergence criteria have been disturbing for some economists since they do not seem to be consistent with the normal requirements for an "optimal currency area". These relate to microeconomic structures rather than macroeconomic conditions. For example, an important issue is the flexibility of labour markets. This permits a region to adjust to an external shock, not hitting other members of the monetary union, without long periods of unemployment. Equally, if there is no such thing as an asymmetric shock, in the sense that all countries are hit by identical economic shocks, then an independent monetary policy would be of limited value. The literature on optimal currency areas is large, but the general conclusion is that EMU would be appropriate for a core group of European countries, but may not be ideal for the EU-15 as a whole.

Ole Rummel (EIB) elaborates on this discussion. He notes that beyond the question of the "symmetry" of an external shock, the macroeconomic effect also depends upon how these shocks are transmitted through the various European economies. An example of possible differences is given by the prevalence of short-term personal borrowing and floating-rate mortgages in the UK. This could make the UK much more sensitive to changes in short-term interest rates than its continental partners. Similar differences could apply for a range of other macroeconomic variables.

Rummel estimates (3) the short-term linkages between a range of economic variables, and studies how European shocks to the money supply, long-term interest rates, inflation, and industrial production propagate through ten member states. There are clear differences between countries. The initial impact of a shock is varied, and the speed at which this impact dies away is also very different. Only Germany and the Benelux consistently act in a similar way. In the extreme, only these would be in the EMU core.

However, this analysis does not assess whether the costs that could arise in a country with atypical transmission channels would be greater than the benefits of membership. It may also be that many facets of an optimal currency area are endogenous. That is to say that economic integration following EMU, such as strengthening trade links and closer correlation of business cycles, means that countries are much more likely to meet the requirements for an optimal currency area once they have actually entered into it. A similar logic could apply to the transmission mechanisms analysed by Rummel. The

3) With a Bayesian Vector Autoregression (VAR) methodology.

important point is that successful membership of EMU may require structural reforms, such as liberalisation of labour markets, to complement the "natural" integration process.

This brings us back to the macroeconomic criteria for EMU membership actually set out in the Treaty. An alternative view is that reaching these entry conditions should be seen as a sort of noble and virtuous deed that permits membership of the ECB "round-table". Bernhard Winkler (European University Institute, Florence (4)) examines this somewhat frivolous description in a more structured game theoretic framework.

As a simplification, Europe can be split into two groups: one where there is already a high monetary credibility and which is concerned about loss of reputation and price stability under EMU. These countries prefer convergence and credibility to be established prior to membership of EMU. As far as the second group is concerned, EMU offers the possibility of obtaining credibility through entry. For this group convergence should come after membership, if at all (5). There are a range of possible outcomes to this game (6). EMU without convergence would be bad for high credibility countries, while convergence without EMU would be a neg-ative outcome for low credibility countries (assuming there is additional Maastricht induced convergence above the level which a country would find in its own interest to perform). The result is that countries get stuck in an equilibrium where nothing happens, neither convergence nor EMU. This is the well-known "Prisoners' Dilemma", where the players of a game may be led by self-interest to take decisions that are mutually disadvantageous (7).

Winkler discusses how the Maastricht Treaty can been seen as a way of ensuring the optimal co-operative outcome of both convergence and EMU. The approach of setting a fixed-date when EMU will happen (January, 1999), coupled with qualified majority voting for entry decisions sets a framework where both groups can commit to an EMU strategy. The risk of re-negotiation of the contract immediately prior to entry may be limited through third-party arbitration - perhaps one role for the convergence reports of the Commission and the European Monetary Institute.

Since the benefits of joining EMU depend upon the number of countries that go in, an individual country's convergence efforts also benefit other members (thus membership has the features of a public good). Again, the setting of a fixed-date for EMU is a way of limiting this co-ordination problem. It also explains why some countries appear to have started con-

4) Bernhard Winkler was awarded the EIB's Campilli-Formentini Scholarship to finance his research at the European University Institute.

5) The point is that the rules of the club will be interpreted by its members. Thus, the goal of price stability is not fully credible if profligate countries enter. Equally, members may be forced to "bail-out" weaker partners, if only with grant payments.

6) Clearly, this excludes countries which exercise and opt-out, and so choose not to play the game.

7) Two prisoners are brought in and interrogated separately. Each knows they will both get off if neither confesses. However, they are both told that if only one talks, the other will receive a particularly heavy sentence. In this case, both players may decide to protect themselves by confessing.

vergence late in the day. It was rational to wait and see what happened as long as other countries did the same.

Winkler's analysis presents the Maastricht Treaty as a contract that moves participants to a socially optimal equilibrium that would not occur of its own accord. This framework also highlights the risk of coun-tries that do not enter in the first round being permanently left out unless a new framework is in place that maintains sufficient incentives for convergence. The importance of some kind of post-1999 agreement, such as the "Associate Membership" of EMU proposed by Gros, is once more apparent.

Speaking a few years ago at a conference in Luxembourg in honour of Pierre Werner, [8] Sir Edward Heath mused: "I always visualise our Ministers of Finance, meeting quietly one Saturday at five to twelve midnight. They agree "we are going to have a single currency at existing rates". And at five past twelve they tell the world "Europe has a single currency." Unfortunately, reality will not be so simple. The second theme of this edition discusses how currency fluctuations could be managed until exchange rates are irrevocably fixed.

When the future core members of EMU are decided, the authorities will have to make some announcement of how future conversion rates will be set. This could either be a pre-specified fixed-rate, or an agreed principle of some kind. An example of the latter would be the "Lamfalussy rule" [9] whereby the conversion rate will be an average of the market rates for a given period of time before 1 January, 1999 (assuming EMU goes ahead at that date). Paul De Grauwe (University of Leuven) had been analysing this question, and we asked him to explain the pros and cons of the different approaches.

De Grauwe shows that the Lamfalussy rule produces some surprising results. The problem arises because the forecast evolution of the moving average of the exchange rate becomes a factor that determines future movements. Every time some news arrives that changes the exchange rate, market agents also change their expectations for all future periods. This changes the forecast moving average. In turn, this feeds back into today's expectations. De Grauwe likens this to an echo that bounces back from a wall at the end of the averaging period. The result is a sudden increase in the volatility of exchange rates in the short term, and a possible drift away the exchange rate that existed when the conversion rule was announced.

De Grauwe considers applying the Lamfalussy rule retro-actively (e.g. the future rate will be an average of the past (1996) and the future (1997 and 1998)). Unfortunately, this does not solve the problem especially if the authorities are unfortunate enough to announce the rule when the trend in the exchange rate and the trend in the moving average are going in opposite directions. In this case,

8) The proceeding of the conference are published in: A. Steinherr (ed) (1993), 30 years of European monetary integration: From the Werner Plan to EMU, Longman: London.
9) So-called because it has been advocated by Alexandre Lamfalussy, the President of the European Monetary Institute.

there can be very large jumps in the exchange rate at the time of announcement. De Grauwe concludes that the Lamfalussy rule produces more problems than it solves.

The question becomes one of credibility. One could argue that the Lamfalussy rule is inherently more credible than announcing a fixed rate exactly because it allows the exchange rate to vary as the fundamentals change. This has a cost of generating higher volatility for an initial period, but this could be partially reduced by heavy front-loading of the formula (e.g. using weightings of 60 percent for 1996, 30 percent for 1997, and 10 percent for 1998). As front-loading increases this becomes progressively like announcing a fixed-rate anyway. The question is whether there is some point where credibility is maximised.

De Grauwe argues for a different solution. With an adequate commitment at the moment of announcement, a fixed exchange rate can also be credible. Such a commitment could be an agreement that conversion rates cannot be changed except by unanimity, coupled with "institutional" front-loading. This would require that countries would put into practice some institutional changes that would normally only occur on 1 January, 1999. Thus, monetary policies would be decided jointly in 1998, and each participating Central Bank would supply its own money in unlimited amounts in exchange for a currency under pressure. We arrive again at the concept of some sort of "Associate EMU Membership", but with different rules from those proposed by Gros. The main differences pertain to joint decision-making, since the relationship now reflects a marriage of equals, rather than the wooing of a rich bride by a poor groom.

Luis Gonzalez-Pacheco and Alfred Steinherr (EIB) also ask whether there are policy decisions to be taken in managing exchange rates in the run-up to EMU. In particular, they look at the value of the ECU vis-à-vis its constituent elements. The private ECU is unlike other currencies in that its value is not established by any monetary authority. Prior to 1988, a group of major European banks (the ECU clearing banks) accepted to convert the private ECU into the basket of its components. This ensured that the private ECU remained very close to its official value. In 1988, this system broke down as the banks were no longer prepared to accept the daily exchange rate risks this entailed nor the transaction costs of bundling and un-bundling the basket.

The result was the creation of the ECU "delta" - a gap between the market value of the private ECU and the basket ECU. (9) At times the delta has been quite large, reaching a peak of 3 percent in early 1996. During 1996 increased confidence that EMU will go ahead as planned has much reduced the discount on private ECUs, since they will be converted to Euro at a one-for-one basis. This defines a future value for the ECU.

Unfortunately, it is possible that optimism for EMU will dwindle and that there will be renewed periods of instability on

foreign exchange markets before 1999. Gonzalez-Pacheco and Steinherr examine the mechanism that determines the value of the private ECU. In essence, the size of the delta results from the expected differential between the private ECU interest rate (given by the intervention rate of the ECU clearing system) and those of the basket currencies.

Using an efficient market hypothesis (i.e. assuming that interest rates and exchange rates follow a random walk), Gonzalez-Pacheco and Steinherr analyse the likely evolution of the ECU delta under the current arrangement. They show that quite large fluctuations are possible, and that once a delta appears one cannot rely on it disappearing automatically over time. A simple solution is to guarantee conversion between the private ECU and the basket ECU at only certain (though regular) dates. Gonzalez-Pacheco and Steinherr show how this limits the maximum delta and ensures that the expected long-term value of the delta is zero (i.e. permanent drift is not possible). This should be possible with minimum cost to market participants.

Since a new currency crisis could result in a rapid widening of the delta (and a loss of confidence in the ECU), this is an important point to examine further. Though of a lesser dimension, it fits in with the development of institutional structures advocated by Gros and De Grauwe.

Many points have been analysed in this issue of the Papers. To conclude, some general points are worth reiterating:

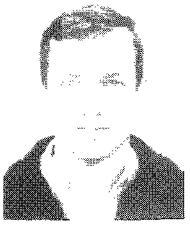
- Assessing appropriate criteria for membership of EMU is a complex matter. Critics have argued that meeting the convergence criteria is little more than the "hazing" of new recruits. But this does not make the criteria unnecessary or any less valid.
- Some of the Maastricht conditions are vague. It would be useful if the way in which these conditions will be interpreted could be more clearly agreed in advance. However, the recent discussion over the post-EMU Stability Pact shows this may be far from easy.
- The goal is credibility, both for choosing members and for managing foreign exchange markets in the interim. One approach is to put more effort into institution building, both ahead of EMU, and afterwards for countries not in the core.
- At the microeconomic level, adapting national institutional structures will require another look at labour markets.

In the absence of hard and fast rules for creating a well-functioning monetary union, more effort in early institution building may be needed. Indeed, this may be the only way to limit the creation of long lasting divisions in Europe.

Christopher Hurst
Chief Economist's Department

10) In most cases the private ECU has been worth less than the basket ECU, though the reverse occurred for a period in early 1990.

The steeple chase towards EMU



Daniel Gros
Senior Research Fellow, CEPS, Brussels

1. Introduction

The year 1996 has seen a transformation of the prospect for EMU. Until the middle of this year it seemed that EMU was a remote prospect and that the preparations for EMU were "as quaint and as potent as a rain dance" to quote a prominent European politician.

What has prompted this revival of the prospects for EMU? The dogged determination of politicians is one explanation. But it is likely that this determination was not just motivated by political considerations. Another driving factor must have been the realization that the economic benefits of EMU are perhaps more substantial than had been assumed so far.

Until recently discussions about the economics of EMU were dominated by the optimum-currency-area approach which suggests that differences in economic structure should be a major determinant of the cost of EMU. This has often been taken to imply that only a small group of countries around France and Germany would benefit from EMU. However, recent studies (see Gros (1996a) for more references) suggest that this might be the case for a larger area. More importantly, the optimum-currency-area criteria have turned out to be only of marginal relevance because the central thesis of this approach, namely that shocks to trade could lead to large unemployment problems, cannot be confirmed empirically. Recent experience with large exchange rate movements within Europe shows that exchange rates do not constitute a powerful tool with which to correct domestic macroeconomic disequilibria. On the contrary they seem to be a source of uncertainty that has a strong negative impact on the economy.

The key problem of the optimum-currency-area approach is thus that it implicitly compares the fixing of exchange rates to an idealised world where everything else is unchanged but exchange rates can be moved in an ideal manner in response to asymmetric shocks. In reality, the choice might be quite different. In the current economic and political context, the choice for Europe is, in fact, between the following two alternatives:

i) Erratically moving flexible rates for all member countries (except a narrow DM-bloc) with the associated dangers for the single market; or

ii) An EMU that expands quickly as the remaining countries satisfy the convergence criteria. This would preserve and even strengthen the single market.

This contribution is based on CEPS Paper 65. I wish to thank members of the CEPS Economic Policy Group for their permission to use our joint work.

From this perspective, the net benefits from EMU would appear to be rather large; larger than what they were thought to be before 1992, when one could assume that the alternative to EMU was a smoothly functioning EMS which posed no threats to the single market. EMU would not only preserve the single market, it should also have some direct benefits by eliminating excess exchange rate variability. Gros (1996c) shows the very high exchange rate variability of 1995 might have increased unemployment in Germany by about one full percentage point.

2. The remaining hurdles

The net benefits from EMU would appear to be rather large; larger than before 1992, when one could assume that the alternative was a smoothly functioning EMS.

The economic benefits of EMU are thus better appreciated today, but there remain obstacles in the form of the convergence criteria - and for some countries in the form of political will. This section concentrates on the 11 member countries that have shown the political will to participate in EMU and have a chance to do so. The four 'definite outs' are: the UK and Denmark (which are most likely to use their opt-out), Sweden which will self-disqualify itself by not participating in the ERM and Greece, which, by common consent, is too far from meeting any of the convergence criteria to have a chance to participate in EMU by 1999.

As the performance of these 11 effective candidate countries will be closely scrutinized by financial markets during all of 1997 this section will discuss some of the convergence criteria. Table 1 presents the relevant data as of end-1996. The examination in 1998 will, of course, be based on the definite data for 1997 that will become available in the spring of that year. The forecasts for 1997 that are available now are discussed below and their likely accuracy is briefly discussed in the annex.

Table 1. Criteria for EMU membership as of late 1996

	Inflation (1)	*Interest rate (2)*	Excessive deficit (3)	ERM membership	Independent central bank
B	OK	OK	**NO**	OK	OK
D	OK	OK	**NO**	OK	OK
E	**NO**	OK	**NO**	OK	OK
F	OK	OK	**NO**	OK	OK
IRL	OK	OK	OK	OK	OK
I	**NO**	OK	**NO**	**NO**	OK
NL	OK	OK	**NO**	OK	OK
A	OK	OK	**NO**	OK	OK
P	**NO**	OK	**NO**	OK	OK
FIN	OK	OK	**NO**	OK	OK
I	OK	OK	OK	OK	OK

Non-candidates:

	Inflation (1)	Interest rate (2)	Excessive deficit (3)	ERM membership	Independent central bank
DK	OK	OK	OK	OK	OK
UK	OK	OK	**NO**	**NO**	**NO**
S	OK	OK	**NO**	**NO**	OK
GR	**NO**	**NO**	**NO**	**NO**	OK

Source: European Commission.
1) At most 1.5 % above the average of the three best performers.
2) At most 2 % above the average of the three best performers in terms of inflation.
3) Existence of an excessive deficits: The entry 'No' means that ECOFIN has found the country to have an excessive deficit in the sense of Article 104c.

There are three criteria that do not need to be discussed here in detail; i) Independence of the national central bank is implicitly also a criterion, but it is easy to fulfil, provided the country has the political will to enact the necessary legislation. All member countries except the UK have done so; ii) The criterion concerning interest rates (a long term interest rate at most 200 basis points above that of the three best performers in terms of inflation) is now fulfilled by all candidates; and iii) The criterion concerning exchange rate stability (membership in the ERM with 'normal' bands of fluctuations) is formally fulfilled automatically by all countries that are members by the ERM as of end 1996. This includes all member countries with the political will to participate in the first wave of EMU (except possibly Italy).

It is often argued that these latter two criteria contain self-fulfilling prophecies in the sense that exchange rates will be stable and interest rates low if the country concerned has a good chance to participate in EMU. But, so the argument goes, if financial markets anticipate that the country will not be allowed to participate in EMU exchange rates will come under pressure and interest rates will rise. A mechanism of this sort might have operated in 1995 (see Gros (1996b) and Obstfeld (1994)) but it is not likely to operate when the alternative to EMU in 1999 is EMU one year later. Given the considerable progress in terms of fiscal consolidation and disinflation that has taken place especially in the 'marginal' EMU candidates, financial markets will no longer assume that exclusion from the first wave of EMU would mean inflationary policies for a long period. Hence it is not likely that self-fulfilling speculative attacks of type that occurred in 1992-1995 will occur again. The following concentrates therefore on the criteria that are likely to constitute the real hurdles for the examination that will take place in 1998, namely the inflation criterion and the fiscal criteria.

Most economists agree that price stability and sound public finances constitute good policy. In this sense, one should not regard the Maastricht criteria as something that has been imposed arbitrarily. If there is a transitional cost that arises from the fulfilment of these criteria, it should be regarded as the cost of achieving sound economic management in the long run — a desirable goal whether the country wants to participate in EMU or not. This is also the main reason why it is of little use to discuss at length whether fulfilment of the Maastricht criteria is necessary from a theoretical point of view. It might be possible to have EMU without prior convergence, but these criteria exist and they represent sound policy.

The criterion concerning inflation deserves a bit more discussion since the transition to price stability is sometimes painful. Most member countries are now close to price stability. The average rate of inflation in the EU has fallen continuously since 1992 and has now gone below 3%. But there are four countries (Italy, Spain, Portugal and Greece), whose rate of inflation exceeds the Maastricht benchmark. Further disinflation thus remains necessary in some case. Except for Greece, these countries will need to reduce inflation by about 2-3 percentage points. Will this cause more unemployment in these countries?

Many economists assume that lowering inflation leads to higher unemployment in the short run. It is also generally accepted, however, that the trade-off between inflation and unemployment is not stable. It depends on the credibility of the anti-inflationary policies, i.e. the extent to which the reduction in inflation is anticipated and thus incorporated in interest rates and in wage contracts. It is also now generally accepted that a permanently lower inflation rate does not lead to permanently higher unemployment. On the contrary, some recent research suggests that lower inflation is associated with better output performance over the long run. (See Barro, 1995, and Banian et al., 1994).

Unfortunately, it is impossible to be more precise on the size of the transitional cost of disinflation. The so-called sacrifice ratio, i.e. the price paid in terms of higher unemployment in exchange for a reduction in inflation, has varied widely over the past. In some countries, disinflation has even been accompanied from the start by more growth and less unemployment. Existing macroeconomic models will be less reliable than in the past, since it is likely that the behaviour of economic agents will not follow past patterns if they see that the economic environment changes fundamentally as EMU approaches. This is the essence of the so-called "Lucas critique" (see Lucas, 1976).

It is therefore impossible to say what transitional cost the four countries with high inflation would have to sustain in order to satisfy the Maastricht criterion on inflation (1), or whether there would be any cost at all. Little can thus be said about the short-term consequences of disinflation, other than that any short-term costs are worth the longer-term benefits. Current forecasts indicate that the further reduction in inflation in Southern Europe should actually be accompanied by a modest increase in growth.

Whether a country has achieved sufficient prices stability to participate in EMU will be judged on a precise rule. The criterion on inflation is defined in the Protocol on the Convergence criteria (Article 1) as:

> "The criterion on price stability referred to in the first indent of Article 109j (1) of this Treaty shall mean that a Member State has a price performance that is sustainable and an average rate of inflation, observed over a period of one year before the examination, that does not exceed by more than 1.5% points that of, at most, the three best performing Member States in terms of price stability. Inflation shall be measured by means of the consumer price index on a comparable basis, taking into account differences in national definitions."

Contrary to the fiscal criteria there seems to be no leeway in this formulation. It would thus be possible that a country that misses this criterion by just one tenth of a percentage point would fail the inflation criterion. Moreover, if by chance three, possible small, member countries achieve very low inflation in 1997 the ceiling set here could be very low.

The only important qualification for the inflation criterion is the word 'sustainable'. Presumably this means that a price performance would not be regarded as sustainable if inflation was acceptable in 1997 but had been higher in 1996; and was projected to increase in 1998. However, since inflation moves rather slowly over time this is unlikely to be the case.

The inflation criterion might turn out to be awkward since, again in contrast to the fiscal criteria, there is very little a government can do to influence inflation in the short run. The consumer price index reacts only sluggishly to a mix of factors that include monetary policy, fiscal policy, exchange rates, wage demands, etc. There is thus very little the authorities in the Southern European countries can do if they discover in middle to late

1) Another danger for inflation might arise for countries that enter EMU with an excessively depreciated exchange rate. Macroeconomic models suggest that it takes a number of years before a depreciation translates into higher prices. This raises the possibility that a country that entered EMU with stable prices but a depreciated exchange rate would for some years have a substantially higher inflation rate than the rest of EMU. It is even possible that such a country would no longer satisfy the inflation criterion after it had already entered EMU. However, this should not be regarded as a danger for price stability in the EMU since the countries whose currencies are relatively overvalued at the start will experience a corresponding moderation of inflation.

1997 that their inflation is running above the Maastricht limit. By contrast, even towards the end of that year will it be possible to take measures that have a substantial impact on the budget for the current year. For inflation this is not possible.

The inflation criterion might turn out to be awkward since there is very little a government can do to influence inflation in the short run.

The forecast for 1997 discussed in the annex shows that Italy, Portugal and Spain will be very close to the borderline of the inflation criterion. If inflation turns out to be better than expected in Northern Europe it is possible that the limit could be as low as in 1995, namely 2.7% (1.2 plus 1.5). If at the same time growth picks up in Southern Europe and inflation ends up only slightly higher than expected there could be a serious problem.

All in all it is thus likely that the inflation criterion will constitute serious hurdle for at least some of the Southern European countries, but there is little governments can do at this except watch and hope. I now turn to the adjustment in public finances which deserves a more extensive discussion because there are some major decisions still to be taken.

The next section 3 turns to a careful analysis of the need for fiscal retrenchment and section 4 asks what macroeconomic consequences this will have. The last section turns to the practical issues in managing variable geometry, including a concrete proposal for the transition.

3. Towards sound finances: Debt levels versus changes

It is widely assumed that the fiscal criteria imply that a country that wants to qualify for EMU has to have a deficit below 3% of GDP and a public debt-to-GDP ratio of below 60%. This is not entirely correct, however, at least as far as the debt ratio is concerned. How could this confusion arise? What are the conditions under which a country has an excessive deficit? This section will try to give an answer to some of these questions.

The second paragraph of Article 104c is key in this respect:

> "The Commission shall monitor the development of the budgetary situation and of the stock of government debt in the Member States with a view to identifying gross errors. In particular it shall examine compliance with the budgetary discipline on the basis of the following two criteria:
>
> (a) whether the ratio of the planned or actual government deficit to gross domestic product exceeds a reference value, unless
>
> - either the ratio has declined substantially and continuously and reached a level that comes close to the reference value;

- or, alternatively, the excess over the reference value is only exceptional and temporary and the ratio remains close to the reference value;

(b) whether the ratio of government debt to gross domestic product exceeds a reference value, unless the ratio is sufficiently diminishing and approaching *the reference value at a satisfactory pace.*

The reference values are specified in the Protocol on the excessive deficit procedure annexed to this Treaty."

The Protocol referred to establishes the reference value for the deficit at 3% (the deficit of general government as a proportion of GDP) and 60% for the debt (gross debt of general government as a proportion of GDP). These are indeed the numbers that dominate the public discussion, but the Treaty also contains important qualifications that are often overlooked.

3.1 Debts: Levels versus changes

On the deficit, the Treaty could be interpreted as saying that only small overruns are admissible and that they have to be temporary. A valid reason for a temporary deficit is often assumed to be a downswing in the business cycle; but there might also be unforeseen expenditure due to a court ruling as happened recently in Italy and Germany. It will always remain debatable what "close to the reference value" means in practice. Is a deficit of 3.5, or even 4% of GDP still close? But it is now generally accepted that the 3% deficit reference value should be considered an absolute upper limit even during a downswing and member countries are aiming at a value somewhat lower than that during normal times. These are questions of detail, however, compared to the ones that arise concerning the debt level, which in some countries is double the reference value. In contrast to the provisions concerning the deficit, the rules concerning debt do not specify that the level of debt has to stay close to the reference value. The reason for this is quite clear: when the Treaty was negotiated, several countries already had debt in excess of 100% of GDP. From this starting point, it was clearly impossible to get close to the reference value in any foreseeable future because the debt level is a stock that cannot be changed quickly. A deficit, which is a flow concept, can be adjusted rather quickly, but it takes time for this to have an impact on the debt level. The Treaty merely requires that the debt/GDP ratio must be moving in the right direction at a certain minimum speed. The decisive formulation concerning the excessive deficit issue will thus be for the foreseeable future: "*unless the ratio is sufficiently diminishing and approaching the reference value at a satisfactory pace*".

The crucial question then becomes: What constitutes a sufficiently diminishing debt ratio? This vague formulation needs to be made more precise; otherwise, there will be too much room for disagreement. The case of Ireland, which was exempted from the excessive deficit procedure in 1994 and 1995 — although its debt/GDP ratio was still nearly 90% — is cited in some countries as evidence that the Maastricht criteria have been softened. This criticism could arise only because the debt criterion is so vague.

The crucial question becomes: What constitutes a sufficiently diminishing debt ratio?

It is not widely appreciated that most of the vagueness arising from the phrase "approaching the reference value at a satisfactory pace" could actually be resolved on the basis of the numbers contained in the Treaty, combined with some simple arithmetic (2). Box 1 shows that a country that observes the 3% deficit limit should, under ordinary circumstances (i.e. if nominal GDP grows at 5% p.a.), see its debt-to-GDP ratio decline automatically towards the 60% target. This is just a special case of the general result that the debt ratio will converge in the long run to a value that is equal to the deficit divided by the growth rate of nominal GDP.

If the deficit is equal to 3% of GDP, the speed of this convergence towards the target would be slow, because only 5% of the difference between the actual debt/GDP ratio and the 60% target would be eliminated each year. But this rule would at least ensure a minimum of convergence, and a country that starts with a higher debt level would automatically achieve larger reductions in the debt/GDP ratio. A country that starts with 140% of GDP would achieve a reduction of 4% points per year, whereas a reduction of 1.5 percentage points would result, and would be considered sufficient under this rule, for a country that starts with a debt ratio at 90% of GDP.

2) But economists have long been aware of the simple arithmetic that follows. Kenen (1995) is just one example.

Box 1. An interpretation of the Maastricht criterion on debt

The numbers specified as reference values in the Maastricht Treaty are arbitrary. The two values, 3% deficit and 60% debt-to-GDP ratio, are at least coherent with each other, however, if one assumes that nominal GDP grows at 5% per year. This seems a reasonable assumption since it corresponds to the growth rate that a relatively good performer in terms of price stability, such as Germany, experienced during the 1980s. (During the 1960s and 1970s, nominal GDP actually grew at over 8% in Germany.) If growth in the EU stays at 3% (i.e. just a bit above potential output growth), a 5% nominal growth rate would be compatible with inflation of 2% (less than the German average over the last 40 years).

Given this assumption, the two reference values are consistent with each other in the sense that at a 60% debt/GDP ratio and a 3% deficit will leave the debt ratio unchanged. This can be seen by considering the government budget constraint in terms of ratios of GDP, which implies that the change in the debt ratio, denoted by $b_t - b_{t-1}$, is approximately equal to the deficit (the overall deficit, not the primary deficit), indicated by def_t, minus an adjustment factor for GDP growth:

(1) $$b_t - b_{t-1} = def_t - b_t * \text{growth of nominal GDP}$$

If the nominal GDP growth is 5%, this equation implies that the 3% deficit limit will lead to a debt-to-GDP ratio automatically at 60% since if the deficit, def_t, equals 0.03, equation (1) can be rewritten as:

(2) $$b_t - b_{t-1} = -0.05 * (b_t - 0.6)$$

If the debt ratio is initially above 60%, it will decline, and vice versa if it starts out below 60%. It *will be constant only if* $b_t = 0.6$ *(i.e. 60%)*.

This result depends, of course, on the assumption of a residual inflation rate of about 2% (plus real growth of 3%). With absolute price stability, GDP would grow only at 3%; in this case, a deficit of only 1.8% of GDP would be required to keep the debt ratio constant. If one takes into account the average deficit should be below 3% of GDP since this value is the upper limit, there is thus room for improvement on the debt ratio even if nominal GDP grows by less than 5%. If the budget were balanced in good times and allowed to go to a deficit of 3% in bad times, e.g., the average deficit would be 1.5% of GDP if good times occur with the same frequency as bad ones.

The most important implication of equation (2) in this context, however, is that one-twentieth (0.05) of the discrepancy between the actual debt ratio and the Maastricht target would be automatically eliminated each year, if the deficit is 3% of GDP.

This suggests that the expression in Article 104c, 2b that a debt/GDP ratio above 60% constitutes an excessive deficit "unless the ratio is sufficiently diminishing and approaching the reference value at a satisfactory pace" could be interpreted more precisely as saying that the debt ratio should be declining at least by enough to reduce the distance between the 60% reference value and the starting point by at least by 5% p.a. If this rule is accepted, any government whose deficit was below 3% of GDP (and that does not accumulate debt off-budget) would automatically meet the debt criterion.

In order to ensure that the improvement is not transitory it would be necessary to apply this criterion over a number of years. This could be achieved, for example, through the following practical rule that could be adopted informally by ECOFIN:

> The debt to GDP ratio is considered "approaching the reference value at a satisfactory pace" if, over the last three years, it has been declining continuously, and the total reduction has been equal to three-twentieths of the difference between the debt ratio at the beginning of the three-year period and the reference value of 60%.

This rule should be applied each year when the public finances of member countries are examined for the excessive deficit procedure. In practice, it would be relevant for those member countries that have a debt/GDP ratio that is clearly above the 60% reference value. It should be obvious, but it bears repeating, that this rule should also apply after a country has joined in order to ensure continued movement towards the 60% target.

The main reason why even such a slow (at least at first sight) speed of adjustment should be acceptable is that the potential pressure on the ECB that derives from a large debt level is much reduced once financial markets see that the debt/GDP is clearly on a durable downwards path.

The rule proposed here is based on the assumption of a growth rate of nominal GDP of 5% p.a. But the ECB might do better than the Bundesbank and keep nominal GDP growth to below that figure. This does not mean that one should change the rule for judging satisfactory progress of the debt ratio towards the reference value of 60% of GDP. If nominal GDP growth dropped to 3%, a deficit of 3% of GDP would lead the debt ratio to converge to 100% of GDP. This is clearly incompatible with the Treaty. The reduction in the debt ratio proposed here should thus be understood as the minimum that has to be achieved whatever the growth rate of nominal GDP.

Table 2 below shows the evolution of the debt/GDP ratio until 1996, for those 8 member countries that are clearly above 60%. It is apparent that, except for Ireland, there has been no improvement since 1993. The last column of this table then shows what would be required if the above-mentioned rule were applied in the 1998 examination that will be based on budgetary data for 1997 (assuming the three year time-span 1994-1997 is the basis). Belgium would be admitted if the ratio had declined from only about 135 to 123% of GDP; this would require a considerable effort, however, since the ratio has essentially been constant over the last few years. For Ireland, the speed of decline since 1993 (12 percentage points of GDP until 1995) would be sufficient to continue to be exempt from the excessive deficit procedure (3). For countries with a debt ratio of around 70%, the required adjustment would be minor.

3) The picture for Ireland would change if one were to take 1992 as a starting point. The development in 1993, however, was due to special circumstances.

It is noteworthy that neither the Maastricht Treaty nor any other official document uses the accounting identity that the increase in government debt over any given year should be equal to the deficit incurred during that year so that the deficit and the debt criteria are linked. Unfortunately, this is seldom the case in reality. Small deviations from this accounting equality would not matter. But the discrepancies that are contained in the official figures for the recent past are so large that they make the interpretation of the convergence criteria very complicated.

For example, in 1994, the deficit of Germany was below 3% of GDP so that the debt/GDP ratio should have been approximately constant given that the growth of nominal GDP was slightly above 5%. But the debt ratio increased during 1994 by about 8.5% of GDP (i.e. more than one would have excepted on the basis of the evolution of nominal GDP and the deficit). The reason was that the German government took over the accumulated liabilities of the Treuhandanstalt, the agency charged with privatisation in the former GDR.

Table 2. Public debt in high-debt countries (Percentage of GDP)

Public debt as % of GDP	1993	1994	1995	Required* in 1997
Belgium	137.5	135	134	123
Denmark	80	76	74	74
Greece	115	113	114	105
Ireland	97	91	86	86
Italy	119	125	125	115
Netherlands	81	78	78	75
Portugal	67	69	71	68
Sweden	76	80	81	76

Source: European Commission and own calculations.
* To achieve a reduction of 3/20 with respect to 1994.

The debt to GDP ratio is considered "approaching the reference value at a satisfactory pace" if, over the last three years, it has been declining continuously, and the total reduction has been equal to three-twentieths of the difference between the debt ratio at the beginning of the three-year period and the reference value of 60%.

The prize for the largest "stock flow adjustment" in recent times goes to Greece, where it exceeded 20 percentage points of GDP in one year alone (1993)! In cases like this one, clearly the deficit numbers are not sufficiently informative by themselves and the formulation in Article 104c(2) that "the Commission shall monitor the budgetary situation and the stock of government debt in member countries with a view to identifying gross errors" acquires real meaning. Reconciling deficit and debt figures should be worth a major effort by the services of the Commission (4).

4) It is surprising that there has been no official explanation of these inconsistencies and no official comment on them in terms of the interpretation of the fiscal convergence criteria. They must clearly be taken into account during the excessive deficit procedure. An increase of the debt ratio could in some cases be cause for concern, but in other cases they might be accepted as having little to do with the overall fiscal situation as explained in Gros (1996a).

Under EMU, most of the legitimate reasons for the stock flow adjustment (e.g. borrowing by the central bank to bolster its reserves, a change in the domestic value of debt denominated in foreign currency, as long as it is in another EU currency, due to a devaluation) should disappear. The practice of keeping certain items off-budget should then be thoroughly scrutinised.

Whatever rule is finally retained, it is important that the interpretation of the criterion be clarified in advance.

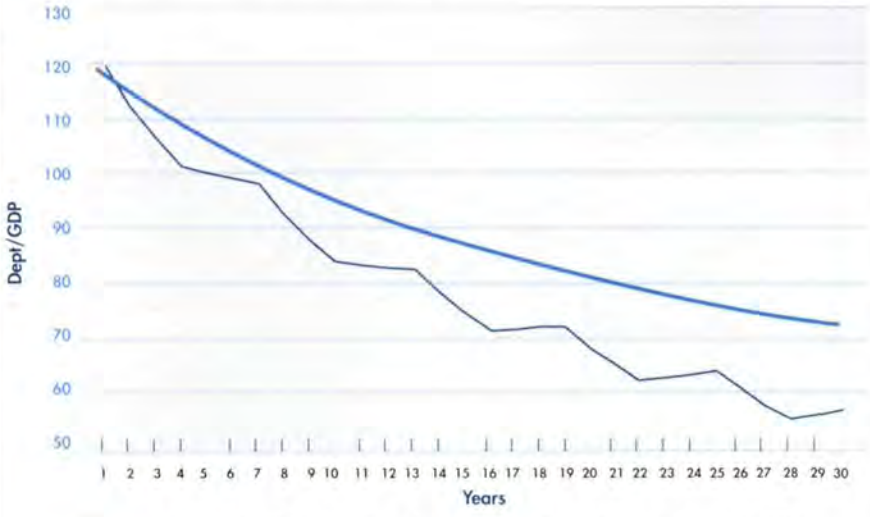
All in all, these considerations imply that a government that keeps the deficit at, or even slightly below, 3% should also be able to satisfy the debt criterion, provided that it does not accumulate debt off-budget and that growth is satisfactory. The deficit is thus the key variable even for countries whose debt level is, still, far above the target value of 60%. This might also be ultimately the reason why the Treaty speaks only of an excessive deficit procedure.

What would be the implications of the proposed rule in reality? A deficit of 3% of GDP at present is not enough to obtain the required reduction in the debt ratio for some member countries for two reasons: i) the growth rate of nominal GDP is slightly below 5%, and, more importantly, and ii) off-budget debt accumulation is continuing to the tune of 1 to 2% of GDP each year. This implies that countries with a debt level far above 60%, such as Belgium and Sweden, would need to aim at a deficit (as officially measured) substantially below 3% of GDP. For these countries, deficits not exceeding 1-2% of GDP would be the only way to attain the minimum reduction in the debt level outlined above. Box 2 shows how the debt/GDP ratio would behave if the automatic stabilisers are allowed to work so that deficits are below 3% of GDP during good times.

The proposed rule is only one possibility. An alternative solution would be to require the primary deficit (i.e. the deficit net of interest charges on public debt) to be consistent with a decline of the debt ratio under normal real growth and real interest rate conditions. This would have the advantage of making the assessment of the fiscal situation independent from a variable that the government does not control, namely the long-term interest rate, but at the cost of making the evolution of the debt ratio less predictable. Any rule based on the primary deficit would also be difficult to reconcile with the Treaty's emphasis on the overall deficit.

Whatever rule is finally retained, it is important that the interpretation of the criterion be clarified in advance, because this would: i) increase the credibility of EMU, ii) avoid a situation in which some countries are (or appear to be) treated more leniently than others for political reasons; and iii) help countries to design their convergence programme, including those that will not qualify in 1998, but aim to do so as soon as possible thereafter.

Box 2. The business cycle and automatic stabilisers



The practical rule proposed here to determine whether a debt/GDP ratio is "approaching the reference value at a satisfactory speed" should be considered as the absolute minimum. If a country were to have a deficit of exactly 3% of GDP, growth of nominal GDP of 5% and no accumulation of debt off-budget the movement of the debt/GDP ratio towards the 60% reference value would indeed be slow as shown in the accompanying graph. Even after 30 years the ratio would still be above 70%.

However, there is now broad agreement that the deficit should in general be held clearly below 3% in order to ensure that even in a recession it does not exceed this limit. It is thus more realistic to assume that the deficit will sometimes be below 3%. The lower line in the graph shows what would happen if the deficit were to be equal to 3% of GDP during a downswing of the business cycle (defined here as a growth rate of nominal GDP of 4%) and 1% during the upswing of the business cycle (defined here as a growth rate of nominal GDP of 6%). This still implies an average deficit over the cycle of 2% of GDP, but the automatic stabilisers would be allowed to work. Under these conditions, the debt/GDP ratio would go down in a stepwise pattern because during the downswing two effect reinforce each other: the deficit is large and the denominator (GDP) grows more slowly. Under this approach, the movement towards the reference value is much quicker. Starting from a debt/GDP ratio of 120%, it would take "only" about 15 years to get close to 70%.

3.2. Deficits: How much adjustment is needed?

For a number of countries a deficit of 3% of GDP is not sufficient to put the debt level on a clearly downward path, because nominal GDP growth is lower than 5% and there is some off-budget debt accumulation.

Satisfying the deficit criterion alone already implies a considerable fiscal adjustment in a number of member countries. Table 3 below shows the most recent estimates of general government deficits in 1996 and forecasts for 1997. The figures for 1990 are also presented to show that the situation in 1995 will be similar to the situation just before Maastricht was negotiated. It is remarkable that in one key country, France, an unprecedented deterioration in the fiscal accounts took place between 1990 and 1995, i.e. just after the country signed up to observe the Maastricht fiscal convergence criteria. The largest swing took place in Sweden, where the deterioration between 1994 and 1990 was equivalent to almost 15% of GDP, but the improvement planned for 1996 is also very large. Finland experienced similarly large swings between 1990 and 1995.

Table 3 below shows that by late 1996 all member states except the UK, Italy and Greece were expected to reach a deficit of 3% of GDP by 1997. If these plans are carried out this would lead to an average deficit for the EU 15 of 3% for that year. This is a remarkable improvement over 1995, when the average was equal to 5% of GDP.

The forecast for 1997 are made under the assumption of unchanged policies. They thus show what would happen if no further action is taken and the economy expands moderately (by 2.3% in 1997 after 1.8% in 1996). But even if one somewhat discounts the plans for 1997, which must always be treated with caution, it is clear that the need for fiscal adjustment in most member countries is now small - if one assumes that a deficit of 3% of GDP is the target.

One has to keep in mind that for a number of countries a deficit of 3% of GDP is not sufficient to put the debt level on a clearly downward path, because nominal GDP growth is lower than 5% and there is some off-budget debt accumulation. This might be the case for Italy where the debt ratio will decline only from 125 to 123% even if the plans are carried through because some of the measures to reduce the deficit recorded in 1997 will not affect public debt accumulation. And the Netherlands will actually experience an increase in its debt ratio unless a further effort is undertaken as indicated in the last column of this table. The cases where the need for further efforts to obtain a 'sufficient' reduction of the debt ratio is more doubtful are indicated by a question mark.

Belgium might use some privatization receipts to reduce its debt ratio in 1997, but this should not be counted here since what matters is the capacity to reduce the ratio continuously over the long run. For Belgium, a further fiscal adjustment of about 1.5 percentage points of GDP (to reach a deficit of about 1.5% of GDP) and for the Netherlands, a further effort of about 1 percentage point (to a deficit of about 2% of GDP) would prob-

ably be required to achieve a sufficient reduction in the debt levels in terms of the practical rule discussed above.

Table 3. Public sector deficits in the EU

	Deficit as % of GDP Maastricht Definition				Further adjustment needed in 1997 to reach sufficient progress towards 60% debt ratio
	1990	1995 (final)	1996 (Provisional)	1997 (Planned)	
Denmark*	1.5	1.6	1.4	0.3	none
Ireland*	2.2	2.0	1.6	0.9	none
Luxembourg*	-5.9	-1.5	-0.9	-0.5	none
Finland	-5.4	5.2	3.3	2.2	none
Netherlands	5.1	4.0	2.6	2.5	1.0
Austria	2.1	5.3	4.3	3.0	?
Belgium	5.4	4.1	3.3	2.9	1.5
France	1.6	4.8	4.0	3.0	none
Germany	2.1	3.5	4.0	2.9	none
Greece	14.0	9.1	7.9	6.5	3.5
Italy	10.9	7.1	6.6	3.3	1.5
Portugal	5.5	5.1	4.0	2.9	?
Spain	3.9	6.6	4.4	3.0	?
Sweden	-4.2	8.1	3.9	2.9	?
UK	1.5	5.8	4.6	3.5	none
EU 15		5.0	4.4	3.0	0.8

Source: Commission of the European Community,
* *country is no longer in the excessive deficit procedure as of 1996.*

The Commission calculations might constitute an overstatement of the need for fiscal retrenchment, since these countries also pay much higher interest rates. As they get closer to EMU, the debt service burden should fall considerably.

There are, however, some countries that would have to reduce their deficits by much more than 3 percentage points of GDP. Italy and Sweden stand out with an adjustment need (as of 1995) of about 4% of GDP to reach a deficit of 3% of GDP. However, the figures used so far might constitute an overstatement of the real need for fiscal retrenchment, since these countries also pay at present much higher interest rates on their public debt. As they get closer to EMU, the debt service burden should fall considerably. Would this effect be important? The answer is yes, but unfortunately it is difficult to predict the exact amount of the interest rate savings. Moreover, these savings will be available only with a certain time lag as old debt is retired. Interest expenditure for 1997 was already determined to 90% at the end of 1996 through the medium and long term debt issued in the past (i.e. mainly 1995 end 1996). In countries with a shorter average duration of

public debt (short term debt or floating rate debt being important) the impact in 1997 would be higher.

Table 3 below uses an average of the estimates of the interest savings the highly indebted countries could experience as they converge to EMU (from Gros (1996a) in order to assess the reduction in non-interest expenditure that remains necessary to reach the 3% limit.

Table 4. Fiscal adjustment and debt service savings

	Basic Data (1995)			Adjustment needed (in % of GDP) to reach a 3% deficit	
	Debt/ GDP	Deficit/ GDP	Potential debt service savings	Overall deficit	Primary balance with debt service savings
Greece*	114	9.3	6.7	7.3	0.6
Italy*	125	7.4	4.5	5.4	1.0
Portugal	71	5.4	.5 - 3.0	2.4	2.0-0.0
Spain	65	6.0	1.5	3.0	1.5
Sweden	81	7.0	2.2	5.0	2.8

* For these countries, the target is a deficit of 2% of GDP because of the high debt level.
Source: Own calculations; see Annex 2 in Gros (1996a).

This table suggests that, if they could count on EMU interest rates, even countries like Italy, Spain and Portugal would have about the same need for discretionary adjustment in primary (non-interest) expenditure (and/or taxes) as other countries with lower deficits, i.e. about 1 - 2% of GDP. The remainder would come through lower debt service costs. For Sweden, the need for adjustment, after taking into account the full potential for a reduction in the cost of servicing public debt, is now only moderately above that of the rest.

A closer analysis of the fiscal accounts thus suggests that the high-interest rate member countries could be in a sort of "catch-22". As long as they are outside EMU, they need to cut deficits by between 3 and 5% of GDP. But if they were in EMU, the need for fiscal adjustment would be manageable, about 2% of GDP. This central problem will appear again in the last section.

3.3. Deficits: the outlook for 1997

As with inflation, it will be useful to discuss briefly the outlook for 1997 since the evolution fiscal deficits will be continuously monitored by financial markets which will also

adjust their expectations in function of the new forecasts that will become available from time to time. The examination that will determine the list of first wave EMU countries will take place in early 1998 and will be based on the figures available then. It will thus be useful to compare the forecasts that were made in the past to the outcomes. The annex does this for five member countries: France and Germany (which are key for starting EMU) and the three southern European countries which are likely to be 'borderline' candidates in 1998.

The very brief analysis of the annex suggests that in the past forecast were rather accurate and that one should thus take the forecasts for 1997 presented in Table 3 seriously. These forecasts are usually made under the assumption of unchanged policies and use rules of thumb from the past to link expenditures and revenues to economic activity. This is not justified for the year in which all governments will use all means to show a deficit under the Maastricht definition of below 3% of GDP. These forecasts must thus be read as indicators of the need for additional measures, not as predictions of actual outcomes. By contrast, there is little governments can do to influence inflation in the short run. The private sector should adjust its behaviour only moderately in the expectations of EMU when the economy has already settled down to a low inflation equilibrium (5).

Past forecasts were rather accurate, and one should take them seriously

For fiscal deficits one has thus to use Goodhard's law which one could adapt to this case to say that an economic indicator that becomes politically as important as the deficit will behave completely differently than in the past.

4. The macroeconomics of fiscal retrenchment: Will fulfilment of the Maastricht criteria hurt economic activity?

What would be the short-term macroeconomic consequences of implementing the deficit reduction identified above as necessary to observe the fiscal criteria? In most macroeconomic models (see Hughes Hallett and Peter McAdam, 1995, for further references), a fiscal contraction leads to lower demand and hence to lower output growth and employment creation, at least in the short run. These effects can in principle be quantified with some precision. Most of the existing macroeconomic models have multipliers somewhat above one so that they would predict that if any one country reduces its deficit by 2 to 3% of GDP, demand would fall by a at least similar amount in the short run. If several countries move fiscal policy in the same direction at the same time, the impact on output might, however, be different depending on the sign of the spillover effect.

Standard macroeconomic models generally predict that a fiscal adjustment quickly causes a fall in output that is then followed by a rebound. This "U-form" adjustment pat-

5) In other words the so-called 'Lucas critique' should in reality not invalidate forecasts based on past behavioural relationships.

tern appears in most models. However, the different large macroeconomic models that are available differ strongly in their implications for the length and the strength of the initial dip. There are also large differences concerning the subsequent recovery, that, depending on the model, could lift output above the starting point because of a strong interest rate effect. The short-term macroeconomic consequences of a fiscal adjustment are therefore difficult to determine with any precision.

The simulations from the early 1990s that are available are difficult to compare with more recent exercises because the adjustment required (to reach a deficit of 3% of GDP) has changed over time. It is symptomatic that none of the international organisations (neither the IMF nor the OECD) nor the services of the Commission has so far published the results that one would obtain with their macroeconomic models. At any rate, different simulations also make different assumptions concerning the time path of the adjustment, the accompanying monetary policies and the number of countries involved. For example, one simulation might hold exchange rates and interest rates constant whereas another allows for flexible exchange rates even within Europe. Box 3 discusses the result of some recent simulation exercises performed for the CEPS Economic Policy Group.

Hughes Hallett and McAdam (1995) provide the most recent evaluation of the macroeconomic effects of the fiscal adjustment necessary to achieve a deficit of 3% of GDP in some larger member countries (France, Italy, and the UK). They use the model of the IMF to determine the impact of this adjustment to the Maastricht norm on output and prices. Their main result is that the models predict a fall in output and prices (compared to the so-called baseline) that could be substantial and protracted, depending on the timing of the adjustment. The cumulative percentage decline in output would in general be somewhat smaller than the reduction in the deficit as a percentage of GDP. Thus for France, the fall in demand could be somewhat below 2%, whereas it would be larger in Italy or the UK.

Box 3. The effects of large fiscal retrenchments: What do macroeconomic models tell us?

Simulations with standard macroeconomic models that assess the adjustments necessary to meet the 3% deficit limit suggest that the remaining reduction in deficits (about 2% of GDP in France, somewhat more in the UK and, about 4% of GDP in Italy) involve non-trivial costs in terms of output losses. The results differ depending on the model used and the starting point, but even more optimistic simulations conclude that the fiscal multiplier (measuring the decline in output per unit of deficit reduction) typically lies between 0.5 and 1.0 for a large country. This implies that fiscal retrenchment will significantly dampen growth in several European countries in the run-up to EMU.

Eichengreen and von Hagen (1995), for example, report serious recessions resulting from a contraction of government spending, where output recovery takes up to five years. One reason for the slow recovery is that the deficit criterion is formulated in relation to GDP. This implies that expenditure needs to be cut by more than needed initially to reach the 3% target (ex-post) to offset the fall in GDP growth. This aggravates the recession, making the needs for retrenchment even larger.

One reason why the models usually produce large output costs is that they assume that nothing else affects the monotonic relationship between fiscal policy and output. This is often not the case, however. Pisani-Ferry and Cour (1995) study large budgetary adjustments in OECD countries since the 1970s and report that the output costs in their sample have been rather low. They therefore conclude that the output costs can be lower than is generally assumed.

One possible explanation for this finding of low impact of fiscal retrenchment could be that the risk premium on the public debt diminishes with a sustained improvement of the deficit. With the exception of Denmark, however, the impact of the adjustment on interest rates has in reality been rather low in the short run. One thus has to attribute the low negative effects of a determined fiscal retrenchment to other stimulating monetary policy and/or to the direct expansionary effect the restoration of sustainability have on private demand.

Hughes Hallett and McAdam (1995) used the IMF's MULTIMOD model to study the effects different adjustment scenarios would have on the long-run growth in those countries undertaking them. They point out that it might be quite easy for countries to squeeze in by forcing their deficit down to 3% but that it would be harder to keep it there. The standard models also predict a considerable deflation (a fall in the price level relative to the baseline) following fiscal retrenchment. Since this is not needed in most countries (especially France), these models thus also imply that a restrictive fiscal policy could be coupled with a less restrictive monetary policy without endangering price stability. By keeping the price level at the baseline, a large part of the output loss could be avoided.

Pisani-Ferry (1996) and Giavazzi and Pagano (1995) also suggest that the experience with large fiscal adjustments in the past shows that determined action can reduce, and possibly even eliminate the output cost of fiscal contractions. Indeed, most of the sustained fiscal adjustments that occurred in OECD countries over the last two decades caused actually very little or no output losses at all. The explanation might be that a fiscal adjustment that is the result of a change in the fundamental rules followed by the government should have different implications than an action that just changes the deficit for a couple of years, as argued in Lucas (1976). EMU would certainly represent a shift in the fundamental rules for both fiscal and monetary policy.

Should one therefore accept the conclusion that fiscal retrenchment leads to a temporary reduction in economic activity? The basic problem with the macroeconomic simulations is that a fiscal adjustment to satisfy the Maastricht criteria should have other than the standard demand effects. In countries where the present fiscal situation is not sustainable, the interest rate reflects also the fear of financial markets that the government will in the end be forced to renege on its debt or create some surprise inflation. This is presumably the reason why, with one exception, namely Belgium, the countries with the largest adjustment need are also those that have the highest risk premium in the sense that the interest rate differential with Germany is high. For these countries (mainly Italy and Sweden), it is virtually certain that a decisive fiscal adjustment will lead to much lower interest rates. It is difficult to say how large this confidence effect will be, but the potential is certainly considerable if one takes into account that the interest rate differential between Italy and Germany has hovered around 5 percentage points in 1995.

Moreover, as shown above, once interest rates fall, the need for adjustment on the primary budget is much reduced. Hence, a confidence effect on interest rates would be beneficial on two accounts: it boosts demand and reduces the need for tax increases and/or expenditure cuts. These considerations suggest that one should distinguish between those countries where the deficit is above 3% of GDP but the debt level is low, and those countries where the situation is unsustainable because the debt-to-GDP ratio is already high and would increase even further without corrective action.

For countries like France, Holland, Belgium and Austria, the interest rate differential with respect to Germany is small. (For most of 1995, it was around 70-80 basis points for France on short-to-medium-run maturities.) This suggests that for these countries, the confidence effect through lower interest rates might be weak. France is the most important example for this situation. In this case, the consequences predicted by macroeconomic models might be qualitatively acceptable.

By contrast, the economies of the high-debt countries (notably Italy and Sweden) are likely to react differently. Decisive action to put the debt/GDP ratio on a clearly declining path

should lead to a large fall in interest rates. Although the need for fiscal adjustment might at first sight be larger in Italy and Sweden, the implementation of decisive measures might have less of a negative impact on output and demand than the more modest adjustment required in the low-debt countries.

It is not impossible that a convincing fiscal adjustment could actually exert an expansion-ary effect on demand and output in countries that start from a truly unsustainable situation. A decisive reduction in the deficit that stabilises public debt or even puts it on a downwards path could lead to so much lower interest rates that their positive effect on demand might more than offset the direct impact of higher taxes or lower expenditure (6). This happened in the 1980s in Denmark and Ireland where a sharp fiscal contraction was accompanied by an expansion of output. The importance of the confidence effect can also be seen (operating in the opposite direction) in the experience of Spain and Italy discussed above. Domestic demand, including investment, fell sharply in both countries after the 1992 ERM crisis, despite small reductions in interest rates. This suggests that a confidence effect can operate even in the absence of any interest rate changes. Giavazzi and Pagano (1995) and Sutherland (1995) provide empirical support and analytical models for this point of view.

Even if one were to accept the predictions of the macroeconomic models that fiscal retrenchment leads to a recession or a protracted slowdown of growth, it would be one-sided to emphasise the macroeconomic costs of the Maastricht criteria. These criteria simply represent generally accepted principles of sound finance. Maastricht can thus be held, at most, responsible for encouraging governments to make hard choices that they would eventually have had to make in any case.

5. How to manage variable geometry?

There is little point in discussing whether variable geometry is desirable or not. The part of the Maastricht Treaty dealing with EMU is clearly based on the assumption that the third, decisive stage, of EMU may initially involve only a subset of countries. This is implicit in the provisions that stipulate that EMU should start by 1999, but that only the countries satisfying the convergence criteria can participate. Those that do not satisfy the convergence criteria will have a derogation. In practical terms, a derogation means that the country concerned does not link its currency irrevocably to the others and does not participate in the formulation and conduct of the common monetary policy.

In general, the gains from EMU increase with the number of participants.

The position of the countries with an opt-out clause, i.e. the UK and Denmark, would formally be similar to that of the ones with a derogation. Politically, and economically, their positions would, however, be quite different. Expressed in colloquial terms, it is the difference between the "willing, but temporarily unable" and the "unwilling". We will first

6) Recent theoretical contributions (see Giavazzi and Pagano, 1995) have also shown that if the fiscal situation is unsustainable, a fiscal adjustment can be expansionary.

discuss the general problems raised by variable geometry and then present a concrete proposal for the "willing but temporarily unable".

5.1. Variable geometry in general

What are the institutional, economic and political consequences of the form of variable geometry foreseen in the Treaty? Does it represent a serious hurdle for EMU, especially for those "willing, but temporarily unable"?

The institutional problems of variable geometry are already addressed in the Treaty which regulates explicitly how the ESCB (and to some extent ECOFIN) will have to deal with a variable number of participants in the third stage. The initial group of countries will, of course, have more influence than the latecomers on the institutions since the Treaty stipulates that only the countries that participate in the initial group will decide on the composition of the Executive Board (the President, Vice-President and four other members) of the ECB (7). Unless it is decided that not all 6 members are appointed immediately (this possibility is already foreseen in the Treaty), these 6 members of the Executive Board will initially have a very important position in the Council of the ECB because there may be only 6 to 8 presidents of the national central banks participating from the start.

The initial group of countries participating in EMU will also take certain decisions concerning the implementation of the common monetary policy and the instruments to be used by the ECB that will have to be accepted by the countries that join later. These are minor issues, however, compared to the economic and political ones.

It is tempting to compare the transitional arrangements for EMU to those that have always been made for weaker member countries (and new members). There is one crucial difference, however. In the legal field, the transitional periods can be defined and limited exclusively in terms of time. In the monetary field, this is not possible, because what counts are the results, i.e. the fulfilment of the convergence criteria – and this cannot be guaranteed by the passage of time.

But what are the incentives created by the Maastricht provisions? In general, the gains from EMU increase with the number of participants. The old adage "the more the merrier" applies thus to EMU as well. However, once a core group that includes at least France, Germany and some other countries has started EMU, the marginal gains in strictly economic terms from adding "peripheral" countries are small, because the latter account only for a small share of trade and output of the Union. This is not necessarily true the other way round: for a "peripheral" country, the gain from participating in EMU might be very large indeed. In general, this implies that the nature of EMU will be affected by

---

7) See Article 109k5.

the composition of the group of countries that takes the first step. The latecomers will have to adapt to what has already been decided for them (see Pisani-Ferry (1996)).

The asymmetry in interests between the core and the rest could create problems. For example, it has been argued (see De Grauwe, 1995) that if the initial core group perceives that it has a higher preference for price stability than the rest of the EU, it might be tempted to increase the requirements for subsequent participation by the countries that are perceived to be weaker. In this view, it would even be possible that the countries that cannot participate in EMU from the start might be excluded indefinitely. It is difficult to see how this could come about in reality, however, since the convergence criteria are defined in objective terms. For the only exception, i.e. the rule on public debt, we have shown above that it is possible to devise a rule of thumb that would eliminate most arbitrariness from this criterion as well.

A more important reason why variable geometry is likely to create problems is that the countries that are not part of the initial core might fear more financial market pressures if EMU goes ahead without them. The reaction of financial markets to the remarks by the German Minister of Finance in October of 1995 shows that news about the likelihood of participation in EMU can have important consequences. The most obvious impact was on Italy whose currency depreciated immediately by several percentage points and interest rates rose by more than one percentage point.

But there were also some "dogs that did not bark" in the autumn of 1995 (and other crisis episodes) which are equally important. Firstly, although Mr. Waigel also mentioned Belgium as one of the countries that was unlikely to join EMU in 1999, there was no reaction in the Belgian financial markets. The reason must be that the markets expected that the hard currency policy of Belgium will be continued whether or not the country is part of the core founding group of EMU. Apparently financial markets suspected in 1995 that this might not be the case for Italy in the sense that the efforts to stabilise public finances would weaken if Italy's participation in EMU had to be postponed. An immediate practical consequence was also that the re-entry of the lira into the ERM, which seemed imminent, was postponed *sine die*. Secondly, there was also no reaction in the financial markets of those countries that have clearly no prospect (or intention) of joining EMU in 1999. For these countries, there was no new element that could have induced financial markets to reassess their evaluation. It is interesting to contrast this episode to the non-reaction of financial markets to remarks by the President of the Bundesbank who recently made similar comments. They were not taken into account by financial markets because the perception is now that even if Italy did not qualify in 1998 it would pursue its adjustments and qualify shortly thereafter.

The 1995 episode thus suggests that the uncertainty about the composition of the core group is likely to lead to increased financial market volatility for those countries that would like to participate in EMU and undertake adjustment efforts mainly for that purpose. If markets perceive that the efforts are undertaken not because fiscal adjustment is desirable in its own right, they might conclude that if the interest rate is high the country will not be able to participate in EMU (because the deficit will be high). This attitude might also lead to a slackening of the adjustment efforts. However, another equilibrium is also possible: if interest rates are low, the adjustment required to enter EMU is smaller and hence it is more likely that it will actually be undertaken. Italy in 1995 seems to exemplify the "bad" equilibrium, whereas Belgium seems to exemplify the "good" equilibrium (8).

All this implies that for some countries, financial market uncertainty will persist until the European Council takes its final decision scheduled for 1998. Until then, financial markets could oscillate between the two equilibria causing large swings in exchange rates and interest rates.

Countries that are close to fulfilling the criteria, but are not admitted into the first group because they fall a little short can expect a strong reaction from their financial markets.

The problem will be most acute when the decision has to be taken in 1998. Countries that are close to fulfilling the criteria, but are not admitted into the first group because they fall a little short can expect a strong reaction from their financial markets. Hence, they could plead that a vital national interest is at stake for them and that EMU should therefore be postponed until they can also join. This would require, however, a Treaty revision, which would put the EU in an extremely difficult position.

The main problems created by variable geometry in the monetary area thus come from the economic and political mechanisms that are amplified by financial markets. In a nutshell, the problem is that countries that cannot participate in stage three in 1999 might try to delay the start of EMU if they are close to satisfying the convergence criteria. In this sense, it is the "near periphery" that creates more of a problem than the "far periphery", i.e. those countries that are clearly some way from satisfying the convergence criteria.

In principle, all countries signed up to the conclusions of the Madrid Council of December 1995. But important politicians in some countries have repeatedly stated in public that postponement should be considered. It would, however, be dangerous to yield to a demand for postponement because there will be differences in the time required by the "near periphery" to fulfil the convergence criteria. Establishing the principle that everybody should wait for the ones that are close to catching up might set in motion a long chain of countries that were formerly far and then come close to being able to participate as others graduate from being close to actually fulfilling the convergence criteria. In the meantime, all candidates would have to bear the cost of the higher risk premia that will persist until EMU really comes into existence. Moreover, it is important to establish the principle that no single country should impede the others to go ahead.

8) See Gros (1995b) for a formal model of this idea.

The two key features of the new ERM are asymmetry and bilateralism.

Whether or not the countries that are excluded, despite nearly fulfilling the criteria, will suffer a confidence crisis depends mainly on two factors: first on their determination to press ahead with convergence efforts so that they can join in the near future, and, secondly, on the exchange rate regime between the common currency of the core and the countries with a derogation.

5.2. What exchange rate mechanism for the outsiders?

One of the convergence criteria in the Treaty is "the observance of the normal fluctuation margins provided for by the exchange rate mechanism of the European Monetary System, for at least two years, without devaluing against the currency of any other member state" (Article 109j (1)). The subsequent article then goes on to say that once EMU has started, there has to be, at least every two years, an examination of the countries with a derogation. A country can join EMU after such an examination only if it fulfils all the convergence criteria. Hence, the Treaty implicitly seems to assume that the exchange rate mechanism of the EMS will continue to exist. This does not necessarily imply, how-ever, that the EMS has to continue in exactly its present form. Since the circumstances will change radically once the third stage begins, one could even argue that it has to change.

It has already been emphasised that countries that cannot participate in the first wave should make clear that they will continue and perhaps even increase their convergence efforts to be able to join EMU at the next possible date. This would help to reduce the potential for financial market instability, but it might not be sufficient to rule out speculative attacks.

The Dublin Council of December 1996 will have confirmed the broad agreement on ERM II that has emerged over the last year. The two key features of the new ERM are: i) asymmetry and ii) bilateralism (or rather "hub and spoke"). There are solid reasons for this:

i) Asymmetry. The core (even assuming it only contains only Germany, France and some smaller countries) will be several times as large in terms of GDP and trade as the set of countries that are outside (excluding the UK which anyway would not be interested) (9). The difference would be even larger in terms of the size of financial markets and reputation for stability. A formally symmetric system like the EMS becomes impossible under these circumstances. In the old ERM, Germany played a central role, although in terms of trade and GDP, it never accounted for more than 45% of the area covered by the ERM.

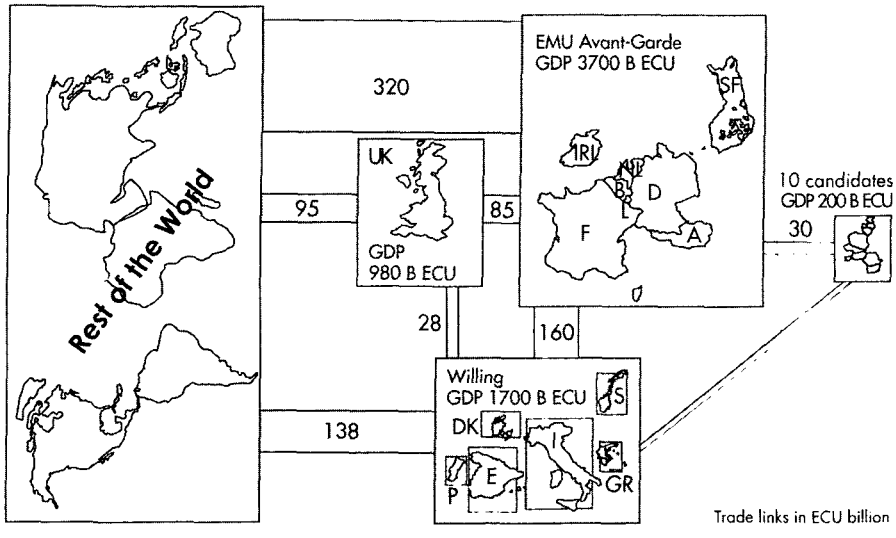
ii) "Hub and spokes". The trade of the periphery with the core that will represent the "hub" of the system is several times larger than the trade among the "spokes" (i.e. the likely outsiders). Hence the new system will not be multilateral.

9) The combined GDP of F, G, NL, AUT, SF, plus IRL, LUX is about 3,000 bn ECU, compared to 800 bn ECU for P, IT, ESP, GR, B, SW.

It will effectively be bilateral in the sense that it regulates the bilateral relationships between the ECB and the national central banks of the outsiders.

Figure 1 illustrates these point with a flow chart that assumes only a small EMU and shows the relative size and the trade links among the major post-EMU players: the EMU 'avant garde', the 'willing but unable' and the 'unwilling'. The group of the 'willing but unable' could of course turn out to be much smaller, but this would only strengthen the point made here.

Figure 1. "Ins and Outs": Relative size and trade links



These consideration do not imply that each outsider should have a different agreement. On the contrary, the same type of arrangement should be offered to all outsiders. However, even if all outsiders are willing to sign up to the same system it will de facto not work in the same way for each participant. Moreover it is apparent that the nature of ERM II will be radically different depending on whether the initial group is large and membership is expected to expand quickly or whether only a small EMU starts and the willing will take a long time to catch up. At present the first scenarios seems more likely, but circumstances can change quickly as the experience of 1995 shows. Under the first scenario, there is really no need for a fully fledged exchange rate system, since exchange rates are likely to be stable anyway. By contrast, under the second scenario, there would be a real need for some system to limit exchange rate fluctuations.

Two further points are also clear; First, the support from the core, i.e. the ECB, should be linked to the convergence effort of the outsiders. The closer a country gets to satisfying

the criteria for full EMU membership, the more support it should receive from the ECB in defending its exchange rate if it comes under a speculative attack.

Second, there must nevertheless be a limit to the obligations of the core. The ECB could not underwrite to a system that forces it to intervene with unlimited amounts at some pre-specified exchange rate because that would put its primary responsibility, namely to keep prices stable for its members, in jeopardy. Hence, an essentially unilateral peg is the only possible solution.

The countries that are excluded from the start of EMU, need some reassurance that the constitution of the core group is only temporary and that they will be invited to join once they have converged.

It is often argued that countries that remain outside will be tempted to resort to competitive devaluations. But this fear, which is based on recent experience, seems to be unfounded. First of all, exchange rates are difficult to control since they evolve with market expectations about future policy. Hence, it will be difficult for any government (or national central bank) to "engineer" a competitive depreciation without starting a cycle of inflationary expectations and high interest rates that is difficult to control. Moreover, as was shown in Gros (1996a), even large exchange rate changes tend to have only a limited impact on unemployment and the trade balance. Finally, since the criterion on exchange rate stability will continue to apply, any country that is tempted by this policy would know that the price for a clearly "beggar-thy-neighbour" policy of this type would be further delay in EMU membership.

How tight the exchange rate system will be after stage three has started, depends thus essentially on the country concerned. The next sub-section presents a specific proposal that is designed to address the legitimate concerns of the excluded countries without delaying EMU.

5.3. A concrete proposal

The countries that are excluded from the start of EMU, despite a desire to participate, need some reassurance from the Union that the constitution of the core group is only a temporary measure and that the others will be invited to join once they have converged. This is certainly the intention of the Treaty. But what if initial exclusion makes convergence much more difficult, even if there is some exchange rate mechanism for the outsiders?

One solution might be granting a form of associate status in EMU (or rather the initial core group). The country concerned could be invited to come under the EMU umbrella

10) The government would have to declare that it accepted the obligations arising from Articles 104c(9) and (11) (excessive deficits procedure); 105(1),(2),(3) and (5) (monetary policy); 105a (notes and coins); and 108a (empowering the ESCB). The national central bank would also accept the obligations resulting from the ESCB statutes (Articles 3, 9, 12.1, 14.3, 16, 18, 19, 20, 22, 23, 30-34 and 52). However, the restrictions specified in paragraphs 3 to 6 of Article 43 of the ESCB statutes would apply. In addition, the country concerned would not participate in decisions under Articles 109 (exchange rate system with rest of world) and 109a(2)(b) (membership of the executive board of the ESCB).

to benefit from lower interest rates, but it would not participate in the management of EMU until it had converged in fiscal terms as well.

This arrangement could be achieved technically by a unilateral declaration that the country concerned accepted all the obligations arising from membership in EMU (10), but it would be preferable to have a formal agreement between the EU (or rather the ECB) and the country concerned, and the political support from the Council because this would make it much more credible with the markets. The agreement would specify mainly that the national central bank agreed to follow the monetary policy of the ECB as if it were a full member of the EMU. At the same time, however, it would be clear that for purposes of decision-making in the ECB (and ECOFIN), the country would continue to be treated as having a derogation. In essence, the country would give up its national monetary policy and replace it with that of the ECB. More precisely, this means that the exchange rate would be irrevocably fixed, the payments systems would be unified, actions by the ECB would have direct effect in the country concerned and the decisions of the ECB would have to be applied by the national central bank, a portion of whose foreign exchange reserves would be pooled in the ECB like those of the full participants. Moreover, the country concerned would be subject to the full excessive deficit procedure (11).

The country would give up its national monetary policy, the exchange rate would be irrevocably fixed, the payments systems unified and the country would be subject to the full excessive deficit procedure.

All this would be officially acknowledged by the Union in conjunction with a convergence programme outlining how the country would, with the help of lower interest payments, satisfy the fiscal criteria by a certain deadline (12). Acknowledgement by both the Union and the ECB would make this arrangement credible and would ensure that market interest rates in the country concerned converge quickly to the level of the core (13).

This sort of associate status in EMU will deliver the benefits in terms of lower interest rates only if it is credible. Credibility should come already from the endorsement given by the ECB, but it would be immensely strengthened if markets see that the exchange rate could be defended under any circumstance. This should be the case if one views the proposed arrangement as a "currency board". A currency board is credible if the national central bank possesses adequate foreign reserves to guarantee conversion of all of their liabilities (the monetary base) into the common currency of the core. Would this be the case? Box 4 below shows that most of the central banks that might be candidates for this approach do indeed have enough reserves to make the currency board approach credible.

11) Unilateral restricted participation would in effect be a sort of Anschluss much like the period when the DM was introduced in the territory of the former GDR. This might not be a very enticing example. In the case of the EU, however, convergence will take place before, not after, monetary unification. Hence, the economic difficulties that followed German unification should not occur.

12) Acknowledgement by the Union should not necessarily imply that the ECB, when setting its monetary policy, would take into account economic conditions in the country that participated in the same way as those of "regular" participants.

13) The actual debt service burden would decline only gradually, however, until the outstanding high interest debt is retired. Depending on the maturity structure, this might take two years.

Box 4. Technical conditions for the viability of a currency board

Technically a currency board is viable if the central bank has enough reserves to exchange all its liabilities (the monetary base) into foreign currency. This is the case if the foreign exchange reserves are larger than the monetary base. Column (3) in the table below shows that the ratio of foreign assets to the monetary base is above, or close to, 1 for all countries except Italy. If one takes into account that, even in a worst-case scenario, few people will exchange their holdings of cash, it would be sufficient for a national central bank to have enough foreign assets to cover the remainder of the monetary base (i.e. required reserves). Column (4) shows that this is the case by a large margin for all the countries considered below, with the exception of Italy and Finland. Even for these two countries, however, the shortfall is rather limited since the existing foreign exchange reserves cover already 100-110% of the reserves held by banks with the central bank. In the Italian case, this result is due to the unusually large reserve requirements imposed on banks in Italy. The reserve ratios in Italy are at present 5 to 10 times higher than in the rest of the EU and have to be lowered anyway if Italy wants to participate in EMU. If reserve requirements were only halved in Italy (leaving them much above the EU average), the international reserves of the Banca d'Italia would be much larger than the mobile part of the monetary base. (Some margin is needed since part, say 20-25%, of the foreign reserves will be pooled in the ECB.) Hence, even the Banca d'Italia could defend the exchange rate if it previously lowered required reserve ratios towards the EU average, provided, of course, that it does not engage in any sterilisation as done so often in the past.

Reserves and Monetary Base

	(1) Base Money	(2) Foreign assets	Ratios based on:	
			Monetary base (3) = (2)/(1)	Required reserves (4) = (2)/[(1) - cash in circulation]
Belgium (bill. Franc)	430.4	731.7	1.7	36.0
Finland (bill. Mark)	38.0	33.5	0.9	1.2
Greece (bill. Drachma)	2500.1	2975.5	1.2	4.6
Italy (bill. Lira)	150.0	86.6	0.6	1.0
Portugal (bill. Escudo)	3001.3	3706.7	1.2	1.6
Spain (bill. Peseta)	7.800	6.152	0.8	4.8
Sweden (bill. Kroner)	163.8	175.7	1.1	1.8

Source: International Monetary Fund

All the candidates for associate membership in EMU could thus be confident of operating a tight link with the core even under a worst-case scenario. If the markets know that there is no chance that they can force a break in the link to the common currency of the core, they will regard it as credible. Any country that chooses this approach could increase the credibility even further by passing a law that obliges the national central bank to defend the exchange rate through unsterilised interventions. Moreover, it is likely that if there were really a totally unjustified speculative attack, the ECB would help the country concerned. If the underlying fundamentals are sound, credibility should thus not be a problem. If the fundamentals are not sound, the ECB would not recommend this approach in any event, and no country would (or should) dare to try it against its advice.

Technical viability is of course only a necessary, and not sufficient condition for the stability of a currency board arrangement. The reason why central banks usually sterilise their interventions is that the large increases in interest rates that might result if they did not are not accepted; either because of their macroeconomic consequences (UK in 1992), or because they could endanger the stability of the banking system (Sweden also in 1992). Central banks and governments will have to convince markets that they will be willing to accept interest rate increases if the market tests their resolve. The experience of Belgium, which faced a test of its commitment in 1993, shows that it is possible to present this case persuasively.

The credibility of the 'associate membership' status would also be greatly enhanced if the country concerned followed full EMU members in converting its public debt in Euro. This would ensure that a speculative attack would not lead to an increase in interest rates on public debt making self-fulfilling attacks even more unlikely.

I do not wish to suggest that associate membership in EMU will constitute a magic wand that eliminates all problems. But it represents an option for countries that are very close to qualifying for full membership. Irrevocably fixing the exchange rate with the prospect of full participation in EMU after a couple of years is fundamentally different from fixing exchange rates in the environment of the 1980s (with high and variable exchange rates) or during the early 1990s (when some currencies were clearly overvalued). The argument that experience has shown that fixing the exchange rate is impossible because financial markets could attack any exchange rate should thus not be over-rated. There will be little reason for financial markets to attack an exchange rate if inflation is low, deficits are close to 3% of GDP (possibly even below), debt ratios are declining and the external current account indicates a good competitive position.

The political viability of this idea depends upon its presentation. If it is characterised as a means of circumventing the convergence criteria, which is actually not the purpose of this proposal, the core will veto it. The scheme merely aims to help the peripheral coun-

tries bridge the gap that separates them from the core without softening in any way the convergence criteria for full participation in EMU.

Only countries that have done their basic homework should be encouraged to pursue this approach. In order to qualify, the deficit when calculated at German interest rates should at a minimum fall below 3% of GDP. This discipline would also ensure that the debt ratio would be declining once the lower interest rates took effect. It bears reiterating that the country in question would have a derogation i.e. it would not be present in the decision-making organs of the ESCB (14), which would imply that the convergence criteria had not been suspended.

Only countries that have done their basic homework should be encouraged to pursue this approach.

In a sense, Belgium and Austria have already successfully opted for this course by pegging unilaterally to the DM. Why can't the others follow their example? The real test of this approach will come in the case of a large country, e.g. Italy. Large countries have always experienced more problems in acquiring stability through the exchange rate. But in this case, they would not attempt to use the exchange rate to force adjustment in prices or wages. Their problem is that they are stuck in a low credibility-high interest rate trap out of which it is very difficult to escape without outside help as analyzed above. The decision to participate in EMU, even if essentially on a unilateral basis, would constitute one large step away from this trap. Of course, this can only facilitate adjustment. It is in no way a substitute for the resolute fiscal action that has to be taken anyway.

6. Concluding remarks

The movement towards EMU now resembles a steeple chase. The hurdles have been set up and governments are now entering the finish stretch in their race towards EMU. This paper argues that one should not overlook the inflation criterion because the Treaty does not provide any leeway to go over the limit of 1.5% above the three best performers and because there is very little governments can do to influence inflation in the short run.

The paper also argues that one should look at changes in the debt ratio when interpreting the fiscal criteria. It provides a concrete rule to judge what reduction in the debt/GDP ratio 'constitutes' satisfactory movement towards the reference value' as required in Article 104c.

The Council discussion in 1998 about who qualifies for the start of EMU in 1999 will of course take political considerations into account. The countries that are close to satisfying the criteria but do not qualify under a 'strict' interpretation will argue that they would pay a heavy price if they were not let into EMU and will thus press strongly for being allowed in. This pressure could be reduced if they are offered the alternative presented in this paper, namely an 'associate' status in EMU for a one or two years to give them the time needed to bring their fiscal accounts under control.

14) Nationals of the country concerned would also not be likely to join the Executive Board of the ECB.

References

Banian, King et al. (1994). "The Inflation Tax is Likely to be Inefficient at Any Level". *Kredit und Kapital*, 27, pp. 30-42.

Barro, R.J. (1995). "Inflation and Economic Growth". National Bureau for Economic Research (NBER). Working Paper 5326.

De Grauwe, P. (1995). "The Economics of Convergence Towards Monetary Union in Europe". *Discussion Paper 117. Catholic University of Leuven.*

Eichengreen, B. and von Hagen, J. (1995a). "Fiscal Policy and Monetary Union: Federalism, Fiscal Restrictions and the No-Bailout Rule". Centre for Economic Policy Research (CEPR). Discussion Paper 1247.

Giavazzi, F. and Pagano, M. (1995). "Non-Keynesian Effects of Fiscal Policy Changes: International Evidence and the Swedish Experience". NBER Working Paper No 5332.

Gros, D. (1995a), "Self-Fulfilling Public Debt Crises". Unpublished manuscript. Centre for European Policy Studies (CEPS).

Gros, D. (1995b). "Excessive Deficits and Debts". Centre for European Policy Studies (CEPS). Working Document 97.

Gros, D. (1996a). "Towards Economic and Monetary Union: Problems and Prospects". Centre for European Policy Studies. CEPS Paper No 65, January.

Gros, D. (1996b). "Germany's Stake in Exchange Rate Stability". Centre for European Policy Studies. CEPS Review, No 1, Summer 1996.

Gros, D. (1996c). "A Stohastic Model of Self-Fulfilling Crises in Fixed Exchange Rate Systems". Centre for European Policy Studies (CEPS). Working Document 105.

Hughes Hallett, A. and McAdam P. (1995). "Fiscal Deficit Reductions in Line with the Maastricht Criteria for Monetary Union: An Empirical Analysis". Unpublished manuscript. University of Strathclyde.

Kenen, P.B. (1995). "Economic and Monetary Union in Europe. Moving Beyond Maastricht". Cambridge University Press.

Lucas, R. (1976). "Econometric Policy Evaluations: A Critique", in K. Brunner and A. Meltzer, eds, *The Phillips Curve and Labor Markets.* Amsterdam: North Holland.

Obstfeld, M. (1994). "The Logic of Currency Crises". National Bureau for Economic Research (NBER). Working Paper 4640, February.

Pisani-Ferry, J. (1996). "Variable Geometry in Europe: An Economic Analysis", in J. Frieden, D. Gros and E. Jones, eds, *Towards Economic and Monetary Union: Problems and Prospects*, Oxford: Oxford University Press, forthcoming.

Pisani-Ferry, J. and Cour P. (1995). "The Costs of Fiscal Retrenchment Revisited". *Problèmes Economiques* 2448, November.

Sutherland, A. (1995). "Fiscal Crises and Aggregate Demand: Can High Public Debt Reverse the Effects of Fiscal Policy?". Centre for Economic Policy Research (CEPR). Discussion Paper 1246.

Appendix
The accuracy of inflation and deficit forecasts

Inflation

A literal reading of the first article of the protocol on the inflation criterion suggests that the examination could use the data for the 12 months preceding the examination (e.g. April 1997 - March 1998) instead of the average for 1997. This might be important for the countries where inflation is still somewhat above the ceiling. But I will continue to assume that the average for 1997 will be used. The latest forecasts for 1997 show that the so-called core countries (D, F, BENELUX, A) should not have any problem in meeting the inflation criterion. But it is apparent that all of the four southern European countries will have difficulties.

During 1997 a lot of attention will thus focus on price developments as well. It is therefore useful to see to what extent forecasts for inflation have, in the recent past, been accurate. Table A.1 shows past inflation forecasts for the two key core countries, France and Germany, plus the three countries that are likely to be 'borderline' candidates for EMU in 1997, namely Spain, Italy and Portugal.

Table A.1. Inflation forecasts versus outcomes

Inflation (Price deflator private consumption)

	E	IT	P	Top3	Best performers
Forecast for 1995 made in:					
Forecast end 94	4,5	3,5	4,6	2,1	DK,D,F
Update mid 95	4,9	5,2	4,5	1,9	B,F,NL
Provisional end 95	4,9	5,6	4,2	1,4	B,NL,SF
Final 96	4,6	5,8	4,2	1.2	B,NL,SF
Forecast for 1996 made in:					
Forecast end 95	3,9	4,3	3,6	2.0	SF,NL,D/F
Update mid 96	3,6	4,1	3,1	1,5	SF,D,L/S
Provisional end 96	3.6	3.9	3.3	1.4	SF,L,S
Forecast for 1997 (as of end 1996)	2.9	2.9	3.0	1.6	SF,F,D

Source: European Commission
See table A.2. for detailed references

The forecast for inflation in 1995 that was available at the end of 1994 was rather accurate for Spain and Portugal whereas Italy overshot it by more than 2 full percentage points. There were special factors in operation in Italy in 1995, including an increase in value added tax, which are unlikely to repeat themselves in 1997, but this episode

suggests that a substantial overshooting of the inflation target is possible. The forecasts for 1996 inflation for these three Mediterranean countries made at the end of 1995 have so far proven rather accurate. But the composition of the three best performers was different and their average was better than expected. If there is a similar discrepancy in 1997 between the actual performance and the forecast for the average of the three best performers the three countries considered here could be in serious trouble.

Fiscal deficits

It will be useful to consider briefly the accuracy of past forecasts of fiscal deficits (under the Maastricht definition, i.e. for general government). Table A.2 below presents the data for the year 1995 for the five most important EMU candidates:

Table A.2

Forecasts for 1995 made in:	Fiscal deficits (Maastricht definition) D	E	F	IT	P
Forecast end 94	2.4	6.0	4.9	8.6	5.8
Update mid 95	2.1	6.0	4.9	7.9	5.6
Provisional end 95	2.9	5.9	5.0	7.4	5.4
Mid 96	3.5	6.2	5.0	7.1	5.4

Forecasts for 1996 made in:	D	E	F	IT	P
Forecast end 95	2.8	4.7	3.9	6.0	4.7
Update mid 96	3.9	4.8	4.2	6.3	4.4
Provisional end 96	4.0	4.4	4.0	6.6	4.0

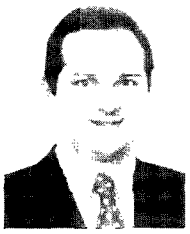
	D	E	F	IT	P
Forecast for 1997 (as of end 1996)	2.9	3.0	3.0	3.3	2.9

Source: European Commission
Forecast end -94 from European Economy no 59
Update mid -95 from 'Statistical Annex of European Economy June 1995
Update end -95 from 'Statistical Annex of European Economy November 1995
Update mid -96 from 'Statistical Annex of European Economy June 1996
Update end -96 from 'Statistical Annex of European Economy November 1996

Table A.2 suggests that in the past the forecasts have been rather accurate, with two exceptions for 1995. Germany performed much worse than expected (also in 1996) whereas Italy performed much better. Given that the Federal government controls only about one half of all general government spending in Germany this is easily explained. But this implies that it will be difficult for the German Federal government to achieve the 3% for general government that constitutes the Maastricht criterion.

All the forecasts are always subject to the underlying assumption concerning economic growth and are based on unchanged policies. This basis was apparently useful in the past. It remains to be seen whether the various accounting movements proposed by the French and Italian governments will actually be sufficient to achieve the 3% deficit target as planned.

On the feasibility of EMU with diverse European economic transmission mechanisms



Ole Rummel
Economist,
Chief Economist's Department

The question arises whether changes in interest rates will have similar effects on the financial systems of each country in the union? This problem is generally valid for all kinds of macroeconomic variables.

1. Overview

It is by now widely expected that not all European Union (EU) member countries will join the third and final stage of European Monetary Unification (EMU) on 1 January 1999, either because countries are unwilling to replace their own national currencies with the Euro, or because they are unable to meet the entrance requirements as laid down in the Maastricht Treaty.

The formation of EMU raises several formidable questions. Of interest is thus not only the question of who is going to join EMU, but also what is going to happen to those countries who are either unwilling or unable to join. In many respects, the latter may be regarded as a more challenging and far-reaching question because of its strategic implications. In the words of Thygesen (1995, p. 7), "there is clearly a strategic interdependence of the decision to join and the nature of the arrangements with the rest". While membership in EMU from the start presupposes convergence of economic performance and structures among members, the same cannot be said about those countries left outside the union. As we will see below, the "outs" will form a heterogeneous group largely by default, where some countries will choose to be "out" because of their political opposition to the loss of sovereignty associated with EMU, while others will be "out" because of important differences in their respective convergence efforts. By their exclusion, the "outs" should not be in a position to – intentionally or unintentionally – jeopardise the achievements of the Single Market through exchange-rate instability or otherwise, and the relationship between the "ins" and the "outs" thus becomes of vital importance. (1)

The future monetary policy under EMU will entail the use of one interest-rate policy for the whole of the monetary union. In particular, the question now arises whether changes in interest rates controlled by the European Central Bank (ECB) will have similar effects on the financial systems of each country in the union? Much more than that, though, this problem is generally valid for all kinds of macroeconomic variables. The analysis of the symmetry and correlation of macroeconomic shocks hitting European economies, which has hitherto been used to differentiate European economies into "ins" and "outs," is sadly lacking in this aspect. Even if shocks hitting European economies were symmetric, in the sense that they affect each country in the same way, there is still no guarantee that the responses to these shocks are symmetric as well. The upshot of this analysis, namely an investigation of the transmission mechanisms of European economies, has received little attention in the literature. (2) This is unfortunate, as the transmission mechanism is not only another instrument to potentially differentiate "ins" and "outs," but also a possible stumbling block in the transition to, and even future functioning of, EMU.

1) The question of access of non-EMU countries to the future European payments system, TARGET, may be a case in point.
2) Notable exceptions are the two studies by Ballabriga et al. (1993, 1995).

The remainder of the paper is set out as follows. The next section outlines the foundations for the creation of a monetary union, which is commonly associated with the idea of an optimal currency area (OCA), i.e. a union of countries in which the circulation and use of a single currency would be optimal. Two criteria for a successful OCA are briefly investigated empirically in Section Three, while the subsequent Section focuses on the main aspect which may complicate the analysis of OCA's, the transmission mechanism of European economies. Three previous studies of the transmission mechanism are also briefly reviewed, before the final Sections present the empirical results for the degree of asymmetry of transmission mechanisms in terms of partial correlation coefficients, forecast error variance decompositions and impulse response functions. As the OCA argument relies on the incidence of highly positively correlated shocks of similar size, the asymmetric transmission mechanism of symmetric shocks within European economies, if it exists, may weaken the positive evidence for the future feasibility of EMU.

2. The Foundations for the theory of Optimal Currency Areas

The biggest change occurring under a currency union such as EMU will be the "loss of the exchange rate as an instrument of macroeconomic adjustment (von Hagen, 1993, p. 264)". The literature tells us that a currency union will be desirable if the inability to change the value of the internal exchange rate does not make the elimination of disequilibria more difficult or more costly. Mundell (1961) showed that a single currency would reduce transactions and information costs and the degree of imperfect competition; but that having fixed exchange rates would prove costly in the face of asymmetric shocks or price rigidities. However, those costs would be smaller if labour and capital were sufficiently mobile. McKinnon (1963) argued that openness to trade was an important criterion because changes in exchange rates would, in that case, have few beneficial effects in terms of real wages or terms of trade. Finally, Kenen (1969) has argued that countries with a high product diversification would find it easier to maintain a currency union since they would be less vulnerable to, and hence better able to absorb, shocks to particular industries or sectors. Von Hagen (1993, p. 264) concluded that the costs of monetary union "will be small, if the size of transitory, country-specific shocks within the union is small compared to common shocks and permanent shocks, if capital and labor mobility are high within the union, and if the majority of the members' trade occurs with other members of the monetary union".

In short, a currency union may be desirable if (a) the countries are mutually open to trade; (b) production factors are mobile; (c) wages and prices are flexible in both directions; (d) there is a high degree of product diversification; and, (e) the countries concerned do not display significant asymmetries in shocks and structures.

A number of recent papers have reviewed these conditions and the extent to which they are satisfied in Europe. (3) The conclusion that the EU economies are sufficiently open to trade among themselves and that capital is highly mobile appears uncontroversial. Likewise, the conclusion that labour is largely immobile for linguistic and cultural reasons, as well as the personal and social costs of migration, is accepted by all.

An important way of assessing the feasibility of monetary union is to try and gauge the degree to which shocks hitting European economies are asymmetric in nature.

Provided that labour is immobile and that wage and non-wage labour remain inflexible in Europe, then asymmetric shocks will lead to significant and persistent disequilibria under a common currency. The conclusion of whether Europe qualifies as an optimal currency area or not thus depends on the balance of benefits against costs, where the latter are related to the asymmetry between national shocks or transmission mechanisms. Hence, to test whether Europe – or a subset thereof – could function well enough as a single currency area requires the examination of the symmetry of shocks and their transmission.

3. An empirical assessment of currency union membership criteria

There is no single criterion that can be used to assess the viability of a currency union between EU member states. For that reason, increasing attention has turned to the analysis of shocks hitting European economies since shock-absorption combines the net influence of several of the traditional criteria. An important way of assessing the feasibility of monetary union is then to try and gauge the degree to which shocks hitting European economies are asymmetric in nature. The more integrated economies are, the smaller the likelihood of asymmetric shocks, i.e. shocks hitting one country or region worse than others.

This line of investigation is most closely associated in the empirical literature with the seminal studies by Bayoumi and Eichengreen (1992a,b), who calculated the sizes and correlations of demand and supply shocks hitting European economies. The methodology distinguished between demand shocks, which were assumed to be transitory in nature and reflected monetary and/or fiscal policy, and supply shocks, which had permanent effects and were independent of policy. The main finding of the authors was that Germany and its immediate neighbours formed a distinct subgroup within EU economies. (4) In other words, a Core EMU was deemed economically feasible, whereas a wider EMU of all EU countries would not be optimal.

The analysis proceeded in two steps, one looking at the sizes of the demand and supply shocks and the other at the degree of correlation between them. Table 1 shows the estimated sizes of the shocks in order to evaluate the first condition for their symmetry.

3) Masson and Taylor (1993) and Tavlas (1993) provide general surveys.
4) It has to be said that the work of Bayoumi and Eichengreen is not without its critics. See, for example, Bofinger (1994) and Demertzis, Hughes Hallett and Rummel (1996).

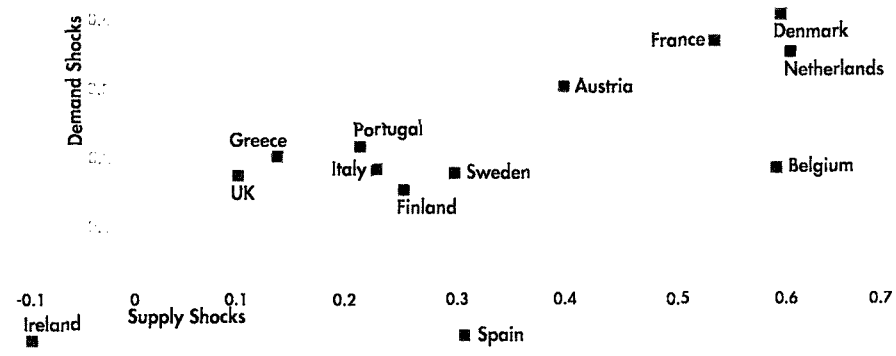
Table 1. Sizes of Supply and demand shocks in percent, 1961-1988

Supply Shock		Demand Shock	
Austria	1.2	Sweden	1.0
France	1.2	France	1.2
Belgium	1.5	Germany	1.4
Sweden	1.6	Netherlands	1.5
Denmark	1.7	Spain	1.5
Germany	1.7	Belgium	1.6
Netherlands	1.7	Greece	1.6
Finland	2.1	Austria	1.7
Ireland	2.1	UK	1.7
Italy	2.2	Italy	2.0
Spain	2.2	Denmark	2.1
UK	2.6	Finland	2.4
Portugal	2.9	Portugal	2.8
Greece	3.0	Ireland	3.4

Countries are arranged in ascending order of the standard deviation of the respective shock.
Source: Bayoumi and Eichengreen (1992b), Table 3.

We can see that the countries with the six smallest shocks (Austria, France, Belgium, Sweden, the Netherlands, Germany and Denmark for supply shocks; Sweden, France, Germany, Spain, the Netherlands, Belgium, Austria and the UK for demand shocks) show a large degree of overlap, from which the authors concluded that several countries on both lists may be candidates for a monetary union. The evidence presented by Bayoumi and Eichengreen becomes even clearer when the correlations of the shocks are introduced, which are displayed in Figure 1. The theory prescribes that countries forming a monetary union should have highly (positively) correlated shocks of similar magnitude. In other words, countries would be in the top right-hand corner of the diagram with both high demand and supply correlations. Germany as the biggest European economy was chosen as the benchmark for the correlation coefficients.

Figure 1. Correlations of demand and supply shocks with those of Germany, 1961-1988



Source: Bayoumi and Eichengreen (1992b), Chart 5

Figure 1 shows that there exists a distinct grouping of Austria, Denmark, France, the Netherlands and – possibly – Belgium, from which the authors concluded that Germany and some of its immediate neighbours have the makings of a natural OCA.

The analysis can be extended by looking at the correlations and sizes of each shock individually. Here, the aim is to have small, but highly correlated shocks. For supply shocks, the same five countries fall into the area previously identified as being optimal for monetary union, i.e. Austria, Belgium, Denmark, France and the Netherlands. This result is borne out by the analysis on the demand side, for which Austria, Denmark, France and the Netherlands emerge as prime candidates for a monetary union with Germany.

Altogether, Bayoumi and Eichengreen's conclusion about "ins" and "outs" has identified Germany and some of its immediate neighbours as forming the nucleus of the "ins". Naturally, highly correlated shocks of similar size in the past are no guarantee of unchanged shocks in the future. Bofinger (1994), for example, has raised the fear that EMU will entail a regime break, in which case the predictive power of observed shocks before the formation of EMU may not necessarily carry over into the EMU-regime.

4. The transmission mechanism of european economies

The last section has left us with some support for the hypothesis that a subset of European countries, mainly composed of Germany and her immediate neighbours, fulfils the requirements for an optimal currency area. Even though the shocks are not perfectly correlated, in the sense that none of the correlation coefficients between the shocks hitting the European economies are equal to one, there is little to suggest that the correlations are in fact too low not to warrant the existence and functioning of an OCA.

The traditional argument in favour of OCA's involved the analysis of asymmetric (real demand) shocks. But EU member states are marked by a high degree of production diversification, which may well make these countries immune to major asymmetric shocks. Bofinger (1994, p. 29) thus concludes that "it is fundamentally difficult to imagine a major asymmetric real demand shock at all. In fact, in the many publications of the EMU critics not a single concrete example can be found". (5) Similarly, the Commission of the European Communities (1990) predicts that "Economic integration will make the occurrence of country-specific shocks less likely ... (p. 136)" and that "asymmetric shocks in the Community, even though they exist, are likely to diminish ... (p. 147)".

The next section will turn to the investigation of the occurrence and propagation of the largely symmetric shocks to Core-countries identified by Bayoumi and Eichengreen (1992a,b) (6), and take the analysis one step further. Common shocks, be they external or sector-specific, can have asymmetric consequences depending on the differences among countries in initial situations, economic structures and behaviour or preferences. The focus thus turns to the investigation of the transmission mechanisms of national European economies, for which the rationale is given by Bayoumi and Eichengreen (1992, p. 2):

> The costs [of monetary union] are associated with the need for the members of a monetary union to run identical monetary and similar fiscal policies. The weight that should be attached to this imperative depends on, among other things, the incidence of shocks. If disturbances are distributed symmetrically across countries, symmetrical policy responses will suffice.

The aim of the investigation is thus not a detailed modelling of European economies, but a representation of the transmission of a common external shock in order to assess its degree of symmetry.

In general, the approach taken in this study is reminiscent in style to Lastrapes and Koray (1990), who investigated the transmission of aggregate shocks between the US and three major European countries, namely France, Germany and the UK. The analysis extended over both the fixed and the flexible exchange-rate period, and concluded that flexible exchange rates do not, in general, provide a complete insulation from foreign shocks. Furthermore, the degree of insulation and interdependence differed substantially across European countries.

5) A judgement of the viability of an OCA is mainly based on the future occurrence of asymmetric shocks. While it is not possible to claim that asymmetric shocks no longer exist, it is difficult to foresee future idiosyncratic shocks such as German unification.

6) Members of the Core are Belgium, Denmark, France, Germany and the Netherlands, while the Periphery encompasses Greece, Ireland, Italy, Portugal, Spain and the UK.

Are European economies prone to different transmission mechanisms of symmetric shocks, thus leading to asymmetric effects?

Of even greater interest for Europe are the studies by Ballabriga *et al.* (1993, 1995), who looked at the propagation of real and nominal shocks among four European economies. The four countries investigated, namely France, Germany, Spain and the UK, encompass not only 70% of the EU's total GDP, but also form a rather heterogeneous group. As such, the group includes two Core and two Periphery countries. Each model contains three variables (the rate of change of the oil price, US output growth and the US nominal interest rate) emanating from the "rest of the world" in addition to three variables each from the four European countries (real output growth, inflation and the nominal interest rate). The authors were thus able to additionally investigate European interdependencies. Employing a Bayesian VAR (7) analysis with quarterly data from 1970 to 1993 to characterise the responses to common and specific, nominal and real, shocks in the four European economies, Ballabriga *et al.* found that asymmetric shocks have dominated in the short-run, which runs counter to the Bayoumi and Eichengreen (1992a,b) result of a symmetric nature of shocks. Important asymmetries existed on the real side over the whole sample period. Most notably, the weight of external shocks was different across countries. Some aspects of asymmetry were even higher with respect to inflation, while a high degree of symmetry existed on the financial side, reflecting no doubt the process of European financial integration.

5. Empirical estimation results: Partial correlation coefficients

By looking at the impact of two real and two nominal shocks at the European level on twelve EU member countries, this study will try to complement the earlier investigations by Ballabriga *et al.* (1993, 1995). The vector autoregression (VAR) methodology pioneered by Sims (1980) can help us to address the questions identified above, namely are European economies prone to different transmission mechanisms of symmetric shocks, thus leading to asymmetric effects. (8) In total, the VAR system for each country includes eight variables in levels, more specifically the narrow money supply (M), the long-term government bond yield (LR), the consumer price index (CPI), the industrial production index (IP) and the equivalent European aggregates of the foregoing. (9) The four variables will be used to assess monetary, financial, nominal and real integration of EU economies respectively. (10) Overall, the model will investigate the relative importance of external (European) and internal (domestic), as well as real (industrial production) and nominal (CPI), shocks. The European money supply and consumer price index data were

7) Appendix B contains a more detailed description of Bayesian VAR modelling.

8) The VAR methodology lends itself to the purpose of estimating dynamic systems.

9) Ireland had to be excluded from the investigation as it does not produce a monthly CPI series. The danger of a break in the German money supply series due to unification was circumvented by scaling all monthly figures prior to the date upwards by 12%, which was roughly the increase in the money supply M1 upon unification.

10) The analysis by Lastrapes and Korey (1990) included bilateral exchange rates against the US Dollar in the VAR's. For the purposes of this study, however, it was decided to follow the example of Ballabriga et al. (1993, 1995) and not include exchange rates in the system, which may perhaps give rise to an omitted variable problem.

taken from the *Main Economic Indicators* of the OECD, while a European industrial production index and the long-term interest rate were constructed by the author. (11) Each variable in the VAR system is treated as an endogenous variable and is modelled as a linear function of the past realisations of all the variables and an unpredictable error term. A vector of variables, x_t , can thus be written as:

$$[1] \qquad x_t = \sum_{i=1}^{k} \mathbf{A}_i x_{t-i} + e_t$$

where, if x_t is a vector of n variables, $\mathbf{A}_i$ will be an $(n \times n)$ matrix of coefficients, k is the lag-length of the VAR and e_t is a vector of normally distributed errors. Each variable in x_t is thus regressed on lagged values of both itself and all the other variables in the system. With a lag length of k and n variables, the number of coefficients to be estimated in each equation is equal to nk. For the whole system with n equations, this number increases to $n \times (nk)$. However, the number of observations typically available is inadequate for estimating the coefficients of the VAR with precision. The likely over-parameterisation of the VAR therefore led us to take recourse to Bayesian VAR modelling, where prior beliefs about the distribution of the coefficients are explicitly included in the estimation process. Bayesian modelling allows us to circumvent the problem of the over-parameterisation of the VAR and is explained in more detail in Appendix B.

Partial Correlation Coefficients of the Variables in the System

It is instructive for the analysis which follows to first look at the partial correlation coefficients between the residuals in the different systems. Their importance lies in the fact that they allow us to gauge some initial economic interactions between the domestic and the European variables. The partial correlation coefficients for the different VAR systems are given in Table 2.

11) The EU industrial production index is a weighted average of the national production indices, with weights equal to the share of the respective national GDP relative to total EU GDP. Following convention, the long-term interest rate for the EU is a weighted average of the national long-term interest rates, with weights equal to the share of the constituent currencies in the definition of the ECU basket.

Table 2. Significant partial correlation coefficients of estimated residuals

	Danish System			
	EULR	EUCPI	EUIP	DKM
EUCPI	*			
DKM	*			
DKLR	*			*
DKCPI		**		*
DKIP			**	

	Belgian System		
	EULR	EUCPI	EUIP
BGLR	**	*	*
BGCPI		**	
BGIP			**

	French System			
	EUM	EULR	EUCPI	EUIP
EUCPI		**		
EUIP				
FRM	*			
FRLR		**	**	
FRCPI			**	
FRIP				*

	Dutch System		
	EULR	EUCPI	EUIP
NLLR	**		
NLCPI		**	
NLIP			**

	German System			
	EUM	EULR	EUCPI	EUIP
EULR	**			
BDM				**
BDLR	**	**		
BDCPI			**	
BDIP				**

	Italian System				
	EUM	EULR	EUCPI	EUIP	ITCPI
EUCPI		*			
ITLR	**	**			
ITCPI			**	*	
ITIP		*		**	*

	Greek System			
	EUM	EULR	EUCPI	EUIP
EUCPI		*		
GRIP			*	**

	Spanish System				
	EULR	EUCPI	EUIP	ESM	ESLR
EUCPI	*				
ESLR	**				
ESCPI		**		**	
ESIP			**		*

	Portuguese System			
	EULR	EUCPI	EUIP	PTM
EUCPI	*			
PTM	*			
PTCPI		**		*
PTIP			**	

	UK System				
	EUM	EULR	EUCPI	EUIP	UKLR
EUCPI		*			
UKLR	*	**			
UKCPI			**		
UKIP				**	*

A * (**) indicates significance at the 10% (5%) level. The first two letters denote the country (BG = Belgium, DK = Denmark, FR = France, BD = Germany, GR = Greece, IT = Italy, NL = Netherlands, PT = Portugal, ES = Spain, UK = United Kingdom, EU = European Union); while the remaining letters denote the variable (M = money supply, IP = industrial production, LR = long-term government bond yield, CPI = consumer price index).

It is perhaps not surprising that the European money supply measure is significantly correlated with the long-term government bond yield in three of the four largest members of the EU. Between them, France, Germany, Italy and the UK make up almost 80% of EU total GNP on the basis of current ECU GNP weights. For France, it is not the long-term interest rate which is (negatively) correlated with European money, but the French money supply. The fact that the European long-term interest rate is only significantly (positively) correlated with the European money supply variable in the German system may lend some credence to the hypothesis that Germany effectively sets long-term interest rates for the rest of Europe.

The rest of the correlations show that none of the European countries are particularly well insulated against contemporaneous shocks.

The rest of the correlations show that none of the European countries are particularly well insulated against contemporaneous shocks. As such, European interest rates are – perhaps surprisingly – significantly negatively correlated with all domestic long-term interest rates except for Greece and Portugal. The existence of significant correlations demonstrates capital links between the European countries. Their absence for Greece and Portugal may be explained either by capital controls, or interest rate targeting by the respective central banks. In fact, Portugal only lifted capital controls in 1990, while Greece still maintains low-level ones. This may give these countries some degree of contemporaneous policy independence. But the European interest rate not only affects the domestic interest rates, it is also – with the exception of Belgium, Germany and the Netherlands – significantly negatively correlated with the European CPI in the remaining national systems, indicating significant changes in real long-term interest rates. Furthermore, there is evidence of correlation between the European long-term interest rate and the national money supplies of Denmark and Portugal.

Altogether, this can be taken as comforting evidence to suggest that a European Union-wide money demand function can be used for a pan-European monetary policy. At the same time, however, the evidence presented by the partial correlation coefficients tells us little about the symmetry of the transmission mechanisms as such. The partial correlation coefficient between European and national interest rates range from an insignificant value for Portugal to a highly significant -0.83 for Germany, and a grouping of the six countries with the highest partial correlation coefficients, namely Germany, France, the Netherlands, Belgium, the UK and Spain, only contains four of what Bayoumi and Eichengreen (1992a,b) classify as Core countries.

European industrial production, finally, has a pervasive influence among all European countries, even though it is – again surprisingly – significantly (negatively) correlated with all eleven national output levels. There is thus a definite interrelationship on the real side. In Belgium, European industrial production is also correlated with the long-term interest rate, while in Germany a statistical relationship exists with the money supply. In Italy, this relationship also extends to the price level.

All in all, links between countries can be found on the output side, which lends some support to the fact that the strength of the links may not only lie on the nominal, but on the real side as well.

6. Empirical estimation results: Variance decompositions and impulse response functions

The analysis of EMU pre-supposes convergence in inflation, interest rates, public debt and deficits as EMU starts, but little attention is being paid to a congruence in monetary behaviour (among others) as EMU proceeds. The potentially different economic structures of EU economies will be the focus of the following analysis, where the VAR methodology is employed to study the dynamics of the system. The plethora of derived empirical information can be conveniently summarised with the help of forecast error variance decompositions and impulse response functions (IRF's).

These measures will help us to evaluate the two conditions for "symmetric shocks," namely a common origin and the symmetric transmission pattern both in terms of size and persistence. In response to a common shock to a European variable, the variance decomposition will quantify the relative importance of each external shock, while the impulse response function explains its transmission mechanism. The former thus gives us an indication of the degree to which national economies are "open" to shocks at the European aggregate level. An asymmetric shock in the variance decomposition is thus one which emerges as a relevant source of variability in the domestic variables for a subset of countries only. The IRF, on the other hand, allows us to characterise symmetries in the transmission of these shocks in terms of the sign of the disturbance, its magnitude and its persistence. An idiosyncratic shock from the variance decomposition must thus be borne out by the evidence in the IRF's as well.

Forecast error variance decompositions break down the variance of the forecast error for each variable into components that can be attributed to each of the endogenous variables and report the proportion of the movement of a variable due to its "own" shock versus shocks to the other variables. Table A in Appendix A shows the variance decompositions for the responses of the four dependent national variables.

The particular ordering of the variables in Table A, i.e. money supply (M) ›long-term government bond yield (LR) ›consumer price index (CPI) ›industrial production (IP), was derived by imposing a "semi-structural" interpretation on the model. This causal – and temporal – ordering means that movements in money precede movements in the other three variables, i.e. interest rates, the price level and output. In addition, aggregate European variables appear before national European variables. This restriction results

from the underlying assumption that Europe as a whole is a much larger economy than any of the constituent parts, from which it follows that the European aggregate is less likely to respond contemporaneously to shocks to national European economies. On the other hand, the structure we impose on the system does not rule out effects that lagged national variables may have on the aggregate European ones, and allows us to interpret EU innovations as fundamental symmetric shocks with regard to the national European variables in the system.

The results from the variance decompositions can be summarised as follows:

Monetary Integration

Regarding the importance of the external European monetary shock, we find that – with the exception of Italy and the UK, for which the weight of the European shock is above 20% and 7% respectively – all countries are relatively "closed" to monetary shocks at the aggregate European level. Except for Italy, the percentage of variance explained by the own shock is above 70% for all countries. (12) With a few exceptions, the three remaining European variables (European long-term interest rate, European CPI and European industrial production) are in general more important in explaining the fluctuations in the domestic money supply than the European money supply shock. Of the four European variables, it is mainly the European long-term interest rate which has the second most important influence on the domestic money supply.

Financial Integration

In terms of financial integration, estimated by the importance of the European long-term interest rate shock, we can identify a group consisting of Germany and France with percentages around 60%, the Netherlands with 42% and another group made up of Belgium, Italy and the UK with percentage weights in the twenties. In general, the classification given above is consistent with the important degree of financial integration in the EU, and mirrors the financial linkages between France, Germany and – to a lesser extent – the Netherlands.

Nominal Integration

The analysis of nominal integration in the variance decompositions reveals a group with a weight of the European CPI shock of over 20%, consisting of Belgium, Spain and the UK; four countries with weights between 10% and 20% (France, Germany, the Netherlands and Portugal) and the remaining three countries, for which the variance decomposition is less than 10%. Most of the variability of the CPI is therefore explained by the domestic variable. In general, the interaction on the nominal side is smaller than that on the real side. With the exception of the Netherlands, Portugal, Spain and the UK,

12) Italy's monetary openness on the basis of the variance decompositions is surprising. A further investigation is beyond the scope of this paper, however.

the percentage of variance explained by the nominal shock exceeds that of the real European shock examined in more detail below. Other European variables enter with percentages equal to or exceeding that of the European nominal shock. Examples for the latter are the influence of the European long-term interest rate on the variability of the French, German, Italian and Dutch CPI. The transmission of a European real shock on the domestic CPI level is generally small, in the sense of being less than 5%, even though it seems to be quite important for Spain, for which the percentage lies above 16%. (13)

Real Integration

Finally, we turn to the discussion of real integration *via* the European industrial production variable. Here, a clear distinction emerges between a group of countries with percentages above 20%, composed of Belgium, France, Germany, Italy and Spain, and the rest of the EU countries, which have percentages less than 20%. The latter thus reveal a small degree of "real openness," as indicated by the large percentage explained by the own industrial production shock, which is above 70% in every case. As the weight of external real shocks is different across countries, the evidence points to the fact that asymmetric industrial production shocks are important. However, the asymmetric real shocks identified are not limited to one particular type of country. In terms of their explanatory power, no other European aggregate variable is important in explaining domestic industrial production variability. The one exception is the influence of the European long-term interest rate on German industrial production with a figure of 11%.

Furthermore, there does seem to be a real versus nominal dichotomy, in the sense that neither domestic nor European nominal shocks, i.e. to the CPI, are important in explaining real variables, i.e. industrial production.

It now remains to be seen whether the results on the origin of the shocks is borne out by their propagation and transmission, which is analysed with the help of impulse response functions. The latter are useful in tracing out the response over time of an endogenous variable, i.e. one that is determined within the VAR system, to a one-period shock – hence the "impulse" – in that and in every other endogenous variable. For example, shocking one (endogenous) variable in the VAR will affect all the other (endogenous) variables, as the shock filters through the model. The IRF's then visually represent the time path of the effects of the shocks on the variables contained in the VAR.

In our case, we are dealing with a system of eight equations in the four European and four national variables for each country. As all variables are endogenous, i.e. determined within the model, a shock to any one of the variables will affect all the other variables in the VAR. This allows us to examine the responses of the respective national variables to a one standard deviation shock in the European money supply, the European long-

13) For Belgium, France, Greece, Italy, Portugal and the UK, the percentage falls between 5% and 10%.

term interest rate, the European consumer price level and European industrial production. The approach taken in this context is to look at the effects of aggregate European shocks, as compared to the effects of national shocks, on the countries of the EU over the period of the EMS, in order to see how similar the responses are. (14)

If the asymmetric effects of shocks are large enough, a monetary union will become extremely difficult to operate for exactly the same reason as it would have been under asymmetric shocks.

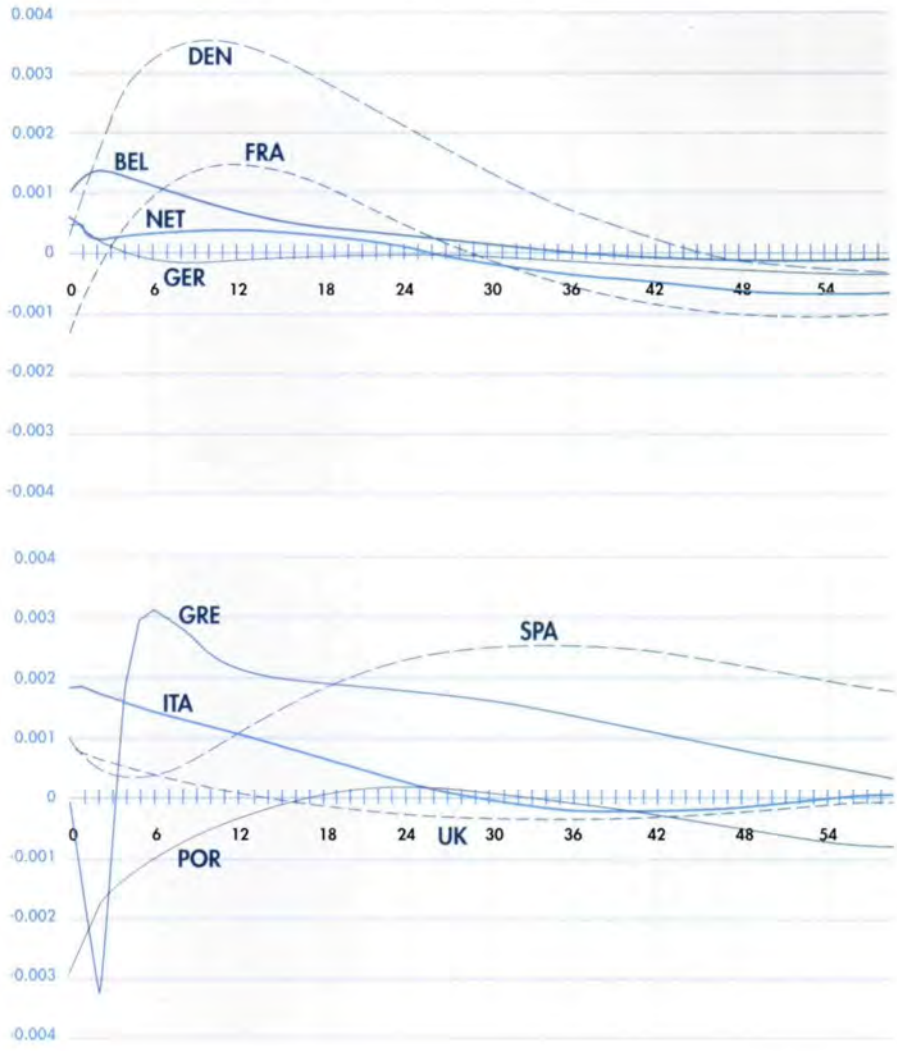
Symmetric shocks can generate persistent disequilibria if the degree of labour mobility or wage and price flexibility varies between countries. By contrast, product diversification would make countries appear more symmetric since either industry or country-specific shocks would become rather small, or the time profile of the transmission mechanisms would become more similar because shocks would be absorbed equally rapidly everywhere. Conversely, regional specialisation – a natural consequence of the opportunities for exploiting the scale economies and wider ranges of comparative advantages which the single European market now offers – would imply asymmetric transmission mechanisms and disturbances that were more persistent. If the asymmetric effects of shocks are large enough, a monetary union will become extremely difficult to operate for exactly the same reason as it would have been under asymmetric shocks. (15)

The impulse response functions in the chief target variables (money supply, long-term interest rates and the CPI level) over a period of 60 months – divided into one diagram each for Core and Periphery countries – are given below in Figures 2 through 4. In order to facilitate comparison, countries are divided into Core and Periphery according to the Bayoumi and Eichengreen (1992a,b) classification, i.e. in each Figure, the top panel shows the IRF's for the Core countries Belgium, Denmark, France, Germany and the Netherlands; while the bottom panel displays the IRF's for Greece, Ireland, Italy, Portugal, Spain and the UK. In the diagrams, the horizontal axis measures the length, and the vertical axis the size, of the response. The similarity of responses will be assessed in comparison to Germany, which, being the largest economy in Europe, makes it the obvious standard for comparison.

14) The extensive results for the domestic transmission effects of national shocks are available from the author upon request.

15) A prime example of how European economies can differ institutionally is given by the UK. It is often alleged that, because of the prevalence of short-term personal borrowing and floating-rate mortgages, the UK differs from its continental partners in its greater sensitivity to short-term interest rates.

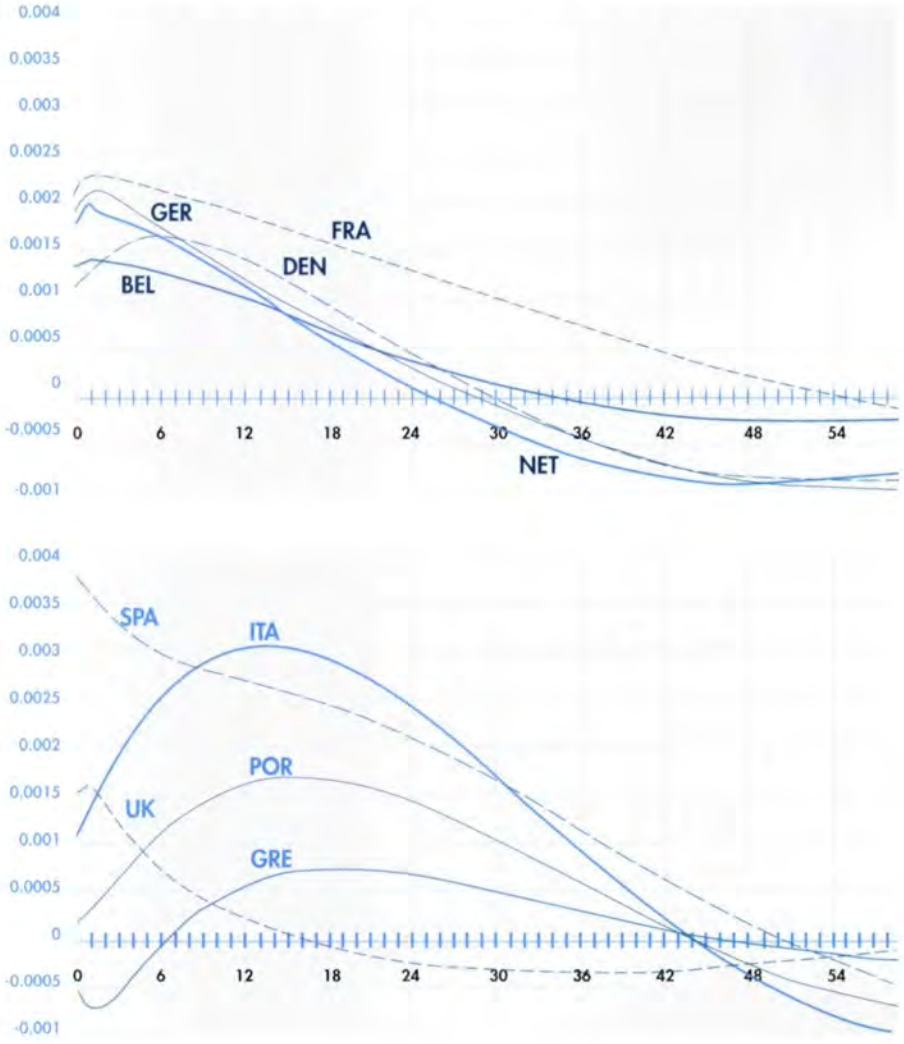
Figure 2. Impulse response functions of money supplies to a one standard deviation shock in the European money supply over a period of 60 months



There is some similarity between Germany and the Benelux countries, as all effects peak within one year. Denmark and France, on the other hand, either have a much larger response (Denmark) or a much later maximum (France). The Periphery generally shows very late minima and maxima and no similarity in the respective responses. At the same time, Italy and the UK have IRF's which are not all that different from those of Germany and the Benelux.

Figure 3 displays the responses to a one standard deviation shock in the European long-term interest rate.

Figure 3. Impulse response functions of long-term interest rates to a one standard deviation shock in the European long-term interest rate over a period of 60 months



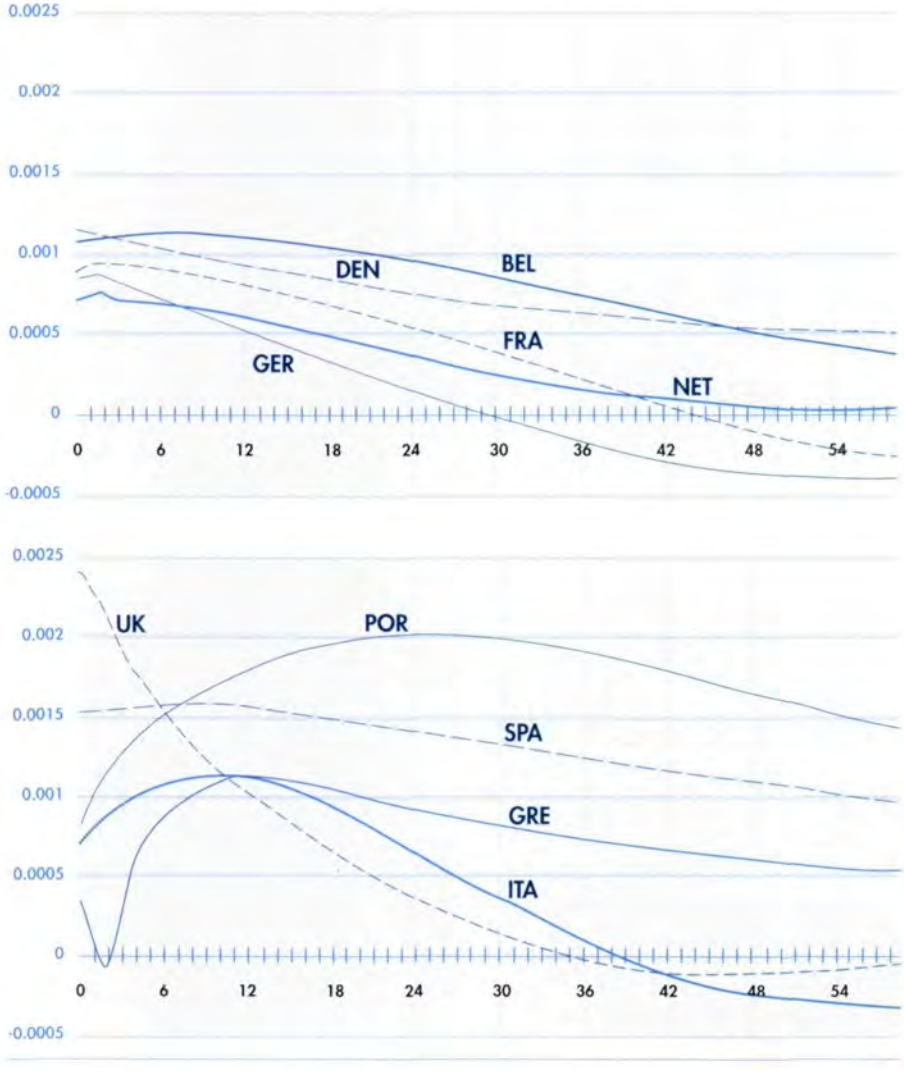
The response of the UK is more comparable to that of Germany, and points to a rather ambiguous position of the UK between the Core and the Periphery on the nominal side.

The IRF's of Germany, Belgium and the Netherlands peak within three months and have positive effects of less than three years, after which the responses to the shock turn negative. While France shares the maximum impact of the shock after three months, the response to the shock lasts much longer. Denmark, on the other hand, shows a maximum after six months only. Again, the Core emerges with respect to Germany and her smaller neighbours, and may

not include Denmark and France in this case. Most of the countries in the bottom panel show a maximum effect of the shock long after Germany does, and their IRF's do not cross the horizontal axis until year four. Spain and the UK stand out as their IRF's peak immediately and then die down, even though Spain's initial impact is much larger. Once again, then, the response of the UK is more comparable to that of Germany, and points to a rather ambiguous position of the UK between the Core and the Periphery on the nominal side.

We can now look at the effects of a one standard deviation shock in the European CPI index, for which Figure 4 presents the results.

Figure 4. Impulse response functions of consumer price indices to a one standard deviation shock in the European consumer price index over a period of 60 months



A long-term interest shock leads to a clear-cut differentiation of countries.

In response to a one standard deviation shock in the European CPI level, all Core countries, except for Belgium, display a maximum response within six months. While Germany has a permanent negative response to the shock, Denmark shows just the opposite, namely a positive long-run impact of the shock to the European CPI level. In the case of the other countries, however, we are unable to identify a common response. In terms of magnitude and duration, the Italian response to the shock could put it in the Core group.

Results for Core and Periphery industrial production IRF's are not presented here, as they show no marked differences between countries belonging to either group.

Overall, monetary shocks may not have similar effects in European countries. Examples for this are Denmark, which shows a much larger response than the other EU countries; France, where the maximum effect occurs after that for Germany; Greece with a rather erratic IRF; Portugal, where the initial effect is negative and never really turns positive; and Spain, for which the effect is large and extremely long-lived. The other nominal shock, namely a one standard deviation long-term interest shock, leads to a more clear-cut differentiation of countries on the basis of the transmission mechanism. With the possible exception of France, all Core countries have similar IRF's in terms of sizes and duration, which is also true for the UK. The remaining European countries, on the other hand, do not seem to share the transmission mechanisms of Germany and its smaller neighbours. With several notable exceptions, the division of the EU into a Core and Periphery on the basis of the nominal evidence presented here seems to be justified. However, while France and Denmark do not share all the similarities with Germany, the UK does, putting the division of Bayoumi and Eichengreen (1992a,b) into doubt, at least on the nominal side.

Turning to the incidence and propagation of real shocks, we find that among Periphery countries, Italy's IRF is closer to the typical response of Germany and its neighbours than any of the other Periphery ones. The UK, for example, has an IRF of similar duration to Core countries, but the initial impact of a CPI shock is much higher. In general, though, shocks to Periphery countries are longer-lived than for Core countries. This distinction disappears when looking at the propagation of industrial production shocks, for which there is little difference between Core and Periphery countries. As such, Ballabriga *et al.*'s (1993, 1995) result of important asymmetries with respect to inflation are confirmed.

8. Summary and Conclusions

From the estimation results, we can clearly see differences between the transmission channels for the member states of the European Union. This result emerges not only from the presentation of the variance decompositions in Table A, but also from the IRF's in

Figures 2 through 4, which give a demonstration of how different convergent and closely linked European economies can be.

In general, our investigation of the degree of symmetry of external shocks has focused on two conditions, namely the common origin of shocks and their symmetric transmission pattern in terms of sizes and persistence. Of the four common shocks considered, three could be regarded as being asymmetric on the basis of the variance decompositions, as they emerge as a relevant source of variability of the domestic variable for subsets of countries only. These are shocks to European interest rates, the European CPI level and European industrial production. The extension of the analysis to include the IRF's generally confirmed these results, in the sense that the responses of EU economies to these shocks are asymmetric. However, it is difficult to find a large overlap between the subsets of countries from the variance decompositions and those from the IRF's.

Our investigation into the justification of grouping European countries into a Core and a Periphery has come up with the result that it may not necessarily be possible to associate EU countries with the groupings identified by Bayoumi and Eichengreen (1992a,b). As such, common shocks to aggregate European variables can have very asymmetric effects among European economies. With important exceptions, responses of Core countries are very similar, no doubt reflecting similar transmission mechanisms. However, according to the analysis, the Core should only be composed of Belgium, Germany and the Netherlands, as the monetary evidence for Denmark and France is different from that of Germany and its neighbours. The position of the UK in the Periphery is also less clear-cut, as its propagation of monetary shocks is very similar to that of Germany. Long-term European interest rates are – on the basis of the partial correlation coefficients – important for all countries considered. The evidence on the real side is different in the sense that both European real variables have a strong influence on most of their national counterparts. This is above all true for a symmetric European inflation shock, which can have very asymmetric effects. Instead of concentrating on the nominal side alone, any further analysis of the benefits and costs of monetary union by prospective entrants may thus have to take the "realities" of the real side into account. Consequently, an "out" wishing to join EMU – and rushing to meet the Maastricht criteria in order to do so – should be aware of the asymmetries on the real side and the associated implications of having to follow policies designed for the Core. The successful membership of EMU may thus have to include structural reforms – of the labour markets, for example – to bring the transmission mechanisms of the domestic economy in line with that of the other EMU members. Leaving aside the ubiquitous threat of the Lucas-critique, "outs" could thus find that by rushing into EMU and ignoring those structural measures, policies suited for a Core could entail significant costs, even if the process of joining EMU as soon as possible was desirable in and of itself.

Of the four common shocks considered, three could be regarded as being asymmetric on the basis of the variance decompositions. These are shocks to European interest rates, the CPI, and industrial production. The IRFs generally confirmed these results.

Appendix A: Variance Decompositions

Given below are the forecast error variance decompositions of the responses of the four dependent national variables to innovations at both the European and the national level.

Table A

Variance decompositions: Percentages of domestic variables explained by European and Domestic Shocks

			Belgian System: Innovation to				
EUM	EULR	EUCPI	EUIP	BGM	BGLR	BGCPI	BGIP
			Dependent Variable: BGM				
1.9	3.7	0.3	1.8	88.7	1.6	2.0	0.1
			Dependent Variable: BGLR				
0.5	28.5	3.0	11.9	5.4	45.6	4.9	0.1
			Dependent Variable: BGCPI				
0.4	7.7	21.8	8.9	6.3	4.9	49.9	0.0
			Dependent Variable: BGIP				
2.7	1.3	1.3	26.0	4.7	0.4	0.4	63.2
			Danish System: Innovation to				
EUM	EULR	EUCPI	EUIP	DKM	DKLR	DKCPI	DKIP
			Dependent Variable: DKM				
1.6	15.6	0.9	2.7	73.8	1.3	4.1	0.1
			Dependent Variable: DKGLR				
0.6	15.4	5.8	1.9	4.5	69.7	4.8	0.3
			Dependent Variable: DKCPI				
0.1	3.6	5.4	1.8	1.9	1.1	86.1	0.1
			Dependent Variable: DKIP				
1.0	2.7	3.4	8.3	3.9	1.9	1.2	77.7
			French System: Innovation to				
EUM	EULR	EUCPI	EUIP	FRM	FRLR	FRCPI	FRIP
			Dependent Variable: FRM				
2.4	2.7	1.6	4.8	74.0	0.7	13.6	0.1
			Dependent Variable: FRLR				
2.2	59.2	3.0	5.6	0.3	26.0	3.3	0.5
			Dependent Variable: FRCPI				
5.4	13.6	15.6	5.0	0.1	0.8	59.2	0.5
			Dependent Variable: FRIP				
5.1	3.0	3.4	37.2	0.7	0.7	6.9	43.0

German System: Innovation to							
EUM	EULR	EUCPI	EUIP	BDM	BDLR	BDCPI	BDIP
			Dependent Variable: BDM				
0.4	6.4	3.8	4.1	74.5	3.3	7.4	0.1
			Dependent Variable: BDLR				
1.6	60.1	0.5	1.2	2.2	20.1	14.2	0.3
			Dependent Variable: BDCPI				
2.0	34.8	12.3	0.3	3.2	1.4	45.8	0.3
			Dependent Variable: BDIP				
4.8	10.7	0.3	25.6	0.9	1.9	8.5	47.1

Greek System: Innovation to							
EUM	EULR	EUCPI	EUIP	GRM	GRLR	GRCPI	GRIP
			Dependent Variable: GRM				
2.8	4.5	2.7	7.8	76.3	2.5	2.9	0.5
			Dependent Variable: GRLR				
3.8	9.8	2.9	5.0	1.7	73.0	3.1	0.7
			Dependent Variable: GRCPI				
5.6	3.5	5.0	7.5	2.0	12.3	63.5	0.7
			Dependent Variable: GRIP				
1.6	2.6	3.9	8.2	0.5	5.9	2.0	75.3

Italian System: Innovation to							
EUM	EULR	EUCPI	EUIP	ITM	ITLR	ITCPI	ITIP
			Dependent Variable: ITM				
21.7	3.5	1.1	2.3	63.4	2.8	5.3	0.1
			Dependent Variable: ITLR				
3.3	25.0	3.0	5.8	1.7	60.3	0.9	0.1
			Dependent Variable: ITCPI				
16.6	12.0	5.5	6.6	0.3	1.0	57.8	0.2
			Dependent Variable: ITIP				
4.2	6.6	2.3	30.4	1.3	1.4	2.9	51.0

Dutch System: Innovation to							
EUM	EULR	EUCPI	EUIP	NLM	NLLR	NLCPI	NLIP
			Dependent Variable: NLM				
0.4	4.5	2.2	1.0	81.3	5.9	2.7	2.0
			Dependent Variable: NLLR				
1.1	41.8	1.5	1.6	12.5	29.1	9.3	3.2
			Dependent Variable: NLCPI				
2.6	22.2	10.7	1.4	10.5	1.9	48.4	2.3
			Dependent Variable: NLIP				
0.3	3.8	2.3	7.7	8.0	3.0	2.2	72.6

Portuguese System: Innovation to							
EUM	EULR	EUCPI	EUIP	PTM	PTLR	PTCPI	PTIP
			Dependent Variable: PTM				
1.9	10.7	2.1	1.9	77.7	3.2	2.0	0.6
			Dependent Variable: PTLR				
8.0	6.2	0.9	4.5	10.9	65.7	1.7	2.2
			Dependent Variable: PTCPI				
8.4	4.7	14.8	8.3	8.4	0.9	53.1	1.5
			Dependent Variable: PTIP				
4.1	3.7	0.6	6.9	12.3	1.1	3.0	68.3

Spanish System: Innovation to							
EUM	EULR	EUCPI	EUIP	ESM	ESLR	ESCPI	ESIP
			Dependent Variable: ESM				
0.1	2.6	1.5	16.7	74.6	1.0	3.1	0.4
			Dependent Variable: ESLR				
0.2	11.8	2.9	11.3	10.5	61.2	1.4	0.7
			Dependent Variable: ESCPI				
0.1	4.2	25.2	16.5	12.2	1.0	39.9	0.9
			Dependent Variable: ESIP				
0.5	2.6	1.8	24.3	9.3	1.4	1.7	58.4

UK System: Innovation to							
EUM	EULR	EUCPI	EUIP	UKM	UKLR	UKCPI	UKIP
			Dependent Variable: UKM				
7.5	1.7	2.4	1.6	79.3	1.4	1.8	4.3
			Dependent Variable: UKLR				
4.0	20.6	0.5	2.1	13.0	56.8	0.5	2.6
			Dependent Variable: UKCPI				
10.4	6.0	22.5	5.4	16.2	1.2	32.0	6.4
			Dependent Variable: UKIP				
4.3	1.2	0.6	14.1	3.9	2.0	1.9	72.1

Countries are arranged in alphabetical order. Shown are the percentage decompositions of the variance of the forecast error for each variable. The value given is the average of the one- and 60-month ahead forecast error variance decomposition. The notes to Table 2 give an explanation of the variables.

Appendix B: An Introduction to Bayesian VAR Modelling (16)

The point of departure for the Bayesian VAR approach is the standard VAR model used to derive short-run linkages between economic variables of interest. With long lag lengths and many variables, however, the number of observations available will often not be enough to allow a reliable estimation of all the coefficients in the VAR. In order to circumvent the likely problem of over-parameterisation, we have to take recourse to a Bayesian estimation method of the VAR, which combines prior beliefs with traditional VAR estimation methods.

The basis is provided by Bayes' theorem, from which it follows that the conditional probability of the coefficient vector (π) to be estimated given the observations (X), $p(\pi \mid X)$, is a function of the probability of our prior beliefs about the parameters, $p(\pi)$, the conditional probability of the observations given the coefficients, $p(X \mid \pi)$, and the probability of the observations, $p(X)$, i.e.

[B.1] $$p(\pi \mid X) = p(\pi)p(X \mid \pi)/p(X)$$

This relationship underpins Bayesian inference and lies at the heart of the estimation procedure, where sample information is combined with prior distributions on the coefficients to give final estimates.

An Application of Bayesian VAR Analysis: The Minnesota Prior (17)

The central role of our prior beliefs about the coefficients in the estimation procedure can be easily seen from the inclusion of $p(\pi)$ in [B.1]. In practice, the convention of the Minnesota prior provides a sensible set of Bayesian prior beliefs that have become the standard in Bayesian VAR models. Under this assumption, coefficients are set in accordance with the random walk hypothesis – or a random walk with drift – for the variables. This is implemented by using a mean of zero for the prior on all coefficients except the first own lag in each equation, even though the data is allowed to override this restriction in the actual estimation process.

Specification of the Priors

In order to reflect the inherent uncertainty of the coefficients, the distribution of the prior is made to depend upon a small parameter vector, τ, that controls aspects of the prior for which we lack knowledge, such as its mean. Estimation of the model in fact proceeds by choosing τ.

16) Approachable introductions to Bayesian VAR modelling in the literature are Todd (1984), Litterman (1984, 1986) and Runkle (1987).

17) The Minnesota prior takes its name from the fact that it was developed by economists at the University of Minnesota and the Federal Reserve Bank of Minneapolis in Minnesota.

Finding the Optimal Prior

Two options are open to the researcher for finding the optimal prior. She can either chose a standard prior, which is associated with a specific setting of τ that has worked well in the past or reflects some empirical rule-of-thumb concerning time-series behaviour, or she can strive to find an optimal prior. A reasonable criterion for the latter is to select the prior associated with the set of parameters, τ^*, that maximises the likelihood function of the model. Table B presents the results of such a procedure for finding the optimal prior. The four possible prior specifications were no prior and a loose, medium and tight prior respectively. (18) With the four specifications, a procedure was used that minimises the logarithm of the determinant of the covariance matrix of the system's forecast errors.

Table B

Log determinants of the out-of-sample forecast error covariance matrix

System	Prior			
	Unrestricted	*Loose*	*Medium*	*Tight*
Belgium	-81.35	-84.06	-86.66	**-86.84**
France	-87.44	-90.50	-93.55	**-94.15**
Germany	-90.31	-92.18	-94.43	**-94.73**
Greece	-78.06	-80.80	**-83.53**	-82.35
Italy	-80.47	-86.72	-90.46	**-91.56**
Netherlands	-83.46	-87.44	**-92.38**	-92.10
Portugal	-78.29	-82.12	-86.72	**-86.75**
Spain	-78.95	-81.96	-86.10	**-87.92**
UK	-86.96	-90.52	-93.97	**-95.18**

Minimum logarithms of the determinant of the estimated variance-covariance matrix are denoted in boldface.

We can see that with the exception of Greece and the Netherlands, the tight prior performs best out-of-sample in the sense that it minimises the logarithm of the determinant of the estimated variance-covariance matrix. For the other two countries, the medium prior gave the desired outcome. Subsequently, the tight prior was imposed on Greece and the Netherlands as well as Denmark, for which the optimal prior could not be calculated directly. (19)

18) The coefficients are assumed to be normally distributed, and thus completely described by their means and standard deviations. The mean of the distribution is one on the first lag and zero on all lags greater than one, while the standard deviation is determined by a number of factors, including the overall tightness of the prior around the mean and the tightness of higher lags relative to the first lag. The latter two parameters have been set to range from loose to tight in the selection procedure.

19) This method of determining a prior was not possible in the case of Denmark, where monthly industrial production figures were not available for the year 1994.

Estimating the Bayesian VAR

After the selection of the optimal prior, estimation proceeds via the Theil-Goldberger mixed-estimation procedure – as described in Theil (1971) – of a system of two sets of equations, one for the actual data and one for the prior. The two equations are then estimated simultaneously by the application of feasible generalised least-squares.

References:

Ballabriga, F., Sebastián, M. and Vallés, J. (1993). "Interdependence of EC economies: a VAR approach." *Banco de España Servicio de Estudios Documento de Trabajo* n.º 9314. Madrid: Banco de España.

Ballabriga, F., Sebastián, M. and Vallés, J. (1995). "European asymmetries." *ESADE Papers* No. 141. Madrid: Escuela Superior de Administración y Dirección de Empresas, June.

Bayoumi, T. and Eichengreen, B. (1992a). "Shocking aspects of European monetary unification." CEPR Discussion Paper No. 643, May.

Bayoumi, T. and Eichengreen, B. (1992b). "Is there a conflict between EC enlargement and European monetary unification?" CEPR Discussion Paper No. 646, May.

Bofinger, P. (1994). "Is Europe an optimum currency area?" In *30 Years of European Monetary Integration from the Werner Plan to EMU*, pp. 38-56 (ed. A. Steinherr). London: Longman.

Commission of the European Communities (1990). "One market, one money." *European Economy* No. 44, October.

Demertzis, M., Hughes Hallett, A. J. and Rummel, O. J. (1996). "Is a 2-speed system in Europe the answer to the conflict between the German and Anglo-Saxon models of monetary control?" CEPR Discussion Paper No. 1481, (forthcoming).

Kenen, P. (1969). "The theory of optimum currency areas: an eclectic view." In *Monetary Problems in the International Economy*, pp. 41-59 (ed. R. Mundell and A. Swoboda). Chicago: University of Chicago Press.

Lastrapes, W. D. and Koray, F. (1990). "International transmission of aggregate shocks under fixed and flexible exchange rate regimes: United Kingdom, France, and Germany, 1959 to 1985." *Journal of International Money and Finance*, 9, pp. 402-423.

Litterman, R. B. (1984). "Forecasting and policy analysis with Bayesian vector autoregression models." *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall, pp. 30-41.

Litterman, R. B. (1986). "Forecasting with Bayesian vector autoregressions – five years of experience." *Journal of Business & Economic Statistics*, 4, pp. 25-38.

Masson, P. R. and Taylor, M. P. (1993). "Currency unions: a survey of the issues." In *Policy Issues in the Operation of Currency Unions*, pp. 3-51 (ed. P. R. Masson and M. P. Taylor). Cambridge: Cambridge University Press.

McKinnon, R. I. (1963). "Optimum currency areas." *American Economic Review*, 53, pp. 717-725.

Mundell, R. A. (1961). "The theory of optimum currency areas." *American Economic Review*, 51, pp. 657-665.

Runkle, D. E. (1987). "Vector autoregression and reality." *Journal of Business & Economic Statistics*, 5, pp. 437-454.

Sims, C. A. (1980). "Macroeconomics and reality." *Econometrica*, 48, pp. 1-48.

Tavlas, G. S. (1993). "The "new" theory of optimum currency areas." *The World Economy*, 16, pp. 663-685.

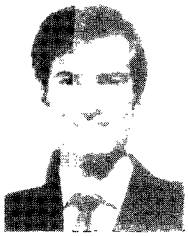
Theil, H. (1971). *Principles of Econometrics*. New York: John Wiley & Sons.

Thygesen, N. (1995). "The prospects for EMU by 1999 – and reflections on arrangements for outsiders." Lecture for the European Policy Research Unit, Manchester.

Todd, R. M. (1984). "Improving economic forecasting with Bayesian vector autoregression." *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall, pp. 18-29. Reprinted in *Modelling Economic Series*, pp. 214-234 (ed. C. W. J. Granger, 1990). Oxford: Clarendon Press.

Von Hagen, J. (1993). "Monetary union and fiscal union: a perspective from fiscal federalism." In *Policy Issues in the Operation of Currency Unions*, pp. 264-296 (ed. P. R. Masson and M. P. Taylor). Cambridge: Cambridge University Press.

Is Maastricht a good contract?



Bernhard Winkler

European University Institute, Florence.
EIB Campilli-Formentini Scholarship 1994-1996

1. The Maastricht transaction

It is to state the obvious to say that the treaty of Maastricht is a contract. Surprisingly, there has not yet been any economic analysis of the obvious. This paper proposes to consider the Maastricht Treaty as a contract device that must organize a mutually beneficial transaction, here European Monetary Union (EMU). In order to assess whether Maastricht is a good contract three possible functions of contracts are explored. First, the treaty can provide countries with extra incentives for desirable behaviour. Second, it can co-ordinate behaviour among different countries to produce a desired outcome. Third, the treaty can structure behaviour and decision procedures such that relevant information is revealed. As for the content of the Maastricht Treaty, three essential features can be distinguished. Maastricht aims to establish a *single* currency for Europe, it seeks to ensure a *stable* currency and finally it makes entry to EMU *conditional* on fulfilling convergence criteria and *mandatory* for the countries satisfying the criteria (with the exception of the UK and Danish opt-outs).

As explained in the "strategic view on EMU" proposed in Winkler (1996a) the key to understanding the Maastricht contract and the role of the convergence criteria is to recognize that interests and priorities differ across countries and change over time. The country that has most to lose from EMU both in terms of credibility as well as in terms of sacrificing sovereignty is Germany. Therefore, at Maastricht Germany was willing to trade away the Bundesbank and share sovereignty equally only if the single currency was to become "at least as stable as the deutsche mark". Thus there was little question that the statutes of the European Central Bank (ECB) would have to be modelled closely after the Bundesbank's. However, central bank independence can at most be seen as a necessary condition for enduring price stability: it is certainly not sufficient (1). This is where the convergence criteria come into play. They call for inflation and interest rates to be within 1.5 percentage points of the three best performers and for membership of the exchange rate mechanism (ERM) for at least two years without devaluation on own initiative. The fiscal criteria stipulate a deficit of at most 3% and a public debt of at most 60% in relation to the candidate's GDP. These reference values are to be applied to decide which countries qualify for entry into EMU at the end of stage two, but the fiscal conditions are to hold also throughout stage three of the Maastricht process.

The key to understanding the Maastricht contract and the role of the convergence criteria is to recognize that interests and priorities differ across countries and change over time.

This paper draws on research for my PhD dissertation at the European University Institute, which was funded by the European Investment Bank. Helpful comments by Michael Artis and Spyros Vassilakis are gratefully acknowledged.

1) The extensive literature on the credibility of monetary policy points to contractual solutions in the form of rules (e.g. on money supply), delegation to a conservative central bank (Rogoff, 1985) or the use of explicit incentive contracts for central bankers as ways to achieve low inflation (Walsh, 1995). Alternatively, under repeated interaction, incentives to build and preserve a good reputation can also lead to low inflation (Backus and Driffill, 1985). Ultimately, however, price stability requires the consensus and support of the population at large over and above the institutional details of monetary policy making.

The Maastricht criteria have drawn severe criticism from economists, who tend to consider them as arbitrary non-sense (Buiter *et al.*, 1993) or as either superfluous or, worse, as harmful and self-defeating (De Grauwe, 1994). They seem to have little to do with economics. In particular they have little to do with the requirements for an optimum currency area, such as price and wage flexibility, factor mobility or fiscal transfers. Instead, all the criteria are best interpreted as indicators of (past, present and future) credibility. In short, in stage two candidate countries are asked to demonstrate their stability orientation before joining EMU. The reasoning is that only a deeply rooted "stability culture" among EMU members will allow the ECB to produce stable prices at low real costs. In particular, conflicts between the orientation of fiscal and monetary policy are to be avoided.

In order to make sense as an entry condition for EMU the convergence criteria must satisfy two requirements. The behaviour they induce in stage two must have lasting and beneficial effects on stage three. Second, they must be seen to address inefficiencies from *spillovers, i.e. induce desirable behaviour that would otherwise not be in the individual* self-interest. The criteria are important if producing stability, credibility and reputation for EMU has public good features, i.e. if it requires individual sacrifice for the common good.

This section has characterized the Maastricht transaction as an exercise in the pooling of sovereignty in a single currency, a "selling" or "sharing" of the Bundesbank, in return for the acceptance of German standards for a stable currency. Statutory independence of the ECB was regarded as insufficient and had to be supplemented by a mechanism to organize the production of credibility and reputation via the convergence criteria. Section 2 explores possible rationales for the Maastricht Treaty provisions by asking what would happen in the absence of any contractual devices. Indeed some commentators such as De Grauwe (1993) have suggested that the decision to form/join EMU should be entirely voluntary and unconditional. It is then investigated how contracts may help in organizing EMU. In Section 3, the principal functions of the Maastricht entry conditions are analyzed. Section 4 concludes with policy implications.

2. Maastricht games and contracts

The Maastricht game

The strategic view on EMU starts from the premise that costs and benefits differ across countries and in their time profiles. In particular countries with a high domestic monetary credibility are concerned about a possible loss of reputation and price stability in EMU. *We call the advocate of these interests "the Principal" for the rest of the paper,* most obviously represented by *Germany and the Bundesbank.* It prefers that convergence and credibility be established by national effort prior to admission into EMU. For

low credibility countries, on the contrary, the whole point of EMU is to gain credibility more cheaply, so they prefer convergence inside EMU, if at all. This group includes most candidate countries and will be called "the Agent" throughout the paper (2). In order to concentrate on the strategic interaction between these two groups of countries consider the following objective functions for Principal *(P)* and Agent *(A)* respectively.

(1) $$V(P) = p(\bar{T}_p + \varnothing\omega E) + (1 - \varnothing)\omega E$$

(2) $$U(A) = p\,\bar{T}_A - \frac{\beta}{2}E^2$$

In short, candidate countries are asked to demonstrate their stability orientation before joining EMU.

The first term in both equations captures the total expected net benefits from EMU, where p is the probability and timing of EMU. $\bar{T}_p$ and $\bar{T}_A$ are the (net) benefits of stage three of EMU for Principal and Agent respectively. It is reasonable to assume that $\bar{T}_p$ is negative, i.e. the Principal would not agree to EMU in the absence of any convergence (E). E only concerns the externality component of convergence, i.e. it abstracts from the convergence effort that a country would find in its *own interest* to undertake in preparation for EMU. For the Agent the *extra* Maastricht-induced component of convergence is costly with increasing marginal costs. The higher β the more painful it is for a country to pursue rigid fiscal and monetary policies or unpopular reforms in preparation for EMU.

The Principal, on the other hand, is interested in inducing as much prior convergence as possible, where ω is his marginal utility of convergence. There are two possibilities: the Principal might be interested in convergence *per se* or he cares about it only if EMU happens. In an alternative interpretation, fraction $\varnothing$ of convergence is reversible and thus will be lost if EMU does not materialize. The share $(1\text{-}\varnothing)$ reflects durable convergence, independent of EMU, or the temporary utility that even reversible convergence yields during the time it is forthcoming. In the special case of $\varnothing$=0, the degree of convergence in stage two has no particular value for stage three. For $\varnothing$=1 convergence *only* matters for the Principal in stage three and only if EMU comes about.

Imagine a simultaneous move game with objective functions (1) and (2) where the Principal must decide whether to surrender the Bundesbank for EMU (p=1) or not (p=0) and the Agent decides on the amount E of convergence to undertake. For illustration the following numerical values are assumed henceforth: $\bar{T}_p$=-1, $\bar{T}_A$=4, ω=2 and β=2. In the payoff matrix (Figure 1) the Agent's payoff for each combination of strategies is given first, the Principal's is the second term for each outcome.

2) For a more detailed account of the role of the criteria in the Maastricht negotiations see Bini-Smaghi et al. (1994).

Figure 1. *The Maastricht game (Nash)*

		Principal	
		EMU (p=1)	No EMU (p=0)
Agent	Optimal Convergence: E=1 ($=\omega/\beta$)	1, 1	-1, (1- ø)2
	No Convergence: E=0	2, -1	0, 0

The unique Nash equilibrium is in the bottom-right corner of *Figure 1*: no convergence is forthcoming and EMU does not happen. The co-operative solution that maximizes joint welfare calls for EMU to happen and for the optimal convergence effort which balances the marginal cost of convergence to the Agent with its marginal benefit to the Principal. The co-operative solution in the top-left corner, as in the well-known Prisoners' dilemma, is not sustainable since, once EMU is assured, the Agent has no incentive to undertake costly convergence. Given that, the Principal will not agree to EMU. Conversely, if the Agent provided optimal convergence the Principal will still refuse EMU unless $\omega \geq 1/2$, i.e. unless there is enough EMU-specific convergence that the Principal can only secure by *granting* EMU. An example of a big ø would be the fear that the single market, exchange rate stability and the entire convergence process could unravel unless it is "locked-in" via EMU. A small ø would obtain if countries' convergence behaviour in stage two said nothing about their reliability for stage three or, on the contrary, convergence would continue just the same even in the absence of EMU.

For concreteness, call the players Germany and Italy. Germany holds the key to EMU coming about; Italy can choose convergence (say fiscal rectitude) or otherwise. If Germany commits to EMU it must fear that ex post, with the Bundesbank surrendered, Italy will not produce sufficient and durable convergence. Italy may not resist the temptation to try to have Europe bail out its debt, redirect its priorities towards employment instead of price stability, delay fiscal reform further etc. Conversely, Italy may fear that painful adjustment E would not be rewarded with EMU entry.

The co-operative solution, as in the well-known Prisoners' dilemma, is not sustainable.

Contracts

There are several ways, in principle, in which the Maastricht Treaty may improve on the inefficient Nash equilibrium of *Figure 1*. First, by structuring the game by specifying a move order, i.e. *when* decisions are taken. Second, by allocating decision authority, i.e. who decides *what*. Third, by altering the payoffs of the game, e.g. by committing players to certain actions, outcomes or procedures, where breach of treaty carries a penalty. In particular, the treaty can specify decision rules, i.e. regulate on what basis and *how* decisions are taken. Here, the Maastricht criteria examined in Section 3 are a

prime example. The Maastricht Treaty deploys a combination of all three options, which will be explored in turn.

The most immediate answer would be to pool all authority at the European level.

The first simple measure the treaty can take is to prescribe a particular move order, i.e. have the players in *Figure 1* make their choices sequentially. Then if the Agent moves first, he will choose the minimum convergence $\bar{E}$ that is necessary to just entice the Principal to go along with EMU. If $\bar{T}_p$ is negative, as before, all that is needed is a positive $\varnothing$, i.e. that some of the prior convergence is EMU-specific. Assume $\varnothing$ =3/4 for illustration; then the top-left corner in *Figure 2* will become a Stackelberg equilibrium, i.e. a Nash equilibrium in a game where the Agent moves first or can pre-commit to this preferred action (3).

Figure 2. The Maastricht game (Stackelberg)

		Principal	
		EMU (p=1)	No EMU (p=0)
Agent	Minimal Convergence: $\bar{E}$=2/3(=-$\bar{T}_p/\varnothing\omega$)	3 1/3, 1/3	-2/3, 1/3
	No Convergence: E=0	4, -1	0, 0

Note that the reverse move order, where the Principal commits first, is of no help. In this case the Agent would always respond with zero convergence and hence the Principal would refuse EMU. Note also that the convergence $\bar{E}$ induced by the efficient move order, will not in general correspond to the efficient amount of convergence of the co-operative solution in *Figure 1*. In the above example the minimal effort is suboptimal (i.e. 2/3 rather than one), but for $\varnothing$ <1/2 convergence becomes excessive rather than deficient. This inefficiency may be one reason why the Maastricht Treaty not only calls for "convergence first" but also sets minimum convergence requirements. Moreover, Maastricht established a final deadline for EMU in 1999, together with the criteria, and therefore does not leave the decision on EMU in the Principal's hands. This suggests that the move order alone was perceived as insufficient to guarantee an efficient transition to EMU.

The second possibility to improve on the Nash outcome of the Maastricht game concerns the allocation of decision authority. The most immediate answer to the Prisoners' Dilemma of EMU would be to pool all authority at the European level. If Europe had already achieved full political union, joint decisions would reflect European welfare (or the result of intergovernmental bargaining) and could be legitimately executed and enforced even against individual nations' interests. For now, however, it seems reasonable to assume that contracts and explicit treaty commitment are necessary for those purposes. Then a two stage game can be envisaged, where, first, players

3) Note that the bottom-right corner still is a Nash equilibrium, but it is not "subgame perfect": If the Agent can move first, he will choose to converge, since he knows that the Principal's best response will then be to allow EMU to go through. Strictly speaking E needs to be slightly greater than 2/3 in order to break the tie.

contract over decision rights and, second, play a Nash game in the decision variables allocated previously. If it were possible to contract for a "reverse assignment" of decision rights, then the Agent would decide whether EMU would go ahead and the Principal could choose the degree of convergence as in *Figure 3.*

Figure 3. The Maastricht game (reverse assignment)

		Principal	
		Maximal Convergence: $\bar{E}=2$ $(=\sqrt{2\bar{\bar{T}}_A}/\beta)$	$E=0$
Agent	EMU ($p=1$):	0,3	4, -1
	No EMU ($p=0$)	-4,(1- ø)4	0, 0

The Maastricht criteria attempt to internalize the externalities in the original Maastricht game and try to achieve the co-operative solution.

Here the unique Nash equilibrium is the outcome in the top-left corner. The Agent will always want EMU to happen and the Principal wants to extract the maximal convergence, $\bar{E}$, which will leave the Agent just no worse-off than in the absence of Maastricht. The treaty contains some elements of a reverse assignment. At least on paper, it assures that $p=1$, i.e. that EMU will happen for sure by 1999 at the latest and it prescribes (qualified) majority vote for the entry decisions. This means the Principal could be outvoted: he cannot block EMU single-handedly. As for convergence, the Principal has been allowed to impose the Maastricht criteria and also to play a vocal role in their interpretation. Moreover, since several of the criteria are formulated in relative terms, by setting monetary policy for the DM-block of currencies the Bundesbank effectively determines the absolute values of the inflation and interest rate criteria.

While the reverse assignment allows a superior outcome compared to the original "natural assignment" in *Figure 1* it runs the risk that the Principal imposes excessive convergence on the Agent, as compared to the co-operative solution (in the example, the maximum $E=2$ instead of $E=1$). Moreover, once the treaty is concluded and if the Principal can effectively control the Agent's effort, he could always ask for still more convergence and could make the Agent worse off than without Maastricht. Anticipating this the Agent would refuse to sign away his control over convergence at Maastricht. The main problem with the reverse assignment is that it is difficult to enforce, because it is "unnatural". Certainly the Bundesbank has been already signed away at Maastricht and Germany can be outvoted in the Council, but still it would be hard to conceive that it could be really coerced into EMU against its will in 1999. Likewise, Germany certainly cannot dictate convergence policies of sovereign partner countries, even with the most rigid interpretation of the criteria (4).

4) The Principal can impose additional convergence by exploiting the fact that for any given level of convergence ex post, the Agent prefers EMU to No EMU. Further risks to the stability of the equilibrium in Figure 3 arise if the reverse assignment is not fully credible. Then, for ø1/4 the Principal prefers the bottom-left outcome and will try to prevent EMU, after convergence has materialized. Similarly, the Agent has every incentive to cheat on convergence to try to achieve his preferred outcome (top-right).

The Maastricht criteria can be seen as a way around the problems of the reverse assignment. First they seek to protect the Agent against demands for excessive and ever greater convergence. Second, they reassure the Principal by making his commitment to EMU conditional on sufficient prior convergence. Third and most importantly, by making entry to EMU conditional on convergence it becomes in the Agent's own *interest* to undertake convergence effort, without signing away national control. In this way the Maastricht criteria attempt to internalize the externalities in the original Maastricht game and try to achieve the co-operative solution in *Figure 1*.

The Maastricht criteria had to be simple, visible and equal for all candidate countries.

It was shown how the Maastricht Treaty might help to solve the Prisoners' Dilemma of the Maastricht game by specifying who decides what and when. The obvious thing, however, would be to commit to the desired co-operative outcome directly. A complete contingent contract would specify the actions to be undertaken by the two sides under all conceivable circumstances and would be perfectly enforceable. Real life contracts, however, are usually incomplete because of transaction costs (Hart and Holmstöm, 1987). These arise, first, from the difficulty of anticipating all possible eventualities. The ERM crisis of 1992/93 is a prime example of such an unforeseen contingency. Second there are costs of agreeing and deciding. Third, the imprecision of language makes it difficult to give clear and unambiguous descriptions of the relevant states of the world. Fourth, legal enforcement of contracts is often difficult and costly. Enforcement will be particularly hard if the subjects are sovereign states and the union has only a limited capacity to impose formal punishment.

A further set of problems arises under private information, i.e. the case where one of the two parties has superior knowledge about the state of the world. In particular, policy-makers' true preferences and intentions might not be known to the other party and relevant actions might not be easily observable or at least not verifiable in court. Convergence effort, i.e. measures that contribute to the credibility and stability of EMU both in the run-up to EMU and in stage three itself, are hardly contractible (and therefore enforceable) directly, even if they should be observable. For example, it is hard to imagine a contract ruling out all conceivable manipulations of budget figures which have nothing to do with achieving the sustainable and sound public finances the treaty is interested in.

The Maastricht criteria, therefore, must be understood as a highly imperfect substitute for a fully state-contingent and enforceable "ideal" complex contract. They had to be simple, visible and equal for all candidate countries, and of course bear at least some relation to the underlying variable of interest, i.e. the willingness and capacity to support and sustain stability oriented policies. However, the cost of abiding by a crude and

inflexible contract to the letter could be very high if important information is disregarded or sizeable shocks (e.g. recessions) intervene in the meantime. A way to get around this problem is not to commit to particular actions or outcomes directly, but to conclude "relational contracts" (Milgrom and Roberts, 1992). These agree on the objectives and the criteria, the process and procedures of decision making, not on the decisions themselves. By providing a framework for the decision to move to stage three of EMU, i.e. by defining who decides when, what and how, the Maastricht Treaty constitutes such a relational contract. As such it preserves the commitment value of a contract (which is necessary to sustain a co-operative solution) while preserving valuable flexibility in the light of unforeseen contingencies.

The principal elements of this relational contract concern the move order discussed before, the automaticity of EMU in 1999 and the joint European decision making on the application of the convergence criteria. Convergence has to precede EMU because it is not easily contractible and enforceable ex post. This contrasts with the transfer of sovereignty from the Bundesbank to the ECB, which is highly observable and contractible. Automaticity tries to ensure the Principal's commitment to EMU and, more generally, the mandatory participation of high credibility countries, who would confer a positive spillover on EMU by joining. Joint European decision making (abstracting from the precise voting rules) means that all parties affected by the decisions, in particular the "outs" as well as the "ins", are present and under efficient bargaining, all externalities could be internalized. However, this presupposes that side-payments, e.g. on Political Union or structural funds, are available to compensate individual countries.

However, problems arise for *ex ante* convergence incentives, which could suffer if countries anticipated renegotiation at the time of the application of the criteria. Depending on bargaining strength Agent countries may receive insufficient reward for prior convergence. Since convergence costs are already sunk at the time of the entry decision, the Principal may take advantage of this and extract further convergence or impose additional conditions. The prospect of opportunistic behaviour will lead countries to undertake less convergence than in the absence of renegotiation. Thus *ex post* bargaining can lead to the distortion of ex ante incentives, as in Williamson's (1975) "hold-up problem". In the presence of asymmetric information, moreover, additional bargaining inefficiencies are prone to arise (Myerson and Satterthwaite 1983). Uncertainty about other countries' valuation of EMU or convergence costs may then prevent a mutually beneficial renegotiation.

One possibility to limit the negative effects of incomplete contracts, that can arise if ambiguities and omissions in the treaty have to be filled later by bilateral bargaining, is to provide for third party arbitration. This role is partly assumed by the convergence reports to be prepared by the European Commission and the European Monetary Institute.

While not binding, they will still be very important in providing an (ideally impartial) interpretation of the treaty provisions. The other alternative is to conclude long-term contracts, even if imperfect, and stick by them rigidly, even in the event of adverse shocks. While this is likely to lead to inefficient convergence, at least it reduces the risk of EMU not coming about at all. The presence of bargaining inefficiencies may explain the dogged determination of European leaders to stick by "the treaty, the whole treaty and nothing but the treaty", studiously avoiding a re-opening of the Maastricht "Pandora's box".

3. The role of the Maastricht criteria

One possibility to limit the negative effects of incomplete contracts, is to provide for third party arbitration. This role is partly assumed by the convergence reports to be prepared by the European Commission and the European Monetary Institute.

The previous section has already furnished several explanations for the adoption of the Maastricht criteria by asking what would happen in the absence of any such conditions. The task of the criteria is to organize a co-operative solution of the Maastricht game. Given the incomplete contract framework proposed as the appropriate reference point, the task of the paper is not to defend (or propose) any particular numbers for the criteria. All that matters here is that policymakers cared enough about them, rightly or wrongly, to include them in the treaty. Andreas Kees (1992), the German representative on the EC monetary committee, where the criteria were conceived, lists three principal functions. According to him (p.31), the criteria are not of a technical but of a political nature. They serve as guideposts for the orientation of economic policy, they create pressure for consolidation and they have a signalling function, especially with a view to the financial markets. The main idea was to create a "dynamic tension", where the prospect of a fixed deadline for stage three would induce and facilitate the necessary adjustments much earlier and in turn create the desired momentum for EMU. The three functions of the criteria are discussed in the following, starting with the external incentive argument.

Providing convergence incentives

As explained before, the Maastricht criteria can serve as a substitute for contracting for optimal convergence directly. For example by making the probability of EMU entry in *equation 3* depend on the degree of convergence as measured by the criteria, the incentives of the two parties become more closely aligned. Now it is in the own interest of the Agent countries to undertake costly convergence effort. EMU becomes the reward that the Principal offers as a function of convergence effort. Ideally the incentive contract should be structured such as to completely internalize the convergence externality in the Maastricht game.

$$U(A) = p(E) \cdot \bar{T}_A - \frac{\beta}{2} E^2 \qquad (3)$$

With the Maastricht criteria governing entry rather than decisions by the Principal and/or the Agent, the probability of entry p now is endogenous and an increasing function of convergence effort E. From maximizing *equation 3* the Agent will choose optimal convergence effort as

$$E^* = \frac{\partial p(E)}{\partial E} \cdot \frac{\overline{T}_A}{\beta} \tag{4}$$

Convergence effort will be higher the greater the rewards from EMU ($\overline{T}_A$), the smaller the costs of convergence (β) and the more extra effort raises the entry probability p. In the probabilistic formulation of *equations 3* and *4* it is already assumed that there is uncertainty, either about the application of the criteria or (and) about the economic transmission mechanism which translates convergence effort into the outcomes relevant for the criteria. As shown in Winkler (1996b) the presence of uncertainty about the criteria can actually be beneficial for convergence incentives. The intuition is straightforward: if the criteria were totally precise countries who are far away from fulfilment will "throw in the towel", while countries sure about reaching them will no longer exert any further convergence effort either. For intermediate cases convergence incentives are weakened, rather than sharpened by uncertainty.

Thus, if the aim is to maintain a "dynamic tension" and maintain the momentum for convergence for the greatest possible number of member states, then ex ante some uncertainty should be kept alive, as long as it influences policy decisions. No country should be ruled out or ruled in, at least not publicly. This also provides a rationale for the EMI and the Commission *not* to do a "dry run" of convergence reports in 1996, at least not until all the budget measures for 1997 have been approved. Thus the simple idea underlying *equation 3* provides an answer to the criticism of the criteria that argues that either they will be useless because they will be overridden politically or that they will be harmful because they cannot possibly be met. It is precisely the uncertainty about the flexibility and interpretation of the criteria that renders the criteria useful and beneficial as an incentive device (5).

The Waigel stability pact

As an alternative (or in addition) to the convergence criteria, incentive effects could also be produced by making the benefits of EMU a function of convergence. An example of this would be the Waigel stability pact. This proposal first put forward by the German finance minister in late 1995 calls for automatic sanctions in the form of fines for any

5) The leaked statements by German finance minister Waigel before a parliamentary committee in 1995, where he asserted that Italy would not be in the first group joining EMU "and they know it", provides an instructive episode. The press report caused a severe market reaction against the Lira and Italian bonds. From the perspective of this model, this was not because the markets necessarily had a much more optimistic view on Italian entry probabilities, but rather because common knowledge of a zero probability would destroy Italian convergence incentives.

breach of the fiscal criteria in stage three of EMU. The concern is that countries that had great difficulty to converge even under the threat of exclusion from EMU are even less likely to do so once that extra incentive has vanished. On the other hand the costs of convergence (e.g. the parameter β in *equation 3*) should be lower in stage three, if interest rates and inflation come down for those countries.

The stability pact is at most a partial substitute for the convergence criteria.

In terms of our model the Waigel pact would have three main effects. First, equations 1-3 can be applied to incentive issues in *stage three*. Then $\overline{T}_A$ would be a negative Waigel penalty for the Agent and *p(E)* the probability that it will be imposed, which is now decreasing in convergence. Countries will be disciplined from *equation 4* the greater the fines, the more the risk of incurring them depends on their behaviour and the lower the costs of fiscal austerity. Second, the Waigel pact, therefore, would alter the parameters of the model as applied to stage two. In particular, it should reduce the risks to the Principal (raise $\overline{T}_P$) or render stage two convergence more durable (increase $\varnothing$). Both should help overcome his reservations over EMU. Third, the Waigel pact could affect the Agent's payoffs from EMU not only via a lower $\overline{T}_A$ from the risk of incurring fines in EMU. More importantly, the benefits of EMU could become a function of prior convergence, i.e. be written as *T(E)* in *equation 3*. Thus they could operate in much the same way as the Maastricht criteria and render it in the candidate's own interest to take corrective fiscal action before entering and thereby reduce the risk of incurring penalties in EMU.

These incentive effects of the Waigel pact open the possibility for a trade-off, i.e. a relaxation of the entry conditions in return. Such a deal could make everybody better off. However, as will become clear further down, a lax application of the criteria and a large initial EMU will encounter less favourable starting conditions and a lower reputation. Furthermore, the effectiveness of the Waigel penalties is untested and in the case deterrence fails, the actual imposition of the fines will aggravate a fiscal crisis rather than alleviate it. For these reasons the stability pact is at most a partial substitute for the convergence criteria.

Co-ordinating convergence

Turning to the second principal role of the Maastricht criteria, in order to produce the desired smooth transition to EMU a co-ordination of individual convergence efforts is required. In fact each country's incentives depend on what other countries are doing. Apart from the usual policy spillovers from fiscal and monetary policies, the various countries' strategies are interdependent via the probability (or timing) of EMU which will be a function of joint effort. Consider two identical Agent countries who maximize utility as before in *Equation 3* above.

$$U(A) = p(E,E_f) \cdot T - \frac{\beta}{2}E^2 \quad (5)$$

Note that in *equation 5* the entry probability is also a function of foreign convergence effort. In principle the externality could be positive or negative. The most straightforward interpretation derives from the simple fact that EMU only happens if at least two countries (often more precisely identified as France and Germany) make the Maastricht appointment. In general the chances of being admitted to EMU depend on various economic and political considerations involving partner countries. For example, a Maastricht induced recession next door lowers one's own probability of meeting the criteria. If an important trading partner looks like jumping the hurdle, one's own efforts will intensify in order not to be left behind. If other large countries stay out, the political stigma of exclusion is reduced, and vice versa (witness the acceleration of Spanish and Italian efforts in mid 1996).

If the start of EMU is conditional on a minimal size requirement (even if that is not in the treaty), again individual convergence which raises the probability of meeting the criteria has public good features. This is because the overall probability that EMU will go ahead as planned is increased and therefore the expected payoff for all partner countries. This in turn increases the incentive to converge for everybody.

Consider *Figure 4* for a simplified illustration of two Nash equilibria, where jointly high effort is assumed to lead to EMU for sure (p=1). Other parameter values are as before.

Figure 4. The convergence game

		Abroad	
		High Convergence: $(\bar{E}_f=1)$	$(E_f=0)$
Home	High Convergence: $\bar{E}=1$	3, 3	-1, 0
	$E=0$	0, -1	0, 0

In *Figure 4*, a country's best response, if no-one else converges, is to do nothing either (bottom-right). Conversely, the greater foreign effort, the greater is the home incentive to converge (top-left). If countries start out in a low convergence equilibrium they will not make it to the EMU equilibrium without a co-ordination and commitment device to initiate and support the transition. This suggests that a market-led or voluntaristic approach, which advocates proceeding to EMU "when the time is ripe" and convergence sufficient, is doomed to failure. The key commitment device that the Maastricht Treaty has furnished to overcome this "horizontal" co-ordination problem (as well as the "vertical" one between Principal and Agent) is to set *both* convergence requirements and a firm deadline. Fixing a deadline and not imposing a minimum size on EMU should render at

least some foreign entry probability close to one and thus provide incentives for other countries to catch up. Other measures to overcome co-ordination failure include the following. Pivotal countries could set the standard and go ahead unilaterally (move order, multi-speed EMU), mechanisms of co-ordination, communication and authority can be installed in order to invoke the good equilibrium (e.g. the convergence reports by the Commission, EMI, the EU summit declarations etc.) and, finally, external commitment should help (e.g. the German court ruling (6), the Bundesbank setting stability standards).

The model of co-ordination failure explains why countries left it very late before they initiated meaningful convergence programmes. In the presence of uncertainty about EMU's fate it was rational to sit and wait, as long as other countries did the same.

However, the co-ordination problem resurfaces if the treaty itself lacks credibility. First, it is politically unrealistic and economically meaningless to conceive of a mini-EMU, especially one that were to exclude either France or Germany. Second (and therefore), given convergence conditions as of 1996 either the deadline or the strict interpretation of the criteria have to give. As long as a delay, a failure of EMU or a relaxation of the entry conditions are perceived as possibilities, the model of co-ordination failure applies as it stands. In particular, it can explain why countries left it until very late, until many years after the signing of the Maastricht Treaty, before they initiated meaningful convergence programmes. In the presence of uncertainty about EMU's fate it was rational to sit and wait, especially as long as other countries did the same.

Given the lack of full credibility of the numerical convergence criteria, moreover, the entry conditions as an incentive device in reality operate much more like relative than absolute performance contracts. For example, France is unlikely to try push its deficit below the 3% limit in 1997 if it predicts that Germany will not meet the target either. Moreover, the inflation and the interest rate criteria are explicitly relative conditions. How strict they turn out to be depends on the behaviour of the three best-performing countries.

There is a further interpretation of the convergence game of *Figure 4* if the home country is playing against the financial market rather than other countries. Then E would denote the markets' levels of confidence in the home country. If the market has optimistic expectations, inflation expectations and interest rates fall and therefore also the fiscal burden. This facilitates convergence, the optimistic expectations thus become self-fulfilling and the "good" Nash equilibrium is realized. Conversely, under pessimistic market expectations (here E=0), a vicious cycle ensues and respecting the Maastricht criteria becomes difficult or impossible (7).

6) The German supreme court (Bundesverfassungsgericht) ruling in 1992 and a resolution of the Bundestag insisted on a strict interpretation of the criteria and argued that Germany was only committed to join (or stay in) a monetary union that safeguards price stability.

7) Examples of such multiple expectational equilibria include Calvo's (1988) model on debt default, Obstfeld (1994) on speculative attacks, Eichengreen and Wyplosz (1993) on the EMS crisis.

Building reputation for EMU

In order to explore the "signalling function" of the criteria recall the original formulation of the "vertical" game between Principal and Agent as given in *equations 1* and *2*. Imagine that the Principal does not know the preferences of the Agent, in particular he may be unsure about the β in *equation 2*. If β is high it is very costly for the Agent to produce stability. Thus his joining EMU could undermine performance, e.g. lead to higher inflation, in stage three. The Principal's payoff in stage three, therefore, can be rewritten as follows (assuming $\varnothing = 1$).

$$V(P) = p(\overline{T}_P + \omega E(\beta)) \tag{6}$$

The degree of convergence and stability in stage three depends negatively on the size of β and therefore the Principal has an interest to prevent countries with a high β from joining. Under complete information he would simply set convergence criteria strict enough such that those countries would find it too costly to satisfy them. At the same time the entry barrier must be low enough as not to deter countries with a low β. However, it may not be possible to separate the two groups if the low stability countries have a stronger incentive to join EMU, i.e. a higher $\overline{T}_A$ in *equation 2*, and if the Principal is not allowed to discriminate against particular countries, even if he knows that their entry would jeopardize EMU performance.

If the Principal is not certain about candidate countries' preferences and stability orientation, then high inflation countries may want to imitate the behaviour of low inflation countries in order to gain admission to EMU. Conversely, low inflation countries have an incentive to signal their type, i.e. choose actions that a high inflation country would not want to follow. As shown in Winkler (1995) making entry to EMU conditional on satisfying convergence criteria can be useful to separate out high-inflation countries and prevent them from joining. In this case uncertainty about preferences is resolved ahead of EMU and stage three starts with a good reputation and low inflation expectations. In the event that the two types of countries cannot be separated and both enter EMU, there will be greater uncertainty about what policy the ECB will follow and its reputation will be lower, inflation expectations and interest rates higher. Even in this case the criteria are beneficial, however, since they induce lower inflation in stage two. This is all the more important because in the run-up to EMU reputational incentives diminish for national policymakers. They will face a finite horizon ("endgame problem") after which they will no longer carry responsibility for monetary policy, and therefore can no longer be "punished" for bad behaviour.

The role for stage two of EMU and of the convergence criteria in such a setting is to induce and help candidate countries to convince the Principal and the markets of their stability orientation. Thus the convergence criteria can have an important function with respect to information revelation even if the behaviour they induce seems utterly pointless and destructive, as has been argued by many critics. In a nutshell, candidate countries for EMU play the role of the groom who has to woo a sceptical bride (Principal and financial markets) before the EMU marriage. Conversely, the bride devises a set of tough exams and obstacles in order to convince herself of the groom's serious and honest intentions.

France's dogged adherence to the "franc fort" policy against most economic advice is a prime example of a signalling and reputation building strategy. Similarly the latter day ERM managed to hold together and discipline countries with quite disparate stability traditions, at least until the final reward of EMU (and hence the incentive to converge) was suddenly thrown into doubt with the Danish and French referenda in 1992.

4. Conclusions

The convergence criteria can have an important function with respect to information revelation even if the behaviour they induce seems utterly pointless and destructive.

A major, recurrent criticism of the Maastricht Treaty regards the long "risky" transition period of stage two. Indeed the obvious way to maximize the probability of EMU is to keep the transition phase as short as possible, i.e. proceed to EMU quickly. As the paper points out, however, the transition is there for a reason: (prior) convergence is a condition for the Principal's participation, treaty commitment is necessary to induce and coordinate prior convergence, and behaviour in the transition period may reveal important information. Moreover, if shocks can so easily knock EMU off course in the transition, then perhaps either the economic conditions and the net benefits from EMU or the political commitment are insufficient and therefore it would indeed be unwise to proceed with EMU. Also in these two dimensions the transition is an important testing ground and, while risky, certainly not superfluous.

The paper proposed to interpret the Maastricht Treaty and its convergence criteria as a contract device that seeks to organize the difficult transition to EMU. It does so by determining the authority, timing and procedures for decision making and by providing rules and sanctions for behaviour. The treaty is certainly not a perfect contract and many of its details remain debatable. However, given its difficult and multifold tasks it may well be "perfectly imperfect".

The paper argues that some entry conditions were required to reconcile the interest of the contracting parties. It does not address the issue of whether the particular criteria chosen in Maastricht is necessarily the best possible ones. It is, however, fair to point out that any such criteria would have had to be simple, transparent and non-discriminatory in order to be included in an international treaty.

If countries already in the club co-opt new members, union size could remain inefficiently small and a division of a two-tier Europe could become permanent.

As for the main policy questions, the Waigel proposal for a stability pact has already been discussed. It should strengthen incentives in stage three and may allow a limited trade-off against the entry criteria. We can also use the framework to analyse the prospect of multi-speed EMU, i.e. the option of staggered entry. One crucial question concerns who will decide on entry. If countries already in the club co-opt new members, as assumed in Alesina and Grilli (1993), union size could remain inefficiently small and a division of a two-tier Europe could become permanent. However, the treaty does not give the power of co-optation to the insiders of the EMU club, but allows countries "in derogation" to join once they are eligible. The important point therefore is to maintain sufficient convergence incentives for the "pre-ins" who do not make the first round. In principle, their situation and incentives are unchanged from stage two, except that the penalty of continued exclusion may be even larger and an appropriately designed ERM II should help in maintaining the momentum of convergence. Therefore the risks of a permanent division of Europe can be limited.

On the other hand, the merits of a multi-speed approach are, first, to allow more flexible convergence horizons geared towards individual countries' needs. Second, it helps to minimize uncertainty about EMU performance, in particular as regards candidate countries' willingness and ability to support price stability. A small ECB is more likely to inherit Bundesbank reputation intact and can then build up its own credibility before admitting more "risky" candidates into the club. The central features of the Maastricht Treaty explored in this paper, conditionality paired with a deadline, made a multi-speed EMU if not inevitable, then the most likely outcome.

References:

Alesina, A. and V. Grilli (1993). "On the Feasibility of a One- or Multi-speed European Monetary Union". *Economics and Politics* ,5, pp. 145-159.

Backus, D. and J. Driffill (1985). "Rational Expectations and Policy Credibility Following a Change in Regime". *Review of Economic Studies*, 52, pp. 211-222.

Bini-Smaghi, L., T. Padoa-Schioppa and F. Papadia (1994). "The Transition to EMU in the Maastricht Treaty". *Princeton Essays in International Finance 194.*

Buiter, W.H., G. Corsetti and N. Roubini (1993). "Excessive Deficits: Sense and Nonsense in the Treaty of Maastricht". *Economic Policy*, 16, April, pp. 57-100.

Calvo, G. (1988). "Servicing the Public Debt: The Role of Expectations". *American Economic Review*, 78, pp. 647-661.

De Grauwe, P. (1993). "The Political Economy of Monetary Union in Europe". *The World Economy*, 16, pp. 653-661.

De Grauwe, P. (1994). "Towards European Monetary Union without the EMS". *Economic Policy*, 18, pp. 149-174.

De Grauwe, P. (1995). "The Economics of Convergence Towards Monetary Union in Europe". *CEPR Discussion Paper 1213.*

Eichengreen, B. and C. Wyplosz (1993). "The Unstable EMS". *Brookings Papers on Economic Activity*, 1, pp. 51-143.

Hart, O. and B. Holmström (1987). "The Theory of Contracts". In: Bewley, T.F. (ed.) *Advances in Economic Theory: Fifth World Congress.* Cambridge, Cambridge University Press; pp. 71-155.

Kees, A. (1992). "Maastricht - Vorentscheidung für eine Europäische Währung". In: L. Gramlich, A. Weber and F. Zehetner (eds.) *Auf dem Wege zur Europäischen Währungsunion.* Baden-Baden, Nomos; pp. 19-36.

Milgrom, P. and J. Roberts (1992). *Economics, Organization and Management.* Hemel Hampstead, Harvester Wheatsheaf.

Myerson, R. and M. Satterthwaite (1983). "Efficient Mechanisms for Bilateral Trading". *Journal of Economic Theory*, 28, pp. 265-81.

Obstfeld, M. (1994). "The Logic of Currency Crises". *NBER Working Paper 4640.*

Rogoff, K. (1985). "The Optimal Degree of Commitment to an Intermediate Target". *Quarterly Journal of Economics*, 100, pp. 1169-1189.

Walsh, C. (1995). "Optimal Contracts for Central Bankers". *American Economic Review, 85,* pp. 150-167.

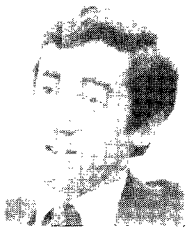
Williamson, O. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications.* New York, Free Press.

Winkler, B. (1995). "Reputation for EMU - An Economic Defence of the Maastricht Criteria". *European University Institute Working Paper ECO 95/18.*

Winkler, B. (1996a). "Towards a Strategic View on EMU - A Critical Survey". *Journal of Public Policy, 16,* pp. 1-28.

Winkler, B. (1996b). "Of Sticks and Carrots - Incentives and the Maastricht Road to EMU". Forthcoming: *European University Institute Working Paper (ECO).*

How to fix conversion rates at the start of EMU



Paul De Grauwe
Professor, Katholieke Universiteit, Leuven, and Member of Parliament

1. Introduction

The problem of how the conversion rates will be determined at the start of the monetary union on January 1, 1999 (assuming that this will be the starting date) is looming larger as we approach that date. The problem is compounded by the fact that the decision concerning membership in EMU should be taken in early 1998, whereas the decision about the conversion rates can only be taken on January 1, 1999. This creates a transition period of uncertainty about the conversion rates and may invite strong and destabilising speculation.

Broadly speaking one can solve this problem in two ways. A first method is to announce the conversion rate at the same moment as the decision on membership is taken (early 1998). The advantage of this approach is that if the market believes this announcement, the transition period will be characterised by stability. The obvious drawback is that in the absence of full credibility the announced conversion rates may be tested by the speculators. As a result, large speculative attacks may destabilise the foreign exchange markets during that period.

The Lamfalussy rule consists in announcing that the conversion rate will be a weighted average of the market rates during a given period before January 1999.

The second method in selecting conversion rates consists in not announcing the conversion rates and letting the market decide. Thus, in this approach the market rate on December 31, 1998 would be the conversion rate on January 1, 1999. This method would also imply an announcement (i.e. that the market will decide), and may thus suffer from credibility (i.e. the market may not believe it). However, this announcement would not invite speculative attacks, because central banks do not have to defend a particular exchange rate. The problem with this method of selecting conversion rates is that the market rates may be volatile and may drift away from their fundamental value during 1998, so that the conversion rate occurs at "mis-aligned" levels.

The two methods just discussed are in fact two extremes among a wide spectrum of intermediate methods. For example, instead of announcing a fixed conversion rate one may announce a rule that will be followed to select the conversion rates. Or moving closer to the market solution one may announce that the market rate will be the conversion rate with the constraint that the market rate must remain between a pre-announced fluctuation band (e.g. the 30% EMS-band).

In this paper we analyse two different methods of deciding about the conversion rates (2). One, which we will call the Lamfalussy rule, consists in announcing that the conversion rate will be a weighted average of the market rates during a given period before

Note: *I am grateful to Filip Abraham, Yunus Aksoy, Claudia Costa, Guido De Bruyne, Hans Dewachter, Chris Hurst, Jon Strand and participants of seminars at the Universities of Leuven and Oslo for their comments.*
2) For a recent analysis of problems relating to the choice of the conversion rates, see Lehment(1996), and SBC Warburg(1996). See also Spaventa(1996) for a more general discussion.

January 1, 1999. We call this the Lamfalussy rule because the president of the European Monetary Institute has been the most prominent personality proposing the use of such a rule.

The second rule that we will analyse is an announcement that the conversion rate will be a fixed rate (e.g. the central rate). We analyse this rule also to contrast it with the Lamfalussy rule. It should be stressed that both rules suffer from a credibility problem. The market may have doubts that the announced rule will effectively be used at the time of the conversion (January 1, 1999). We will, therefore, proceed as follows. We will first formally analyse both rules assuming full credibility. In a second stage we study credibility problems associated with these rules.

2. The Lamfalussy rule

According to the Lamfalussy rule the conversion rate is announced to be a weighted average of the market exchange rates during a period prior to the start of the union. Specifically, Lamfalussy has proposed that the weighted average of the market exchange rates during 1996, 1997 and 1998 should be used to calculate the conversion rates that will apply in 1999. In this section we formalise this rule. One issue that will arise here is to what extent this rule should be applied retroactively.

Let us start from a well-known model of the exchange rate (see Mussa(1976)), which we write as follows:

$$S_t = Z_t + b\, E_t \Delta S_{t+1} \tag{1}$$

where S_t is the exchange rate in period t, Z_t is the vector of exogenous variables that affects the exchange rate. We will call them the fundamental variables. These variables also include political factors that the markets deem to be important to determine the exchange rate in period t; $E_t \Delta S_{t+1}$ is the expectation held in period t about period's t+1 exchange rate. It will be assumed that expectation are formed rationally.

We can also rewrite (1) as follows

$$S_t = 1/(1+b) Z_t + b/(1+b)\, E_t S_{t+1} \tag{2}$$

or

$$S_t = \gamma Z_t + \delta E_t S_{t+1} \tag{3}$$

where $\delta = b/(1+b) < 1$ is the discount parameter with which the future exchange rate is discounted.

We now apply equation (3) to model the exchange rate when it is known that at some final date the exchange rate will be irrevocably fixed using an average of the market rates observed during a period preceding this date. Let us assume that this period extends over three years (3). We can then write

(4) $$S_1 = \gamma Z_1 + \delta E_1 S_2$$

(5) $$S_2 = \gamma Z_2 + \delta E_2 S_3$$

(6) $$S_3 = \gamma Z_3 + \delta E_3 S_4$$

(7) $$S_4 = \alpha_1 S_1 + \alpha_2 S_2 + \alpha_3 S_3$$

where α_i is the weight given to the market exchange rate of period i, and $\Sigma \alpha_i = 1$.
We now solve the model consisting of equations (4) - (7) for S_1 using the rational expectations assumption. Thus, here we ask the question what the exchange rate would be if the Lamfalussy rule were announced and implemented in period 1. (In a second stage we will analyse the question of how the exchange rate is affected if the rule is announced in a given period (say period 2) and applied retroactively (from period 1 to 3)).
Repeated forward substitution of the expectational terms allows us to solve for S_1 (4). This yields:

(8) $$S_1 = \gamma \Omega_1 Z_1 + \gamma \delta \Omega_2 E_1 Z_2 + \gamma \delta^2 \Omega_3 E_1 Z_3$$

where

(9) $$\Omega_1 = \frac{1 - (\alpha_3 \delta + \alpha_2 \delta^2)}{1 - (\alpha_3 \delta + \alpha_2 \delta^2 + \alpha_1 \delta^3)} > 1$$

(10) $$\Omega_2 = \frac{1 - \alpha_3 \delta}{1 - (\alpha_3 \delta + \alpha_2 \delta^2 + \alpha_1 \delta^3)} > 1$$

(11) $$\Omega_3 = \frac{1}{1 - (\alpha_3 \delta + \alpha_2 \delta^2 + \alpha_1 \delta^3)} > 1$$

From (8) we observe that S_1 depends on the fundamentals expected during the transition period (up to period 3). The interesting aspect of this solution is that the fundamen-

3) Lamfalussy has proposed that the 1999 conversion rate should be an average over the three preceding years. Presumably this would be formulated as a daily average over three years. Here we consider one period of time to be a year. The analysis will be extended to the case where the unit of time is a day (see section 4).
4) Solving the system (4)-(7) requires an infinite amount of iterations despite the fact that there is a final date after which the fundamentals play no role anymore. This is due to the fact that each time the final date (time 4) is reached, the Lamfalussy rule "throws back" expectations to the past. This produces an "echo-effect" that continues ad infinitum but dies down at each round.

tal variables are multiplied by factors whose values exceed 1. In order to understand the origin of this multiplier effect that arises when the Lamfalussy rule is applied, it is useful to compare the solution (8) with the solution one would obtain if the exchange rate were freely floating (5). We then obtain for S_1

$$S_1 = \gamma Z_1 + \gamma\delta E_1 Z_2 + \gamma\delta^2 E_1 Z_3 + \gamma \sum_{i=3}^{\infty} \delta^i E_1 Z_{i+1} \tag{12}$$

Each time a shock occurs this changes the expected conversion rate, and "throws back" expectations to the starting point. We can compare this process to an echo-effect, where the conversion rate acts as a reflecting barrier.

In the floating exchange rate regime all the fundamental variables are multiplied by the coefficients $\gamma(< 1)$ and the discount factor δ (< 1), so that $\gamma\delta < 1$. In addition, in a floating exchange rate environment the expected fundamentals beyond period 3 also play a role in determining the current exchange rate. Note, however, that as the future recedes, the weights given to the future fundamentals progressively decline ($\gamma\delta^i > \gamma\delta^{i+1}$).

We can now contrast the exchange rate under the Lamfalussy rule with this free floating exchange rate. First, the fundamentals during the transition period (periods 1 to 3) have an amplified effect on the current exchange rate compared to the free floating regime. The amplification effects are measured by the terms Ω_i which all exceed 1. Second, these amplification effects increase for fundamentals farther away in the future, i.e. $\Omega_3 > \Omega_2 > \Omega_1$. The result is that the effect of the fundamentals farther in the future exceeds the effect of the fundamentals closer to the present. It can be shown that this result is independent of the discount factor, i.e.

$$\gamma\delta^2\Omega_3 > \gamma\delta\Omega_2 > \gamma\Omega_1$$

This contrasts very much with the freely floating exchange rate solution. Where do these differences come from?

The amplification effect can be explained as follows. (It can be useful to look at the structure of the model as presented in equations (4) to (7)). Suppose new information arrives changing agents' expectations about Z_3. Through the rational expectations process this affects the current exchange rate S_1 and all the other periods' expected exchange rates (S_2 and S_3). This can be called the direct effect, which we also find in the free floating model. The changes in all these (expected) exchange rates, however, affect the expected conversion rate S_4 which is a weighted average of these exchange rates. This in turn changes the expected exchange rate in period 3, and therefore also all the preceding ones, which changes the expected conversion rate again. This process goes on ad infinitum. It converges, however, because of the discounting factor. Put differently, each time a shock occurs in an expected fundamental variable Z_t this changes the expected

5) This is not the only regime with which the Lamfalussy rule should be compared. In a later section we compare the Lamfalussy regime with a regime where a fixed conversion rate is announced beforehand.

conversion rate, and "throws back" expectations to the starting point. We can compare this process to an echo-effect, where the conversion rate acts as a reflecting barrier against which expectations (the sound) are bounced back.

It can now also be understood why this echo-effect is stronger when a shock occurs in Z_3 (close to the reflecting barrier) than when it occurs in Z_2. In the latter case the shock does not affect S_3 in the first round, so that the effect on the conversion rate is less strong.

The amplification (echo-) effect implicit in the Lamfalussy regime has the important implication that unexpected changes in one of the fundamentals (news) during the first period (the announcement period) will produce more variability of the current exchange rate than compared to the freely floating regime. For example, if because of new information agents change their expectations of Z_3, the impact on S_1 becomes

(13) $$\Delta S_1 = \gamma\delta^2\Omega_3\Delta E_1 Z_3$$

this compares with the change in the exchange rate under a free float which is

(14) $$\Delta S_1 = \gamma\delta^2\Delta E_1 Z_3$$

How important are these differences quantitatively? From an inspection of the amplification terms Ω_i one can see that the additional variability in the Lamfalussy regime can be quite substantial. For example, if we set the weights $\alpha_i = 0.333$, and the discount factor $\delta = 0.9$, we find

$$\Omega_1 = 2.3$$
$$\Omega_2 = 3.7$$
$$\Omega_3 = 5.3$$

We conclude that the amplification effects are likely to be substantial, adding a lot of volatility in the exchange rate in period 1 when news occurs about one of the underlying fundamentals.

The previous discussion makes clear that the use of the Lamfalussy rule to determine the conversion rates is likely to make the exchange rates quite volatile during the run-up to monetary union. This volatility can be mitigated, however, by starting the application of the rule by surprise, i.e. by announcing that the rule will apply retroactively. If this can be done successfully, one can hope that the volatility of the exchange rate will be mitigated by the very fact that a part of the current exchange rate developments will be influenced by the past, and known, exchange rate trends. We, therefore, now analyse

the application of the Lamfalussy rule, assuming that this is done retroactively. In order to analyse this regime we return to equations (4) to (7). We now call period 2 the present (current) period. Therefore, period 1 is the past, and period 3 and 4 are the future periods. Everything that has happened in period 1 is known with certainty. We now solve for the exchange rate in period 2 (S_2). The solution can be written as follows:

(15) $$S_2 = \gamma\Psi_2 Z_2 + \gamma\delta\Psi_3 E_2 Z_3 + \alpha_1\delta^2\Psi_3 S_1$$

where

(16) $$\Psi_2 = \frac{1 - \alpha_3\delta}{1 - (\alpha_3\delta + \alpha_2\delta^2)} > 1$$

(17) $$\Psi_3 = \frac{1}{1 - (\alpha_3\delta + \alpha_2\delta^2)} > 1$$

We find that the amplification effects, which we now measure by the expressions Ψ_2 and Ψ_3, are smaller than the corresponding amplification effects when the rule is applied without retroactive force (equation 8). Nevertheless, the amplification effect remains large. Using the same numerical example as before ($\alpha_3 = 0.33$ and $\delta = 0.9$) we find that

$$\Psi_2 = 1.6 \text{ and } \Psi_3 = 2.3.$$

Thus, even in the retro-active application of the rule the current and future fundamentals are likely to have a significant effect on the current exchange rate. In section 4 we return to this issue when we simulate the rule using days as our unit of time.

3. Announcing a fixed conversion rate

An alternative to the Lamfalussy rule consists in announcing a fixed exchange rate (the central rate, or any other fixed number) as the future conversion rate. If this announcement is perfectly credible (we come back to the issue of credibility later) the solution for the exchange rate in period 1 can easily be found from equations (4) to (7) and from setting

(7') $$S_4 = S^*$$

where S^* is the announced fixed conversion rate.

The solution for S_1 can then be written as follows

(18) $$S_1 = \gamma Z_1 + \gamma\delta E_1 Z_2 + \gamma\delta^2 E_1 Z_3 + \delta^3 S^*$$

As can be seen, the exchange rate solution does not suffer from the amplification effect found in the Lamfalussy rule. In addition, as we come closer to the conversion time, the variability of the exchange rate must necessarily decline. For example in period 2 we have

(19) $$S_2 = \gamma Z_2 + \gamma\delta E_2 Z_3 + \delta^2 S^*$$

and

(20) $$S_3 = \gamma Z_3 + \delta S^*$$

It is useful to point out here that the Lamfalussy rule where the weight on past observations is set equal to 1 and on the present and future observations equal to zero is equivalent to the fixed conversion rate rule. For example, use equation (15) and set $\alpha_1 = 1$, $\alpha_2 = \alpha_3 = 0$. This yields equation (19).

4. A simulation exercise

During the first half of the period, the Lamfalussy rule produces significantly more daily volatility compared to the free floating regime.

The analysis of the previous sections can be complemented by simulating the two regimes for choosing the conversion rates. We proceed as follows. Instead of defining three periods, we now apply the analysis to daily observations. We consider 400 days. Each day "news" arrives in the market changing the current and future expected fundamentals. The news is modelled as a "white noise" stochastic process. This process was scaled such that the exchange rates always remain within the ERM band of free fluctuation of 30%. The weights α_i are redefined as daily weights. Given that there are 400 days, $\alpha_i = 1/400$. The *yearly* discount rate is assumed to be 10% (yearly discount factor = 0.9)

We first apply the exercise to announcing the Lamfalussy rule without retroactivity. Thus, the authorities announce that the conversion rate which will be used at the start of EMU, will be the average of the market rates starting at the moment of the announcement. We simulated this rule (using equation (8) reinterpreted to hold for 400 days) and compared these simulations with a system of free floating (equation (13)). We show a few representative examples of such simulations in figure 1 and 2.

We observe the following. During the first half of the period, the Lamfalussy rule produces significantly more daily volatility compared to the free floating regime. In approximately the middle of the sample period the volatility under the Lamfalussy rule declines relative to the volatility of the free float regime. At the end of the period, the Lamfalussy rule produces a smooth convergence towards the announced conversion rate (the moving average). This has to do with the fact that as we approach the conversion period, the relative importance of shocks in the fundamentals in influencing the exchange rate declines, whereas the importance of the average of the past exchange rates increases.

Since there is no surprise about these past exchange rates anymore, the exchange rate is increasingly stabilised and smoothly converges towards the announced conversion rate at the time of the conversion.

We document the differences in volatility in the two regimes (free float and the Lamfalussy rule) in the following table 1. This shows the mean of the standard deviation of the exchange rate under the two regimes for different sub-periods in 100 different simulations. We observe that during the first 200 days of the application of the Lamfalussy rule the volatility of the exchange rate is considerably higher than under a regime of freely flexible exchange rate. This has to do with the amplification effect described in the previous section. In the second period, however, the use of the Lamfalussy rule significantly reduces volatility.

Table 1. *Mean of standard deviations of simulated exchange rate (100 simulations)*

period 1- 200		*period 201-400*	
Floating	Lamfalussy	Floating	Lamfalussy
1.4	2.2	1.4	0.6

Figure 1. Lamfalussy rule and floating rates compared

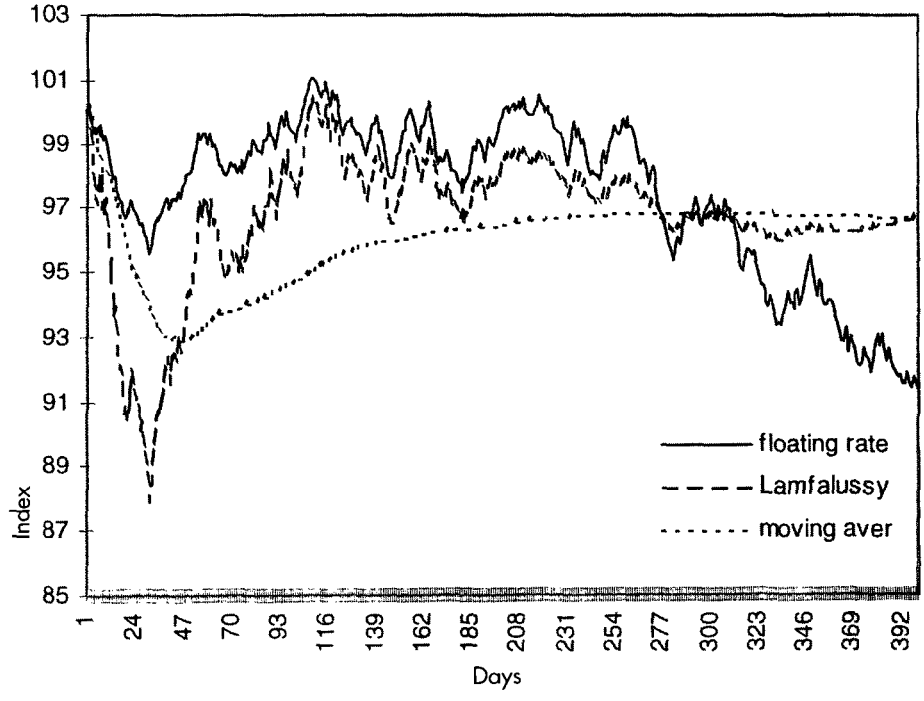
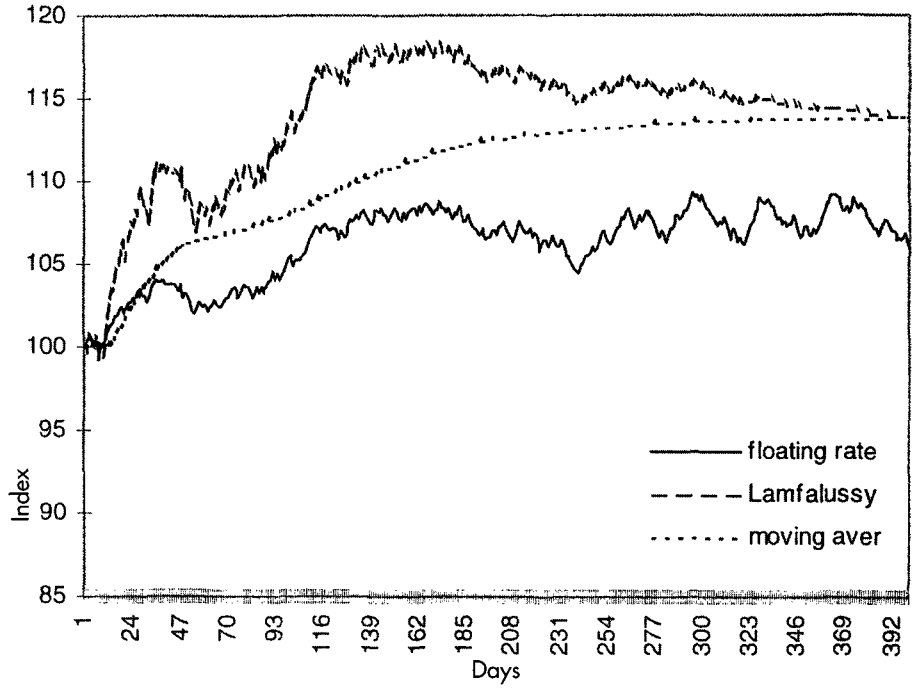


Figure 2. Lamfalussy rule and floating rates compared



A second observation one can make from figures 1 and 2 is that the application of the Lamfalussy rule can produce drift in the exchange rate which exceeds the drift obtained in the free floating regime. Figure 2 illustrates this. This has to do with the fact that in the early phase of the application of the rule the excess volatility is built into the averaging formula, producing extra drift. Note that this result does not always hold. It depends on the exact sequence of the stochastic shocks driving the exchange rate. We come back to this problem of drift later.

From the preceding discussion we conclude that the application of the Lamfalussy rule without retro-activity has great disadvantages. The results also suggest, however, that the rule has stabilising properties, but that these appear only during the second half of the simulation period. This suggests that the rule should be applied with retro-active force. (In fact, Lamfalussy has proposed to use this rule retroactively). We, therefore, analyse the stabilising properties of the rule when it is applied retroactively. We implement the rule as follows. On day 201 *the authorities announce that the conversion rate will be* the daily average of the 400 days prior to conversion time. Thus, at the moment of the announcement 200 observations needed to compute the future conversion rate have already passed and are, therefore, in the information set of the economic agents. We make the assumption that economic agents did not expect this announcement, so that the latter arrives as a complete surprise.

In order to evaluate the stabilising properties of the retroactive Lamfalussy rule we will compare it with the other rule analysed earlier. In this second rule, the authorities announce on day 201 that the conversion rate will be the (fixed) central rate. In both cases we assume that the economic agents have full confidence that this rule will be applied at conversion time. Thus, the degree of credibility is 100% in both cases.

We show some representative samples of the simulated exchange rate in figures 3-6. The simulations have been run in such a way that during the first 200 periods, when no rule is applied and agents are unaware that a rule might be applied later, the exchange rate is driven by the same stochastic shocks in both regimes.

The results have the following interpretation. The stabilising properties of both rules are comparable. However, a more formal inspection of the volatility of the exchange rate (from day 201 on) reveals that the fixed-convergence-rate-rule produces less volatility. This is shown in table 2 where we present the mean of the standard deviations of the exchange rate in 100 simulations of the two rules. We also computed another measure of volatility, i.e. the root mean squared deviation between the simulated exchange rate and the announced conversion rate.

Table 2. Measures of volatility of the simulated exchange rate

Lamfalussy rule		Fixed conversion rate rule	
standard deviation	root mean squared error	standard deviation	root mean squared error
0.81	1.35	0.57	0.84

We find that the Lamfalussy rule leads to volatility which is approximately 50% higher than the fixed conversion rate rule.

A second observation one can make from the results of figures 3 to 6 is that the Lamfalussy rule, even when applied retroactively, can still produce a lot of drift. This is made clear in figure 5. This feature is likely to lead to the need for applying wide bands of fluctuations. We pursued this question further by comparing a larger number of simulations of both rules. This is done in figures 7 and 8, where we present 20 simulations of both rules. We observe that the use of the Lamfalussy rule leads to a situation in which the conversion rate used at conversion time lies in a relatively wide band. This suggests that the Lamfalussy rule will have to be accompanied by the use of wide bands of fluctuation. This is not the case with the fixed conversion rate. In this case the exchange rate always converges smoothly towards the unique fixed conversion rate. Thus, the fixed-

conversion-rate-rule could be implemented together with a gradual narrowing of the band of fluctuations.

A third observation to be made from the results is the following. Both regimes lead to jumps at the moment of the announcement of the conversion rule. This is not really surprising since the announcement is unexpected, and like any "news", leads to a jump in the current exchange rate. There are differences in the nature of the jump in the two regimes, however. In the case of the fixed conversion rule, the jump is always towards the central rate. This result is due to the fact that when the exchange rate has drifted away from its central rate (normalised at 100) prior to the announcement, the announcement (assumed to be fully credible) forces the exchange rate on a path close enough to the central rate so that it can reach the central rate on conversion time in a smooth way (i.e. without a jump). This result is similar to the "smooth pasting" condition obtained in target zone models (Krugman(1991), Bertola and Svensson(1993)).

The market exchange rate is on a downward trend, whereas the average of past exchange rates is still moving up. The average of the past exchange rates suddenly becomes a determinant of the market exchange rate and forces a large upwards adjustment.

In the case of the Lamfalussy rule, jumps occur in both directions, depending on where the market rate is situated relative to the moving average of the past exchange rates. We show an example of such a jump after the announcement of the Lamfalussy rule in figure 9. At the moment of the announcement, the market exchange rate is on a downward trend, whereas the average of the past exchange rates is still moving up. The average of the past exchange rates suddenly becomes a determinant of the market exchange rate (it was not before), and therefore forces the market rate to make a large upwards adjustment so as to move on a path that will allow for a convergence towards the moving average of the exchange rates. In figure 10 we show the simulation of the fixed-conversion-rate-rule assuming the same underlying disturbances in the fundamentals. The contrast in the direction of the jump is striking.

It should be stressed that jumps are not always as pronounced as in figure 9. In order to find out how prevalent these large jumps are we made 100 different simulations of the Lamfalussy rule and found that in 30 cases the jump (positive of negative) exceeded 2%.

We conclude that the use of the Lamfalussy rule can create significant and quite unexpected turbulence in the market at the moment of its announcement. This is certainly an unattractive feature of the Lamfalussy rule. The fact that, at the moment of the announcement, the exchange rate may be forced to make a relatively large jump because the past moving average of the exchange rate (an artificial construct) has been moving in a direction unrelated to current trends creates artificial turbulence in the market. This problem of the Lamfalussy rule is also made clear in figure 8 which shows the results of 20 different simulation. We observe that after the announcement the spread of the exchange rates actually increases.

Figure 3. Lamfalussy rule (from day 201 on)

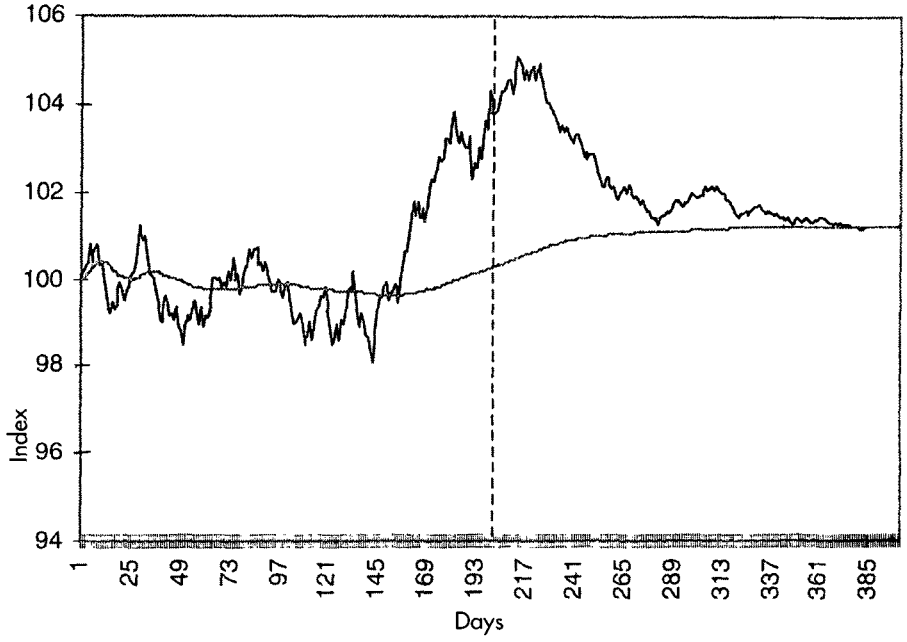


Figure 4. Fixed conversion rate (from period 201 on)

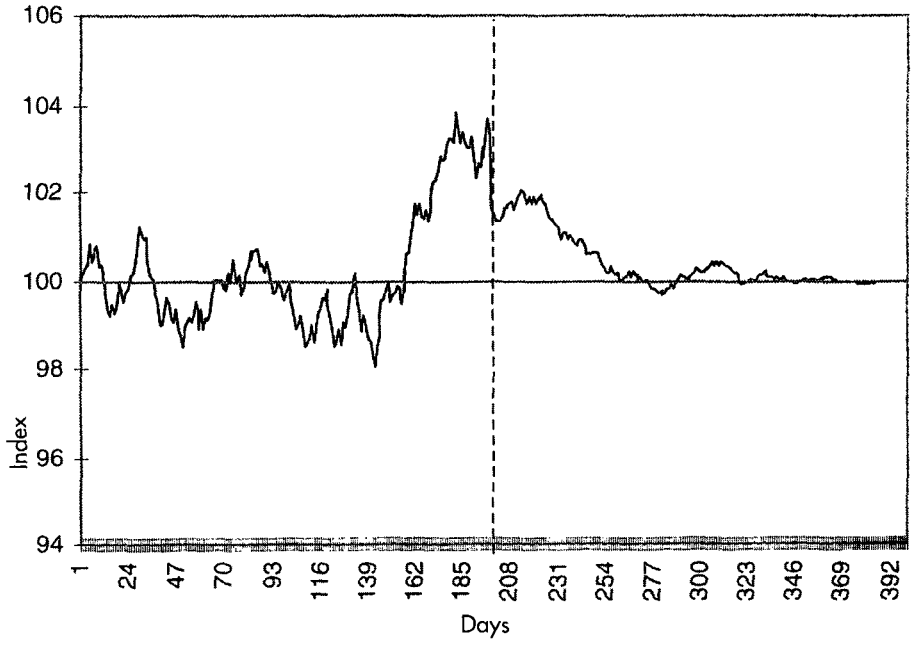


Figure 5. Lamfalussy rule (from day 201 on)

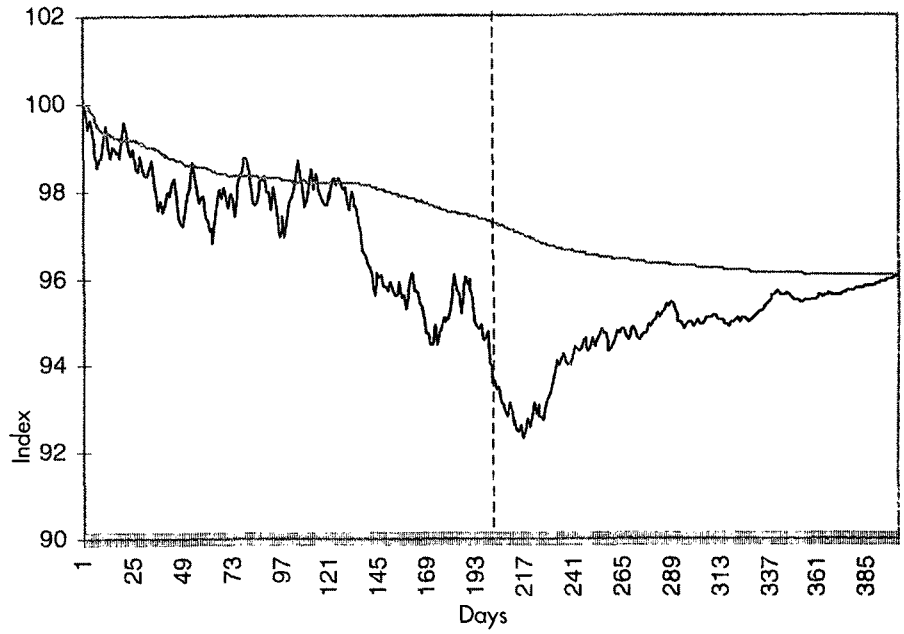


Figure 6. Fixed conversion rate (from period 201 on)

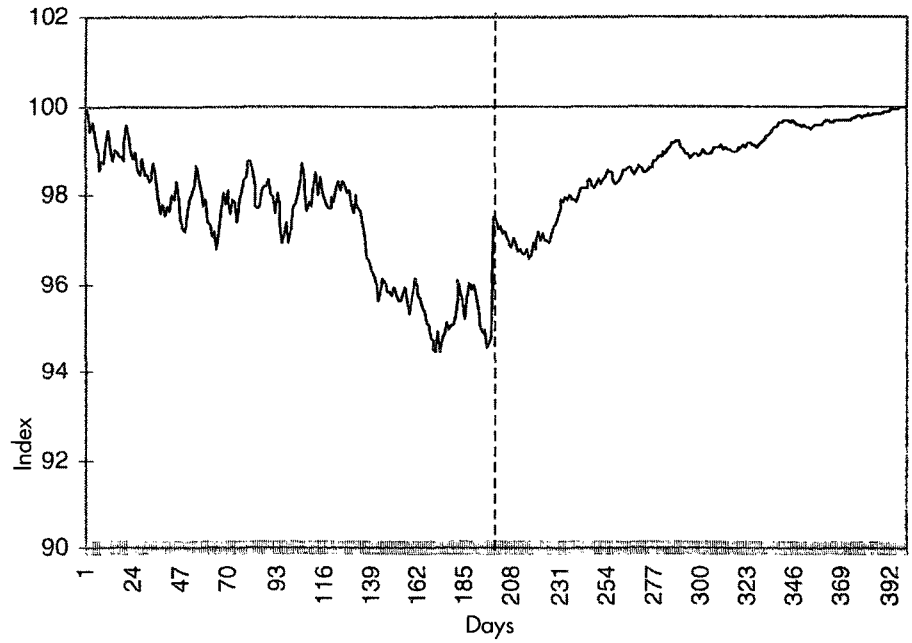


Figure 7. Fixed conversion rate rule (from day 201 on)

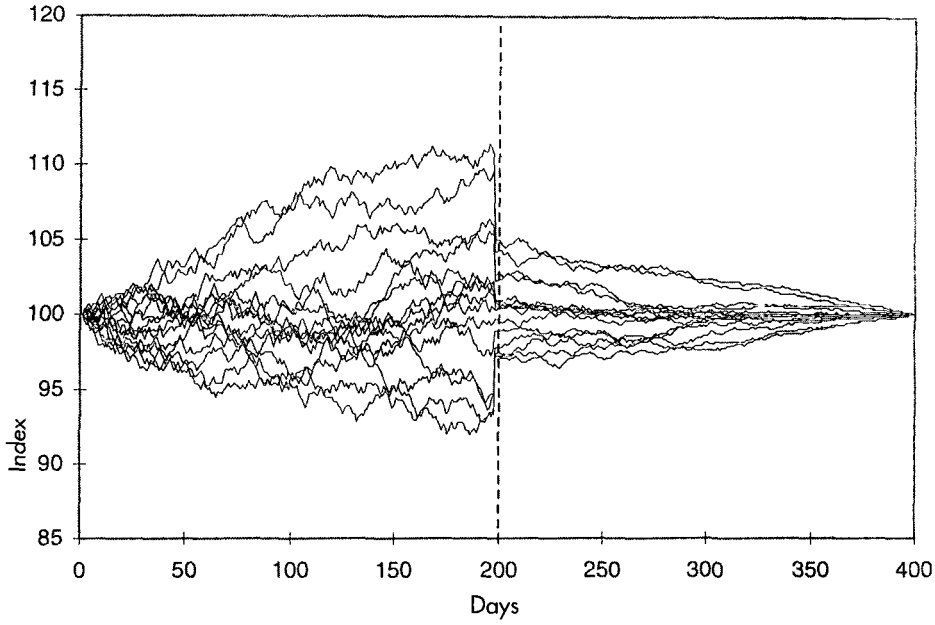


Figure 8. Lamfalussy rule (from day 201 on)

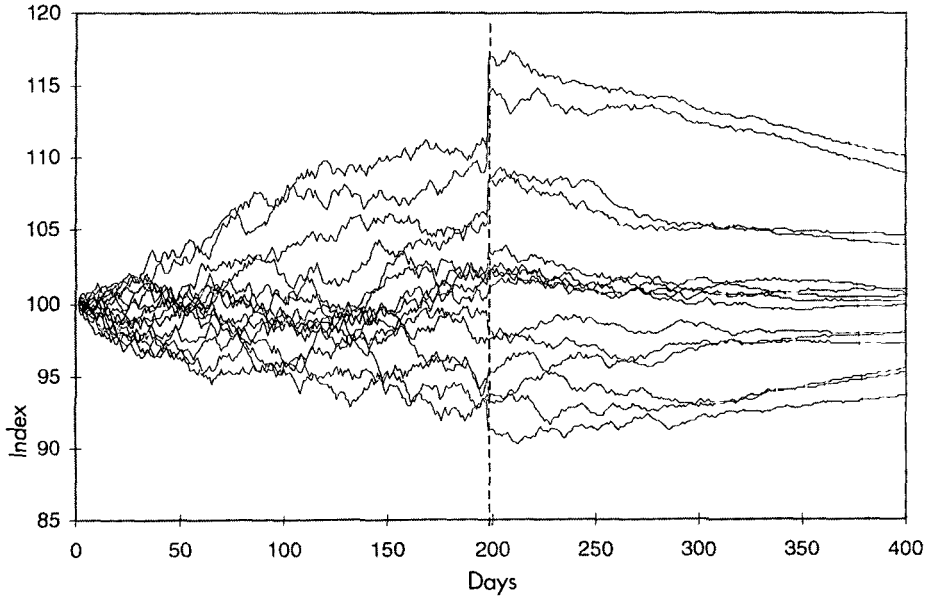


Figure 9. Lamfalussy rule (from day 201 on)

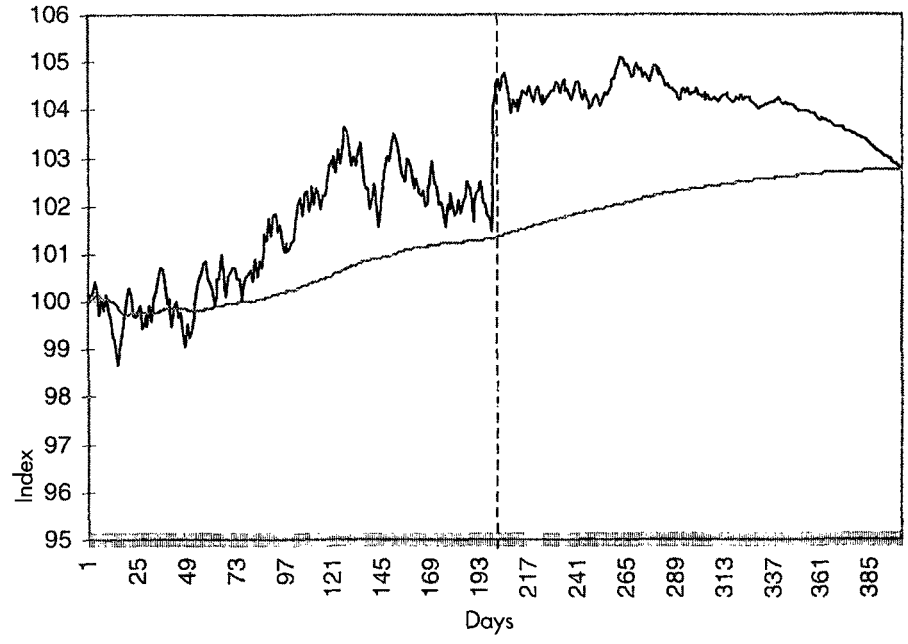
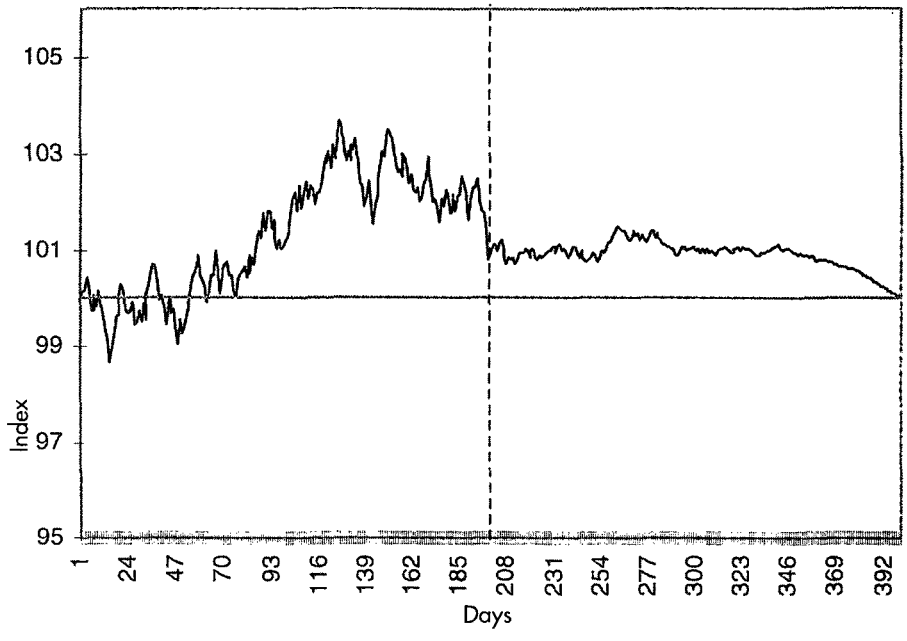


Figure 10. Fixed conversion rate (from period 201 on)



5. Credible and non-credible rules

In the previous sections we discussed two rules to fix the conversion rates assuming that the announcement of the rules is fully credible. One of the interesting aspects of the results is that the jumps in the exchange rate observed at the moment of the announcement of the rules occur because these announced rules are fully credible, i.e. because the market is 100% sure that the rules will be implemented. In this section we contrast these results with the results obtained when the rules are not credible. We concentrate the analysis on the Lamfalussy rule.

Let us assume that the authorities announce the Lamfalussy rule but that the market gives this announcement a 0% credibility (i.e. it does not believe the rule will be implemented). In that case the rule has no influence on the market exchange rate. (We continue to assume that the market believes that monetary union will start at the end of the simulation period). The market exchange rate is then simply the free float solution, whereby speculators believe that the market exchange rate will be used as the conversion rate. We contrast the two regimes (fully credible and non-credible Lamfalussy rule) in figures 11 and 12, where we present 20 simulations of the two regimes assuming the same shocks in the underlying fundamentals. We observe (not surprisingly) that no jumps occur in the exchange rate at the moment of the announcement when the announcement has no credibility. When the announcement is fully credible, jumps occur frequently. As a result, at the moment of the announcement, turbulence in the market is in fact greater than under the free float (zero credibility) regime.

We also observe that at conversion time (day 400) the success of the fully credible Lamfalussy rule to narrow the spread of the exchange rates is limited. At conversion time the difference between the lowest and the highest exchange rate amounts to approximately 10% (while it is 15% in the free float regime). This does not appear to be a large gain given that the start of the Lamfalussy regime is likely to be quite turbulent.

In reality credibility is rarely 100% or 0%. It is more likely that the credibility of the announced rule lies somewhere between these two extremes. As a result, the movements of the exchange rates will lie between the two extremes shown in figure 11 and 12. As we move from 100% credibility towards less credibility the jumps at the moment of the announcement, and therefore, turbulence, will tend to decline at the cost, however, of more turbulence later.

Figure 11. Lamfalussy rule

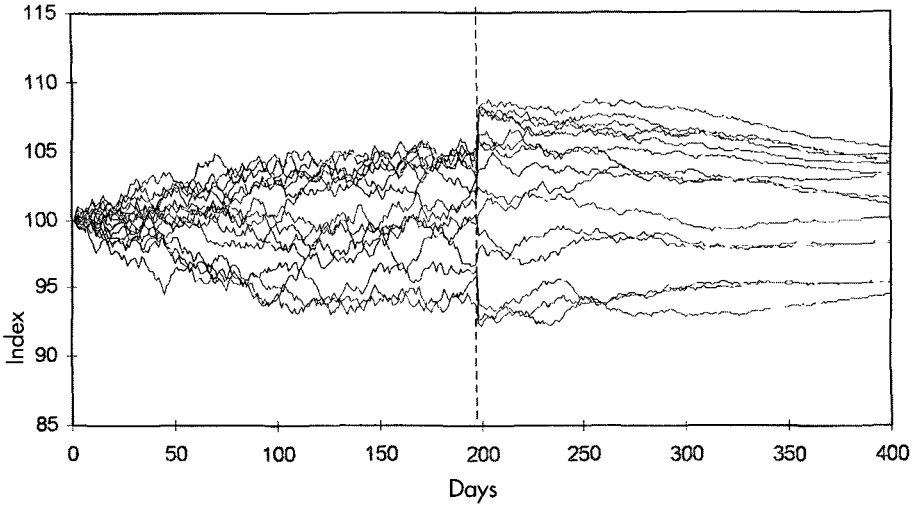
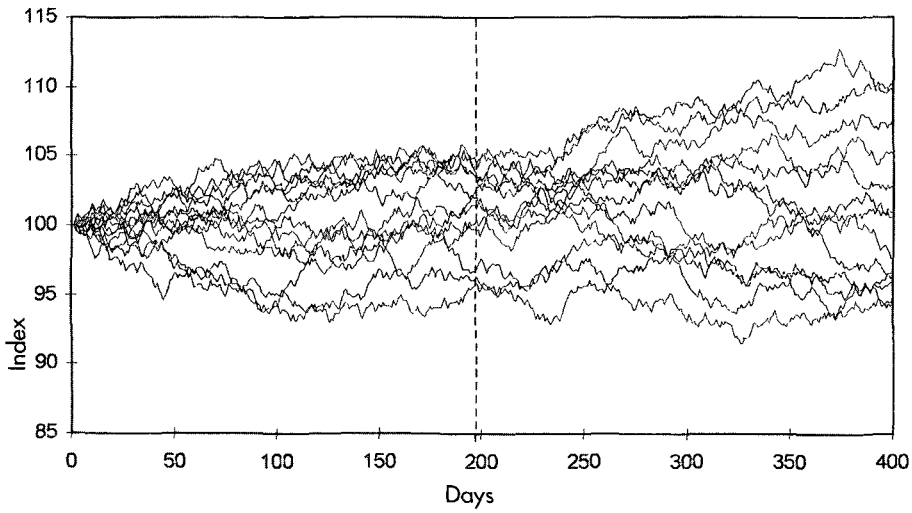


Figure 12. Free float



6. Expected announcement

In the previous analysis we have assumed that at the moment of the announcement of how the conversion rates will be fixed, this announcement comes as a complete surprise. Put differently, we assumed that prior to the announcement the market was unaware that such an announcement would be made. This is quite an artificial assumption. The reason is that when in early 1998 a decision about EMU-membership will be made the authorities have to make some announcement: either an announcement will be made about

how the conversion rates will be fixed (e.g. a fixed conversion rate or a rule like the Lamfalussy rule), or no such announcement will be made. Therefore, before 1998, the market will attach some probability that some announcement will be made. Thus, the announcement can never come as a complete surprise. This may then affect the dynamics of the exchange rate changes when the announcement is made.

In order to analyse this problem, we proceeded as follows. We assumed that prior to day 201, the market attaches equal probabilities that the following announcements are made:

- The authorities announce fixed conversion rates (the central rates)
- The authorities announce the Lamfalussy rule with retroactive force
- The authorities announce that the market exchange rate will be the conversion rate.

Clearly, other possibilities exist (e.g. no announcement at all). In order to make the analysis tractable, we limit the number of possible announcements.

The way we solve the model is as follows. For each expected announcement we have a solution for the exchange rate. When the market expects that the Lamfalussy rule will be followed the solution is given by equation (8); when it expects the fixed conversion rate the solution is given by (18), and when it expects that the market rate will be the conversion rate the solutions is given by (12). Prior to day 201, the market attaches the same probability to these three announcements. Therefore, the solution is a simple average of these three equations (given that we assume equal probabilities). From day 201, the solution is given by either one of these three equations depending on which announcement is made. We show simulations of the Lamfalussy rule and the fixed conversion rate rule in figures 13 and 14. In both cases we have assumed, as before, that the underlying stochastic disturbances are the same. We observe that the properties are very similar to those reported in figures 7 and 8. In both cases the exchange rate jumps at the moment of the announcement. These jumps, however, have become somewhat smaller under the Lamafalussy rule, although the difference is rather small. The same can be said about the fixed conversion rate rule. Clearly, our assumption about the probability distribution of the different announcements allows for a significant portion of surprise. The other results noted earlier are also found here, i.e. the jumps under the Lamfalussy rule are frequently away from the central rate. This contrasts with the regime of a fixed conversion rate. Finally, we find a lot of drift in the exchange rate under the Lamfalussy rule.

Figure 13. Fixed conversion rate rule (announcements expected)

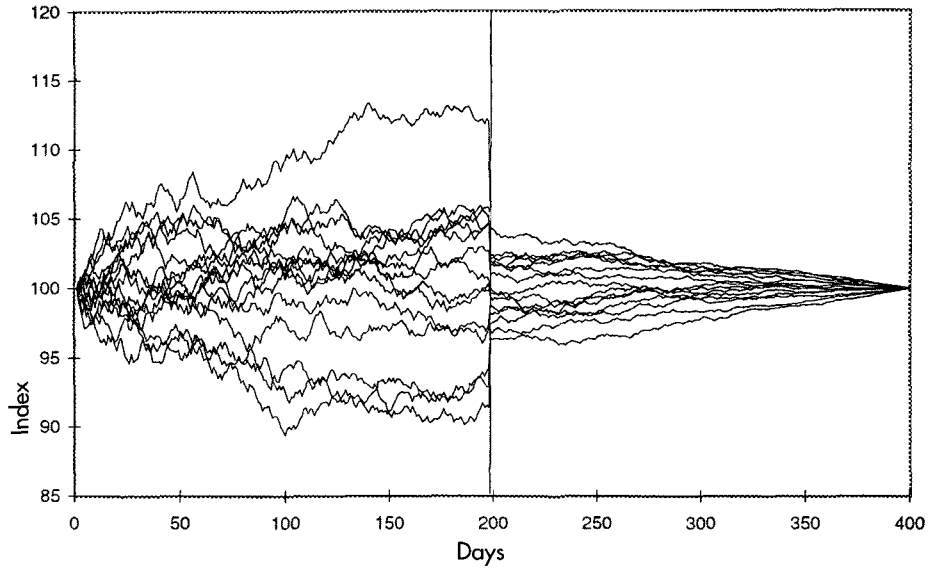
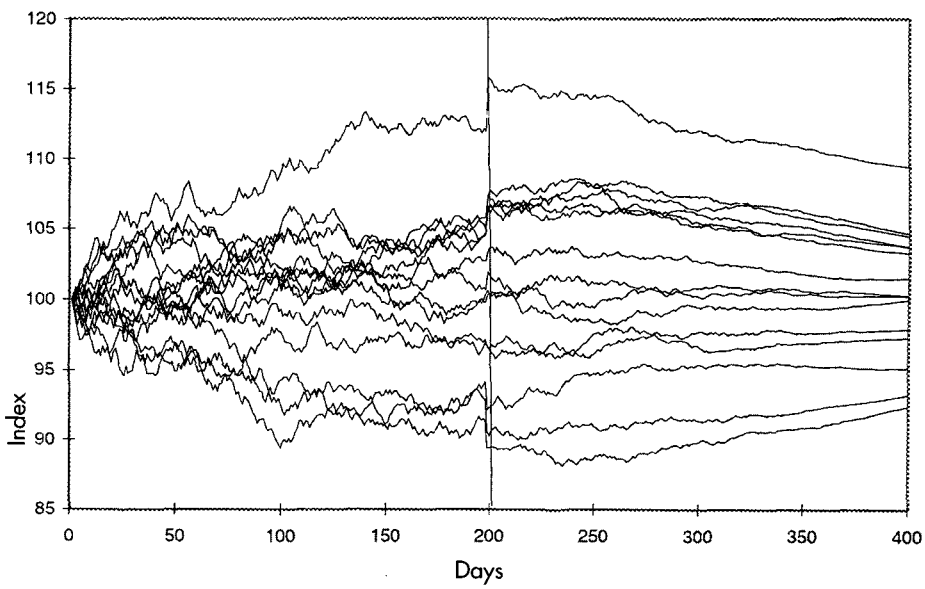


Figure 14. Lamfalussy rule (announcements expected)



7. Conclusion: Issues of credibility

The problem of choosing conversion rates arises from a trade-off between stability and credibility. Announcing a fixed conversion rate only produces stability if it is fully credible. Not announcing a conversion rate (or a conversion rule) solves the credibility problem at the cost of volatility. The proposals to tie the conversion rate to an average of past exchange rates are inspired by the need to find a compromise between stability and credibility.

We have argued that the Lamfalussy rule produces more problems than it solves. It will lead to quite unpredictable volatility at the moment of its announcement. In addition, it leads to substantial drift in the exchange rate after the announcement, so that a large amount of uncertainty will continue to exist about the precise value of the conversion rates at the start of EMU. This will also necessitate the use of relatively large bands of fluctuation until the start of the monetary union.

The Lamfalussy rule produces more problems than it solves. It will lead to quite unpredictable volatility at the moment of its announcement and it leads to substantial drift in the exchange rate after the announcement.

Against this view, it could be argued that the Lamfalussy rule is inherently more credible than a fixed conversion rate rule because it permits drift in the exchange rate in response to changes in fundamental variables. Experience, however, suggests that much of the drift in the exchange rates is not related to fundamentals but to chartist behavior and technical analysis. As a result, an averaging rule may produce a lot of artificial drift. It is then not obvious a-priori that the Lamfalussy rule is inherently more credible than a fixed conversion rate rule. We conclude that the "compromise" that the Lamfalussy rule appears to be is no serious alternative. We are back at square one: the choice between a fixed conversion rate announced at the same moment of the decision about membership, or no announcement at all.

The analysis of this paper allows us to formulate some qualitative judgements about this choice.

The announcement of the fixed conversion rates has potentially great advantages. If it can be made credible, it allows for a smooth transition from the market exchange rates into the irrevocably fixed exchange rates. This is due to the fact that, if credible, the announced fixed convergence rates will force the market rates into an increasingly narrow band of fluctuation, which becomes "infinitely" small at conversion time. (We have called this the "smooth-pasting" condition of a fully credible announced conversion rate). Thus, the potential advantages of such a regime are large. The question then is how such an announcement can be made credible so that it can produce its benefits?

In general, the answer is that a commitment technology should be set in place at the moment of the announcement, so that the market firmly believes in the authorities' com-

mitment to the set of fixed conversion rates. As a minimum, it should be agreed that the conversion rates cannot be changed except by unanimity. This will eliminate the temptation of individual members to engineer a "last devaluation". (It should be stressed that this is already foreseen in the Maastricht Treaty which stipulates that the decisions about the conversion rates shall be made by unanimity, (see art. 1091)).

A commitment technology should be set in place at the moment of the announcement, so that the market firmly believes in the set of fixed conversion rates.

A second element in this commitment technology can be called "institutional front-loading", i.e. at the moment of the announcement, some institutional changes that would normally only be implemented on January 1, 1999 should be put into practice. Thus, monetary policies of the countries accepted in EMU should already be decided upon jointly during 1998. Another part of this commitment technology consists in declaring that each participating central bank will supply its own money in unlimited amounts in exchange for the currency under pressure. At the same time the participating central banks make a commitment to target the money stock for the area as a whole. Such a solemn declaration, if credible, can beat back any amount of speculation for the simple reason that central banks that support another currency can create unlimited amounts of their own currency to be sold in the market. Once this is known by speculators, they will not find it worthwhile to undertake a speculative attack (6). At the same time, speculators know that the targeting of the money stock of the whole area makes sure that the intervention activities do not affect the global money stock since one currency is sold in exchange of another one.

If the countries accepted into EMU fail to set up such (or a similar) commitment technology they will take a risk. In that case it will be necessary to allow for a sufficient amount of flexibility in the exchange rates. The existing 2x15% fluctuation margin should then be maintained so as to absorb speculative shocks that may arise. The authorities can strengthen the stability of this fluctuation margin by declaring that the central rates will be the conversion rates. Even if the speculators do not fully believe this (because of the absence of a commitment technology), there would be sufficient uncertainty about this, so that large deviations of the exchange rates from the central rates would create a high risk of large losses for those speculators betting against a currency. This would help to stabilise the exchange rate within the band.

6) See Obstfeld(1995) on this issue.

References

Bertola, G. and Svensson, L. (1993). "Stochastic Devaluation Risk and the Empirical fit of Target zone Models". *Review of Economic Studies*, 60, pp. 689-712.

Krugman, P. (1991). "Target Zones and Exchange Rate Dynamics". *Quarterly Journal of Economics*, 106, pp. 669-82.

Lehment, H. (1996). "Wie sollen die Wechselkurse in der Europäischen Währungsunion festgelegt werden?". *Die Weltwirtschaft*, Heft 1, pp. 61-69.

Mussa, M. (1976). "The Exchange Rate, the Balance of Payments and Monetary and Fiscal Policies under a Regime of Controlled Floating". *Scandinavian Journal of Economics*, 78 (2), pp. 229-48.

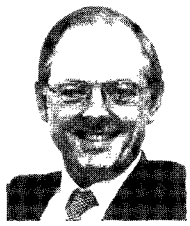
Obstfeld, M. (1995). "Models of Currency Crises with Self-fulfilling Features". NBER Working paper, No. 5285.

Spaventa, L. (1996). "Out in the Cold? Outsiders and Insiders in 1999: Feasible and Unfeasible Options". *Quarterly Review*, Banca Nazionale del Lavoro, Special Issue, pp.122-137.

Warburg, SBC (1996). "Pre-announced Rules for Euro Conversion Rates?". *Foreign Exchange*.

A proposal to stabilise the value of the ECU

Luis Gonzalez-Pacheco,
Senior Economist, Chief Economist's Department



Alfred Steinherr
Chief economist

1. Introduction

ECU-denominated financial instruments have achieved an unexpected success - at least until 1992. Although not supported by any Central Bank or Government, and only launched in 1981, ECU eurobond transactions ranked among the top 5 currencies in the early 1990s. One perceived advantage during the 1980s was that the basket definition of the ECU provided a cost-effective diversification. A second attraction of the ECU which assumed its importance only by the end of the 1980s, was EMU and, with it, conversion of ECU into Euro.

From 1990, the spread which appeared between the ECU exchange rate and the basket proved that the values of both were not strictly related. This was widely realised during the EMS crisis of 1992 when the spread widened (1).

The impetus that the Maastricht Treaty could have provided to the ECU market was diminished by two factors. The first was that the Treaty dashed all hopes of a "parallel currency" approach to EMU, that is, to promote, or at least allow the ECU to gradually replace national currencies and to grow into the currency of the EMU. This was a possible alternative strategy that at least some market participants had favoured, or expected (recall the "hard" ECU proposal). The second drawback hurting the ECU market were uncertainties about when the EMU would start, if at all, and on which conditions ECU contracts would be converted into Euro.

This paper starts with a review of ECU market developments. Section 3 interprets the evolution and volatility of the ECU exchange rate in relation to the basket. Section 4 proposes a simple model of ECU exchange rate determination showing that the ECU value is determined much like any other exchange rate. Since a smooth path to EMU would benefit from renewed confidence in ECU instruments, we argue that stability of the ECU value at par with the basket would be beneficial both politically and to the ECU market. We propose, therefore, a "linking mechanism" in Section 5, and show the advantage of such a scheme.

2. Background

The ECU was created at the end of 1978, together with the European Monetary System (EMS). It was defined as a "basket currency", that is one ECU was equivalent in value to a basket of the currencies of the European Economic Community (EEC). This is the definition of the "Official ECU". Over time, the composition of the ECU has changed, including some currencies from new members of the EEC and readjusting the shares of the other currencies (2).

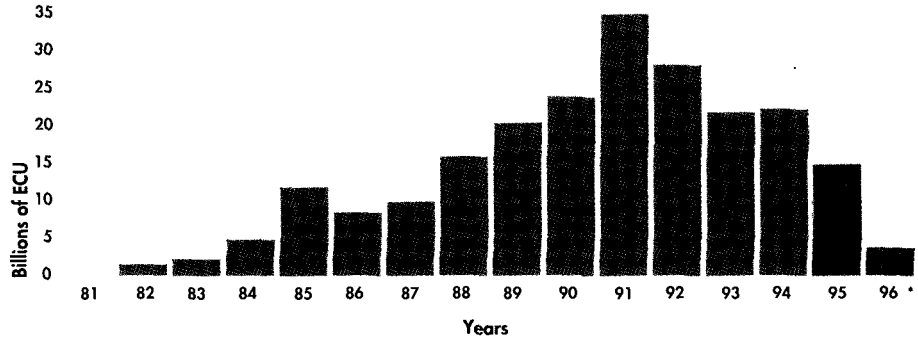
1) See ECU Banking Association (1991).

2) Of course, the amount of currencies in the basket have changed in line with exchange rate realignments.

Since September 1989, with the inclusion of the Spanish Peseta and the Portuguese Escudo in the Basket, the composition of the ECU has not been modified, as the Maastricht Treaty has definitively frozen the basket. Even, when Austria, Sweden and Finland joined the EU on 1 January 1995, their currencies were not included in the composition of the "Official ECU".

Based on the definition of the "Official ECU", a "private ECU" developed in financial markets. Its remarkable success is illustrated in Figure 1 by the evolution of new bond issues in ECU (3).

Figure 1. ECU bond issues 1981 - 1996



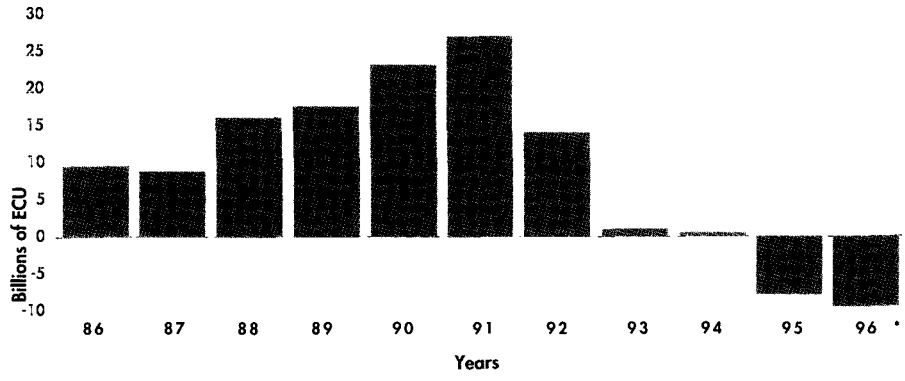
(*) 1996 data are only for the first half.

Figure 1 shows that issues increased steadily until 1991, to reach a maximum of ECU 35 billion. Thereafter, it has declined gradually to 15 billion in 1995, (the amount of ECU 4 billion in 1996 is only for the first half of the year).

This evolution is confirmed by looking at the net flow of ECU bonds (difference between new issues and reimbursements). This is presented in Figure 2. The amount of net flow of bonds increased up to 1991. In 1992 the net flow was still significantly positive, but in 1993 and 1994 it was almost zero. In 1995 and 1996 net flows were negative.

3) For details on the development of ECU financial markets, see Steinherr and Girard (1991).

Figure 2. Net flow of ECU bonds 1986 - 1996

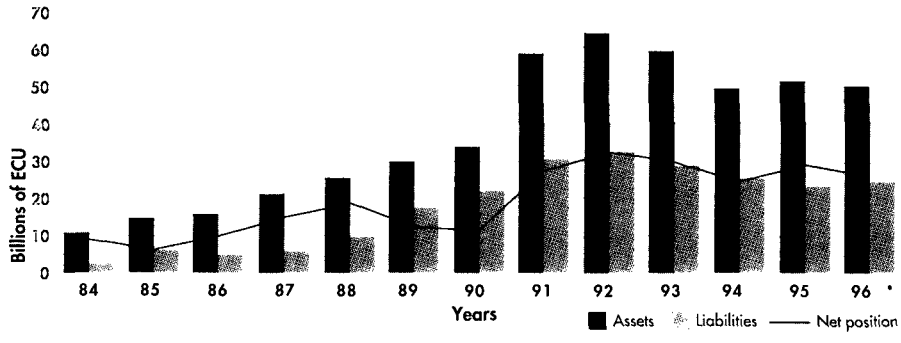


(*) 1996 data correspond to 30/06.

Issues increased steadily until 1991. Thereafter they declined gradually and in 1995 and 1996 net flows were negative.

Figure 3 shows that during the last 12 years, the banking sector has had an ECU creditor position vis-à-vis the non-banking sector. Assets reached a maximum at the end of 1992 with an amount of ECU 64 billion, before declining to ECU 51 billion in the first quarter of 1996. Liabilities followed a similar evolution during this period, with a maximum of ECU 35 billion at the end of 1992 and a decline to ECU 25 billion in the first quarter of 1996. The net position has stabilised in a range between ECU 26 and ECU 31 billion since 1991, after a period of increase from 1984 to 1988.

Figure 3. International position in ECU of Banks vis-à-vis the non-banking sector



Source: Bank for International Settlements. International Banking and Financial Markets Developments, various issues.

Despite the fact that the private ECU was not created nor controlled by any monetary authority, the market value of the private ECU was close to the value of the Official ECU

(that is, the basket value) up to 1988. A group of major European banks (the ECU clearing banks) accepted the commitment of changing private ECU for basket ECU at close to par for settlements of balances within the ECU payments system.

A group of major European banks accepted the commitment of changing private ECU for basket ECU at close to par. However, after 1988, the "fungibility of the ECU" was effectively suspended.

This link between the private ECU and the basket ensured a narrow spread between both for many years. However, after 1988, the existing link between the private ECU and basket disappeared when ECU clearing banks decided for operational reasons (banks were obliged to support one day exchange rate risk on ECU payments and had transaction costs of constituting the basket) to discontinue settlement in basket units. The "fungibility of the ECU" was effectively suspended.

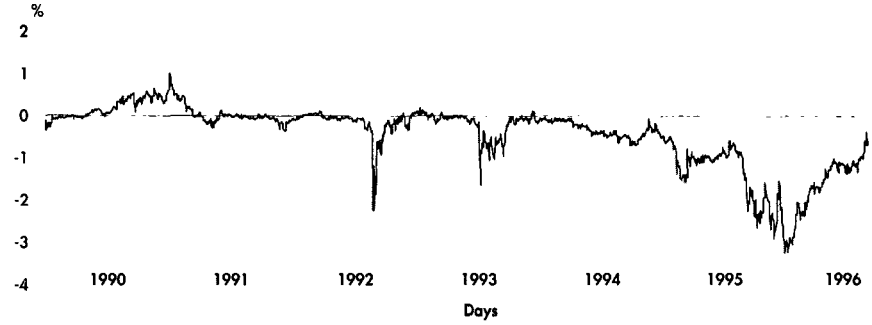
As a result, the exchange rate of the ECU in terms of the basket (i. e. the number of "baskets" to be paid for one ECU) has fluctuated, according to the supply and demand of the ECU, just like any other currency.

3. Evolution of ECU exchange rate

The market value of the ECU with respect to other currencies is quoted every day. With the exchange rates of the eleven currencies included in the basket, it is easy to obtain the value of the basket (Official ECU) in terms of the private ECU, summing up the exchange rate of the currencies weighted by their corresponding amount.

The evolution of the exchange rate of the ECU with respect to the basket can be observed in Figure 4. This depicts the percentage deviation of the ECU from the basket exchange rate (so-called the ECU Delta), since January 1990.

Figure 4. Delta of the ECU. Daily data 1990 - 1996



Source: European Commission. DGII - ECU Unit.

The value of the ECU has deviated substantially from parity with the basket. The behaviour of the delta can be grouped as follows:

- May 1990 - March 1991. The ECU appreciated with respect to the basket, reaching a maximum positive spread of 1% in January, 1991.
- April 1991 - August 1992. The exchange rate of the ECU presented a very small deviation from the Basket. In December 1991 the Maastricht Treaty was signed and the confidence in the stability of the EMS was solid.

The value of the ECU in terms of the basket followed a downward path until reaching a maximum spread of -3%.

- End of August 1992 - October 1992. The exchange rate of the ECU fell below the basket, with a maximum spread of 2% in mid-September. After the first Danish referendum in April 1992, rejecting the Maastricht Treaty, and the announcement of the French referendum in June, strong doubts about the likelihood of EMU provoked a crisis of confidence on the EMS. Sterling and lira exited from the system, and the peseta was devalued. The exchange rate of the ECU suffered from this instability, but by the end of October the negative spread had once more disappeared.
- November 1992 - July 1993. A quiet period on the markets, during which the recently adjusted currencies in the EMS showed a stable evolution inside the intervention limits of the system. At the summit of Edinburgh in December 1992, many exceptions were accorded to Denmark for the Third Phase of the EMU, allowing for the possibility of ratification of the Maastricht Treaty in a second referendum, in May 1993.
- August 1993 - October 1993. There was a new period of heavy depreciation of the ECU, provoked by the second currency crisis of the EMS. During the month of July, strong speculative attacks against some currencies (French Franc, Belgian Franc, Danish Krone, Peseta and Escudo) obliged Central Banks to intervene massively. On 2 August, the limits of the currencies in the EMS were enlarged to 15% from the previous 6% (Peseta and Escudo) and 2.25% (others). This decision, forced by markets events, undermined confidence in the ECU. The delta reached a negative value of 1.5%.
- November 1993 - April 1994. ECU markets calmed with only minor spreads between the value of the ECU and the basket.
- May 1994 - January 1996. The value of the ECU in terms of the basket followed a downward path until reaching a maximum spread of -3% at the end of January and the first days of February, 1996.
- February 1996 - September 1996. Increased optimism in EMU led to a continuous reduction of the spread from -3% to only -0.6% by the end of September.

This data is summarised in Table 1 with the annual mean and variance of the delta for each of the last 6 years. The steady negative trend, plus increasing volatility, is clearly visible.

Table 1. Delta of the ECU (Annual averages of daily observations)

Year	Mean	Variance	St. Dev.
1990	0.19	0.048	0.219
1991	0.08	0.053	0.230
1992	-0.14	0.102	0.320
1993	-0.16	0.079	0.281
1994	-0.27	0.034	0.184
1995	-1.14	0.356	0.597
1996	-1.62	0.422	0.650

This brief description of the evolution of the ECU reveals that its value is only weakly linked to the value of the basket. As there is no monetary authority controlling the supply and demand of ECU and stabilising its parity, the exchange rate of the ECU relies mainly on the confidence that the markets accord to the stability of the EMS and the final conversion of ECU to Euro at par.

As it is not possible to discard the risk of new periods of instability in the European currency market before 1999, it would be helpful to link the ECU exchange rate to the basket exchange rate. To see how such a link can be achieved, we model the ECU exchange rate and use this to simulate the effect of reintroducing a "limited fungibility".

4. Modelling the ECU-Basket exchange rate.

In modelling the exchange rate evolution of the ECU with respect to the basket, we must consider the ECU to be like any other currency and formulate the financial equilibrium relationship between exchange rates and interest rates (4). Dynamics is obtained from the exogenous evolution of the interest rates of the basket.

Interest rate parity for the daily evolution of the ECU exchange rates is written as:

(1) $$E_t\ (q_{t+1}) - q_t = R_t^{(1)} - r_t^{(1)}$$

where:

q_t = logarithm of the exchange rate of the ECU with respect to the basket. When one ECU equals one basket, the value of q_t will be zero.

4) See Steinherr (1994)

$R_t^{(1)}$ = Continuous daily zero-coupon interest rate of the basket at time, t, and with a maturity of one day.

$r_t^{(1)}$ = Continuous daily zero-coupon interest rate of the ECU at time, t, and with a maturity of one day.

Interest rate parity implies that in equilibrium the expected return due to the variation of the exchange rate of the ECU must be equal to the differential return of the interest rates of the basket and the ECU, i.e. if the ECU has an interest rate greater than the basket, the exchange rate of the ECU must depreciate with respect to the basket. Otherwise, there would be riskless arbitrage opportunities.

For a complete description of the evolution of the exchange rate, we need to describe the evolution of ECU and basket interest rates. Clearly the interest rate of the basket is determined by the (exogenous) interest rates of the currencies included in the basket. The easiest way of computing this rate is to compound the interest rates of the currencies weighted by shares in the basket.

The efficient markets hypothesis, implies:

(2) $$R_t^{(1)} = R_{t-1}^{(1)} + \varepsilon_t^{(1)}$$

That is, the exogenous basket rate follows a random walk, where ε_t is an error term.

With the interest rate of the basket exogenous, we still have two variables in equation (1), the interest rate and the exchange rate of the ECU. Both cannot be determined by the equation, in the sense that if the interest rate of the ECU increases automatically, the expected exchange rate would be reduced by the same amount. For each value of the interest rate of the ECU, there would exist an expected exchange rate satisfying the equation. However, the interest rate of the ECU is actually fixed by the markets (depending on the demand and supply of ECUs). In the ECU clearing system, the overnight rate (Intervention rate) is fixed by the Bank of International Settlements (BIS) on a basket basis for the preceding day.

(3) $$r_t^{(1)} = R_{t-1}^{(1)}$$

With these three equations, we have a model for the evolution of the ECU exchange rate.

Equation (1) can be reformulated in the following way:

(4) $$q_{t+1} = q_t + R_t^{(1)} - r_t^{(1)} + \alpha_{t+1}^{(1)}$$

which means that the exchange rate of the ECU at time, t+1, can differ from its expected value only by the random term $\alpha^{(1)}_{t+1}$, which is unknown at time, t. The efficient markets hypothesis applied to the exchange market implies that the markets use all the information available concerning the evolution of the exchange rate, process it and include this information in the expected exchange rate. Thus, differences between actual exchange rate and the expected rate must be due to unexpected effects, which can be assumed to be random and uncorrelated. In addition, we also assume the variance of the random variable to be constant.

Therefore, we have the following properties for the random variables:

(5) $$E_t(\alpha^{(1)}_{t+k}) = 0;\quad V_t(\alpha^{(1)}_{t+k}) = \sigma^2_\alpha;\quad Cov(\alpha^{(1)}_t, \alpha^{(1)}_s) = 0;\ \text{if } t \neq s$$

for any value $k > 0$

For the basket interest rates, we also assume the efficient markets hypothesis, so that:

(6) $$E_t(\varepsilon^{(1)}_{t+k}) = 0;\quad V_t(\varepsilon^{(1)}_{t+k}) = \sigma^2_\varepsilon;\quad Cov(\varepsilon^{(1)}_t, \varepsilon^{1)}_s) = 0;\ \text{if } t \neq s$$

Finally we must also assume that both errors for different dates are uncorrelated:

(7) $$Cov(\varepsilon^{(1)}_t, \alpha^{(1)}_s) = 0;\ \text{if } t \neq s$$

These hypotheses have been tested using daily data for the exchange and intervention rates. The zero-mean hypothesis on the daily variations of interest and exchange rates can be statistically accepted. The autocorrelations of the errors, $\varepsilon^{(1)}_t$ and $\alpha^{(1)}_t$ are also near zero and both series are uncorrelated as assumed in the model. Less validity can be accorded to the hypothesis that variances are constant, mainly due to the high disturbances which occurred in 1992 and 1993. During the calmer period from 1994 to 1996, these variances have been stable.

From above we can derive:

(8) $$E_t(q_{t+j}) = q_t + R^{(1)}_t - r^{(1)}_t \quad \text{for any value } j > 0$$

Equation (8) generalises (1) to accommodate any lag and results from an iterative application of equations (1), (2) and (3) from period, t+j, to, t (for more details see Appendix).

Equation (8) implies that the expected exchange rate for any future period is equal to the actual exchange rate plus the actual interest rates differential. Thus, the variation in the exchange rates is expected to compensate the differential of daily interest rates. However, if there were a cumulated deviation of the exchange rate at time, t, there is no mechanism to correct this deviation, as the expected movement will be just to compensate future changes in interest rates.

Analysis of the relationship between the actual exchange rate and future exchange rates, together with the intervention rate, (see Appendix) suggests:

(9) $$q_{t+j} = q_t + R_t^{(1)} - r_t^{(1)} + \sum_{i=1}^{j-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{j} \alpha_{t+i}^{(1)}$$

The expected exchange rate for any future period is equal to the current exchange rate plus the interest rate differential.

We observe that q_{t+j} is equal to the actual exchange rate plus the differential of interest rates plus two random components reflecting respectively the variation of the interest rates of the basket, $\sum_{i=1}^{j-1} \varepsilon_{t+i}^{(1)}$, and the variation of the exchange rate from its expected value $\sum_{i=1}^{j} \alpha_{t+i}^{(1)}$.

If we take expectations at time, t, in formula (9), we obtain directly formula (8), as all the random components have zero-mean at time, t.

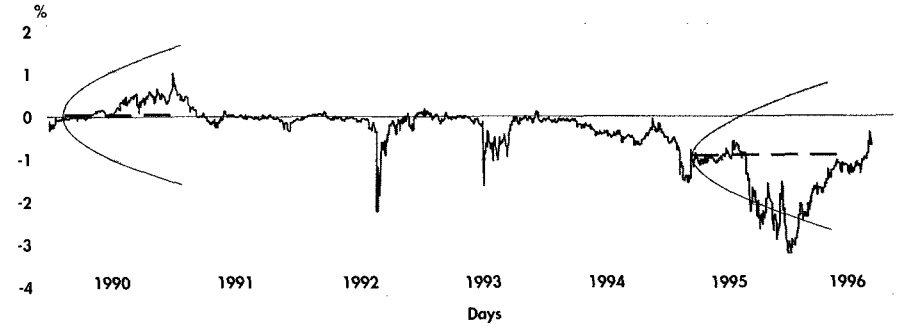
We can also obtain the variance of the process, assuming that ε_t and α_t are uncorrelated and with constant variances, σ_ε^2 and σ_α^2, respectively:

(10) $$V_t(q_{t+j}) = (j-1) \cdot \sigma_\varepsilon^2 + j \cdot \sigma_\alpha^2$$

Expression (10) shows that, although all futures exchange rates have the same expected value, the variance around this common value increases linearly with the lag between, t, and the future date.

The model can be viewed graphically in Figure 5, where we have projected the expected future exchange rates values and the confidence limits that are determined by the model from two dates (1990 and 1995).

Figure 5. Expected exchange rates and 95% confidence limits



The preceding results can be summarised as follows:

In case of an initial deviation, we cannot expect that the exchange rate will revert to zero.

- The deviation of the exchange rate from the basket equals (in an opposite direction) the interest rate differential between the basket and the ECU. Thus, if the market starts from a delta near zero, (as in the first point projected in Figure 5) and with a small differential between the interest rates of the basket and the ECU, we can expect the exchange rate of ECU to stay near zero. But, in case of an initial deviation from zero we cannot expect that the exchange rate will revert to zero. This can be easily appreciated visually in the second point projected in Figure 5.

- The confidence limits on the expected exchange rate increases with the lag. Thus, the confidence limit widens rapidly. In other words, anything becomes possible, a fact not contributing to reassure ECU investors.

- Finally, this model has fixed a relationship between the daily interest rates of the basket and the ECU through the latter's "Intervention rate". The Intervention interest rate could be set with the goal of reducing the spread between the ECU and basket interest rates. But, as in the case of exchange rates, there is an increasing variance of the random component, so that the stability effect could be very weak.

These conclusions are confirmed by the long periods of negative delta seen during the last two years.

5. Limited fungibility model

Making sure that the value of the ECU is close to the value of the basket requires an effective mechanism that brings about equality. One such mechanism would be legal equivalence, implying that any ECU debt could be settled either in ECU or in basket units. Legal equivalence between ECU and basket does not exist, although the Commission has elaborated a proposal to this effect.

What else could be done to prevent the remote, but nevertheless real, danger of an ECU meltdown? The proposal is for "limited fungibility".

If legal equivalence does not exist, a private acceptance could achieve the same result. This is, precisely, what the ECU Banking Association achieved until 1987 by allowing settlement in either unit. What is interesting is that equivalence in only a segment of the market is all that is needed, in this case, in the ECU payment system. If, for example, all ECU deposits were to be repaid in either ECU or basket - whichever is higher in value - this would achieve exactly the same purpose. As with two interconnected water basins, one only needs to control the level in one to ensure the same level in both.

Another possibility of ensuring parity between ECU and basket would be central bank support. One or several European Central Banks would have to intervene when a certain spread is reached.

Short of political commitment through central bank support and short of legal equivalence, what else could be done, assuming (as we do) that it is in the public interest to prevent the remote, but nevertheless real, danger of an ECU meltdown?

There are two things the ECU Banking Association (EBA) could do. Why the EBA? Because the EBA manages what comes closest to a "monetary function" by operating a payments system with intra-day credit, and because it regroups in its clearing system the 48 most important banks in the ECU market.

One possibility would be to set the overnight interest rate in line with the delta. This proposal has already been adopted by the EBA, but has not yet been implemented. But, even if implemented, it would suffer from a major drawback: in times of pressure on the ECU exchange rate, the overnight rate would have to rise to a level of several hundred percentage points to be effective - whereas the EBA would only accept variations of a few basis points (5).

The second possibility is a return to fungibility. But as the drawbacks in terms of costs and value-day are well-known, a return to the pre-1987 system would be unattractive. Hence the proposal of "limited-fungibility", for example once per month or per quarter. In the remainder of this section, we analyse whether this "limited fungibility" could stabilise the ECU market. The proposal we are considering is to establish fungibility at certain dates known in advance (for example the last clearing day of the month). At such dates, creditors can choose to be paid either in ECU or in the basket if the delta is negative, while debtors can choose payment when the delta is positive. Obviously, at these "fungibility" dates, the exchange rate of the ECU cannot be less than the value of the basket (except for a small difference due to transaction costs). For other business days,

---

5) For the daily interest rate differential to compensate a 10 bp exchange rate difference would require an annualised interest rate of some 43%.

the divergence of the exchange rates can be expected intuitively to remain quite small due to the perspective of the next "fungibility date". This solution would retain to a large degree the advantage of the "permanent fungibility", but would reduce its shortcomings in terms of cost and risk, as the number of fungibility dates is small.

The variance is upper bounded and the upper bound depends on the lag between "fungibility dates".

In order to analyse the effects of the "limited fungibility", we modify the model of section 3 to include the fungibility condition. For reasons which will become clear below, we neglect transaction costs. If we call, T, the number of days between two dates of "fungibility" and consider the starting date 0 as one of the these dates, then the following condition must be added to the model:

$$q_0 = q_T = q_{k \cdot T} = 0, \quad k = 0, 1, \ldots . \tag{11}$$

We use condition that $q_T = 0$ together with equation (9) and obtain for the period $0 < t < T$:

$$\alpha^{(1)}_{T-t} = \left(q_t + R^{(1)}_t - r^{(1)}_t + \sum_{i=1}^{T-t-1} \varepsilon^{(1)}_{t+i} + \sum_{i=1}^{T-t-1} \alpha^{(1)}_{t+i} \right) \tag{12}$$

Therefore,

$$E_t (\alpha^{(1)}_{T-t}) = - (q_t + R^{(1)}_t - r^{(1)}_t) \tag{13}$$

Equation (12) means that the error variable at the "fungibility date", $\alpha^{(1)}_{T-t}$ depends on a term known at time, t, and a sum of random effects to appear between, t+1, and, T-1. At time, t, the expected value of $\alpha^{(1)}_{T-t}$ compensates the delta at time t from the last fungibility date. The random term will compensate the new deviations to be produced from, t+1, to T-1.

While deviations in the basic model had a permanent effect on exchange rates, now the deviations are maintained just until the next date of fungibility. From this date onwards, the process has zero-mean deviation as the stochastic process has been driven by parity.

Evaluating the variance of the exchange rate around its mean, as we have done with the basic model, and proceeding iteratively (for details see Appendix) one obtains

$$V_t (q_{t+i}) \leq T \cdot (\sigma^2_\varepsilon + \sigma^2_\alpha) \tag{14}$$

Comparing this result with the corresponding one in the basic model, we see that in this case the variance is upper bounded and the upper bound depends on the lag between two "fungibility dates". Thus equation (14) represents a suitable criteria to establish the period between "fungibility dates", depending on the acceptable level of the delta.

Finally, condition (8) creates a link between the term structures of interest rates of the ECU and of the basket. We know that on dates, $k \cdot T$, for $k = 0, 1, 2, \ldots$ the exchange rate of the basket and the exchange rate of the ECU will be the same. At these maturities, the interest rates on both currencies must also be the same to prevent arbitrage opportunities.

We have then

(15) $$R_0^{(k \cdot T)} = r_0^{(k \cdot T)} \text{ for } k = 1, 2, \ldots .$$

In the case of a different initial date, t, with $0 < t < T$, we can write:

$$q_T - q_t = (T-t) \cdot (R_t^{(T-t)} - r_t^{(T-t)}) = -q_t \quad \text{and as} \quad q_T = 0 \quad \text{we have}$$

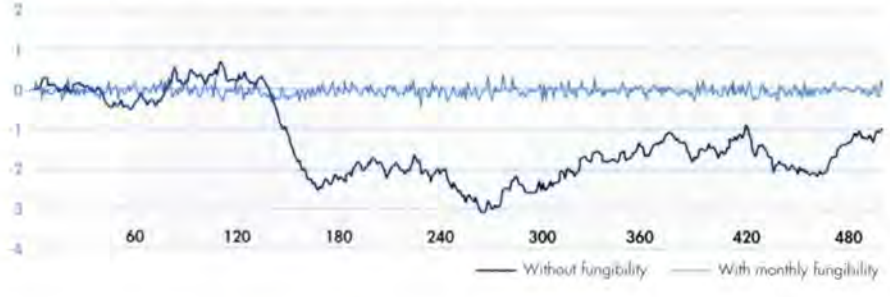
(16) $$q_t = (T-t) \cdot (r_t^{(T-t)} - R_t^{(T-t)})$$

At moment, t, the values of $R_t^{(T-t)}$ and of $r_t^{(T-t)}$ are known, so that q_t is determined by equation (16). This condition occurs on the next fungibility date, determining the actual exchange rate. For the following fungibility dates, the interest rates of the ECU are determined by the interest rate of the basket for the same maturity and the current delta.

With the actual differential of interest rates, equation (16) imposes a very narrow band for the data. In 1996 the mean differential of the short-term annualised interest rates has been 15 bp with a standard deviation of 10 bp. Thus, with a probability of 97.5%, we can expect that the interest rate differential will be less than 35 bp, or 3 bp on a monthly basis. Adding transaction costs of 30 bp, we can expect that the maximum delta with monthly fungibility must be less than 35 bp.

To compare both models, with and without limited fungibility, a simulation of a series generated by each model is represented in Figure 6.

Figure 6. Simulation of the evolution of exchange rates



As both processes start at zero, the expected long term value of the delta for both will be also zero. However, the first one allows for long periods of large deltas, while the second keeps the series close to zero and strongly reduces the variance.

The same reasoning can be applied to the announcement of EMU which can be considered as a process with only one date of fungibility (6). Certainty of EMU and taking account of the fact that, on this date, the ECU will be exchanged for an Euro at the basket value, would be sufficient, according to this model, to constrain the delta to a maximum. As shown by equation (16) the maximum possible delta depends on the date of EMU and the actual interest rate differential up to that date.

The impact role of EMU is arguably the reason for the recent decline of the delta. Since March 1996, EMS exchange markets have been calm and there has been a growing confirmation of the EMU calendar. This fact, in the absence of short term disturbances, has acted as an anchor pushing the ECU to basket value.

6. Conclusions

Despite the simplicity of the analysis three robust results emerge:

- The condition of periodic fungibility would force the exchange rate to return to parity at the fungibility dates, thus eliminating the delta. After each such date, the process starts again from parity, so the effect of any previous disturbance on the exchange rate of the ECU is erased. In between fungibility dates, the delta can be different from zero, but its value will be confined to the expected monthly variation of the delta (in the case of monthly fungibility). With the data available, the monthly mean delta would be less than 0.01%, which compares with the historical values of Table 1, ranging from 0.19% to -1.62%.

- With fungibility, the maximum variance of the exchange rate is bounded and depends on the intrinsic daily variance of interest rates and exchange rates, and on the periodicity of the fungibility dates. More frequent fungibility reduces the maximum variance proportionally.

- Interest rates of the basket and the ECU will be equal at the dates of fungibility. In between, small divergences can occur, due to the effect of the Intervention Rate mechanism. For the first fungibility date, that implies a quick decline in the delta, which will be dependent only on the interest rate differential. For longer maturities, this condition forces the interest rates of the ECU and of the basket to converge.

We therefore conclude that the "limited fungibility" condition establishes a link between the ECU and the basket which is strong enough to stabilise the exchange rate of the ECU

6) See Steinherr (1994) and Folkerts-Landau (1991).

and reduce the value of the delta. This will increase confidence in the ECU and strengthen its role in financial markets.

The condition of periodic fungibility would force the exchange rate to return to parity at the fungibility dates, thus eliminating the delta. The cost should be minimal.

The cost of limited fungibility should be minimal. In principle, the mere announcement should push the ECU rate to parity. If not, a cost equal to the delta plus transaction costs on basket construction would be incurred by net debtors. At present (October 1996) the delta is in a range of -20 to -40 bp, so that the total cost could amount to 40-60 bp, including transaction costs. Transaction costs could be saved if, instead of delivery of the basket, cash settlement was accepted. Of course, if cash settlement were to be accepted, then there would be no reason to stick to limited fungibility, whose only motivation is to save transaction costs. Having established permanent fungibility in this way would, of course, maintain parity at all times.

Are there gainers and losers in this proposal? The biggest gainer is surely the ECU market and net ECU asset holders. Households are long in ECU as is the banking sector as a whole (see Figure 3). Net debtors are mainly governments and, to an insignificant amount, non-financial enterprises.

References:

ECU Banking Association. (1991). "The ECU - To be or not to be a basket - That is the question". *EBA Newsletter.* Special Issue 6, June.

Steinherr, A. and Girard, J. (1991). "ECU financial markets: Recent evolution and perspectives", in Steinherr, A. and Weiserbs, D. (eds.) "*Evolution of the International and Regional Monetary Systems*" London: Macmillan.

Steinherr, A. (1994). "ECU interest and exchange rates: the key role of EMU", in Steinherr, A. (ed.) "*European Monetary Integration*" London: Longman.

Folkerts-Landau, D. (1991). "The determination of market and theoretical ECU exchange rates". *Eurostat. Doc.* n° 75 E.

Appendix
Derivation of the models

The basic model

The evolution of the exchange rate of the ECU with respect to the basket has been modelled with the following equations:

(A1) $E_t(q_{t+1} - q_t) = R_t^{(1)} - r_t^{(1)}$ Interest Rate Parity

(A2) $R_t^{(1)} = R_{t-1}^{(1)} + \varepsilon_t^{(1)}$ Random Walk for daily interest rates of the Basket

(A3) $r_t^{(1)} = R_{t-1}^{(1)}$ Intervention rate.

In these formulas, q_t, is the logarithm of the ratio of the ECU to the basket, i.e., the logarithm of the number of basket units needed for buying one ECU in period, t, and, $R_t^{(1)}$, and, $r_t^{(1)}$, are daily continuous interest rates of the basket and the ECU respectively.

As we have defined in Section 2, the delta of the ECU, δ_t, is the percentage deviation of the exchange rate of the ECU with respect to the basket.

With this notation, we have $q_t = \log(1+\delta_t) \approx \delta_t/100$, or that, the delta in percentage terms can be roughly approximated by q_t.

From (A2) and (A3), we have that:

(A4) $R_{t+j}^{(1)} - r_{t+j}^{(1)} = R_{t+j}^{(1)} - R_{t+j-1}^{(1)} = \varepsilon_{t+j}^{(1)}, \quad \text{for } j > 1$

As we have discussed in the main text, (A1) is equivalent to

(A5) $q_{t+1} = q_t + R_t^{(1)} - r_t^{(1)} + \alpha_{t+1}^{(1)}$

Iterating this formula backwards from, t+j, to, t+1, and using (A4) we obtain:

$$q_{t+j} = q_{t+j-1} + R_{t+j-1}^{(1)} - r_{t+j-1}^{(1)} + \alpha_{t+j}^{(1)} = q_{t+j-1} + \varepsilon_{t+j-1}^{(1)} + \alpha_{t+j}^{(1)} = q_{t+j-2} + \varepsilon_{t+j-2}^{(1)} + \alpha_{t+j-1}^{(1)} + \varepsilon_{t+j-1}^{(1)} + \alpha_{t+j}^{(1)} = \ldots$$

From which,

(A6) $$q_{t+j} = q_t + R_t^{(1)} - r_t^{(1)} + \sum_{i=1}^{j-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{j} \alpha_{t+i}^{(1)}$$

Taking expectations of (A6) and taking account that, $\varepsilon_t^{(1)}$, and, $\alpha_t^{(1)}$, are zero-mean random variables:

(A7) $E_t(q_{t+j}) = q_t + R_t^{(1)} - r_t^{(1)}$

The variance of q_{t+j} can also be computed from A6, as both errors are uncorrelated, and with constant variances:

(A8) $$V_t(q_{t+j}) = V_t(\sum_{i=1}^{j-1} \varepsilon_{t+i}^{(1)}) + V_t(\sum_{i=1}^{j} \alpha_{t+i}^{(1)}) = (j-1)\cdot\sigma_\varepsilon^2 + j\cdot\sigma_\alpha^2 < j\cdot(\sigma_\varepsilon^2 + \sigma_\alpha^2)$$

In terms of the delta, we obtain:

(A9) $$E_t(\delta_{t+j}) \approx \delta_t + \frac{(I_t^{(1)} - i_t^{(1)})}{360}$$ where, $I_t^{(1)}$, and, $i_t^{(1)}$, are the overnight interest rates (discrete) of the basket and the ECU at time, t.

As can be seen, the delta at any future time will be corrected only by the effect of the differential of interest rates. It is maintained at this value without reverting to zero.

The limited fungibility model

The fungibility condition imposes that at certain dates the delta is zero. Denoting by, T, the time between two such consecutive fungibility dates and assuming time zero as one of these dates, we have:

(A10) $$q_0 = q_T = q_{k\cdot T} = 0, \quad k = 0, 1, \ldots .$$

For any intermediate date, t< T, and according to (A6), q_T can be expressed as:

Therefore:

(A11) $$\alpha_{T-t}^{(1)} = -(q_t + R_t^{(1)} - r_t^{(1)}) - \left(\sum_{i=1}^{T-t-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{T-t-1} \alpha_{t+i}^{(1)}\right)$$

We can thus split $\alpha_{T-t}^{(1)}$ in two components: $-(q_t + R_t^{(1)} - r_t^{(1)})$, which is determined at time, t, and $-\left(\sum_{i=1}^{T-t-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{T-t-1} \alpha_{t+i}^{(1)}\right)$, which is random at time, t, but will be completely determined at time, T-1.

This formula indicates that $\alpha_{T-t}^{(1)}$ will compensate the actual deviation (deterministic component), plus all the future deviations to be produced from, t, to, T-1 (random component).

In this way the fungibility condition modifies the assumed characteristics for the variable, $\alpha_{T-t}^{(1)}$:

(A12) $$E_t(\alpha_{T-t}^{(1)}) = -(q_t + R_t^{(1)} - r_t^{(1)})$$

(A13) $$V_t(\alpha_{T-t}^{(1)}) = (T-t-1)\cdot(\sigma_\varepsilon^2 + \sigma_\alpha^2) < (T-t)\cdot(\sigma_\varepsilon^2 + \sigma_\alpha^2)$$

Formula (A13) shows that the variance of the exchange rate is bounded and that it depends on the time to the next fungibility date. Then its maximum value is reached immediately after a fungibility date, and this maximum depends on the time between fungibility dates.

If in formula (A6) we consider the period, j >T-t, we obtain:

$$q_{t+j} = q_t + R_t^{(1)} - r_t^{(1)} + \sum_{i=1}^{j-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{j} \alpha_{t+i}^{(1)} = \left(q_t + R_t^{(1)} - r_t^{(1)} + \sum_{i=1}^{T-t-1} \varepsilon_{t+i}^{(1)} + \sum_{i=1}^{T-t} \alpha_{t+i}^{(1)}\right) + \sum_{i=T-t}^{j-1} \varepsilon_{t+i}^{(1)} + \sum_{i=T-t+1}^{j} \alpha_{t+i}^{(1)}$$

The expression between brackets is, q_T, which is zero. Therefore:

(A14) $$q_{t+j} = \sum_{i=T-t}^{j-1} \varepsilon_{t+i}^{(1)} + \sum_{i=T-t+1}^{j} \alpha_{t+i}^{(1)}$$

This equation means that the history of the process is erased at each fungibility date and the process starts again from zero. This is a major difference with the basic model, where shocks have a permanent effect.

Finally, for the interest rates, we have:

(A15) $$q_{k\cdot T} = q_t + (k\cdot T-t)\cdot(R_t^{(k\cdot T-t)} - r_t^{(k\cdot T-t)}) = 0$$

For $k=1$ this formula gives an arbitrage condition for the actual exchange rate and the interest rates at maturity, T:

(A16) $$q_t + (T-t)\cdot(R_t^{(T-t)} - r_t^{(T-t)}) = 0$$

This relation is not exact in the real world because of market imperfections, such as transaction costs. It is probably the reason for the current decline of the delta following increased confidence in the EMU.

For $k>1$, we get a condition for the ECU interest rate:

(A17) $$r_t^{(k\cdot T-t)} = R_t^{(k\cdot T-t)} + \frac{q_t}{k\cdot T-t}$$

Thus, as "k" increases, the difference between the interest rates of ECU and the basket must be reduced.

Book review

Winds of Change. Economic Transition in Central and Eastern Europe
Daniel Gros and Alfred Steinherr, Longman, London and New York, 544 pages, 1995.

At the time of the 1989 revolution in Eastern Europe, which brought about the fall of communism, it was a commonplace observation that one would seek in vain any indication in the works of economists as to how a centrally-planned economy could be transformed into a market economy. Much has changed in this respect in the intervening years. The book I wish to discuss comprises 5 parts, each ending with a detailed bibliography which primarily lists books and articles about the transition from the communist system to a market economy.

It would not in fact surprise me if the book written by Daniel Gros and Alfred Steinherr came to be regarded as a standard work in this field. The authors summarise their work very concisely as follows:

"After the description of socialist economic organisation and performance in Part I and the mainly conceptual discussion of the reform problems in Part II, the remainder of the book concentrates on the concrete situation in reforming countries. The reforms already carried out are evaluated and compared, as are the problems still to be solved. Part III focuses on Central Europe and leaves the former Soviet Union (FSU) to Part IV because the size and nature of the problems in the FSU are incommensurable with those in Central Europe" (page 231).

In a work such as this it is a good idea to provide a fresh general analysis of communism as a social ideology and of the socialist economic system. This is what Part I does. One of the mistakes made was that the best of everything went to the military-industrial complex; this was then perhaps able to compete with the West but the remainder of the economy suffered from a lack of competition, protection from foreign influences and insufficient access to Western technology, as a result of which the opportunities for growth were limited. In the period after World War II the lack of any kind of price mechanism for the allocation of capital had a growing impact. After the collapse of the system it was also discovered that production in the Soviet Union was lower than had previously been assumed. The "obsession with growth" is also discussed. It is pointed out earlier in the book that autarchic tendencies are not inherent in socialist principles and that the lack of a proper cost allocation system resulted in large-scale production of goods with a negative added value.

Translation of the Dutch original published in Maandschrift Economie, 6, December 1996.

Part II deals with "transition and reconstruction", discussing everything that will have to be done in Eastern Europe to create a social market economy. First the scale and the chronology of the reforms are discussed, followed by price liberalisation, foreign trade and foreign exchange liberalisation, macro-economic stabilisation, privatisation and reforms in the financial sector.

Each chapter ends with a number of conclusions. The authors stress, for example, that the credibility of a reform programme and sufficient political support are so important that they have to take precedence over the speed and comprehensiveness of the "big bang". Another conclusion is that there is no point in liberalising prices unless financial discipline is also introduced in enterprises. If subsidies continue to be provided, production will not be adjusted. A measure which must be taken to complement price liberalisation is liberalisation of international trade, which strengthens competition. Domestic capital markets also need to be developed in this context. Gros and Steinherr advocate free exchange rates for capital transactions and a fixed rate for the current account as an interim solution to the problems of international capital transactions. In the case of the Visegrad countries this is no longer necessary, though it is for Russia.

The authors have some interesting comments on the "safety net" for those sections of the population who are hit too hard by the reform programme. They are in favour of income transfers but prefer a "give-away privatisation programme that provides citizens with real assets to compensate for the reduction in income streams" (page 175). Those assets can then serve as security for loans in bad times. It is an interesting idea because the state is naturally going to sell off houses and shares in state-owned industries as part of the privatisation programme anyway. The authors believe their suggestion is honest because they assume that everyone will receive an equal amount and that difficult valuation problems will be avoided.

As I believe the safety net to be of critical importance, I should like to make a few observations on this. As a solution to the privatisation programme, I find the suggestion attractive but I would question whether it constitutes a "safety net". I do not think that the idea of using the newly acquired assets as security for a bank loan is a particularly good one because it would mean people who were already not enjoying economic success would incur debts which would have to be repaid. The only option then open to them would be to sell. That would offer some temporary relief but the people concerned would be eating into the assets they had only just acquired. Personally, I believe that free support, i.e. income transfers from the state, is unavoidable in the case of the poorest and I should have liked to have read more about this aspect.

In fact, all the countries concerned have chosen a mixed programme: some important enterprises remain in state ownership, others are being sold (through a coupon system, for example), while others again are being closed down or placed provisionally under the control of a trust ("Treuhand").

For some citizens the reform programme has serious consequences and, after 7 years, I am amazed that in Eastern Europe there was not much social unrest.

The second part of the book ends with an examination of the financial sector. The main recommendation is, of course, that the central bank should be independent and that this should be laid down in the country's constitution. The central bank should also supervise the banking system. The idea that the banking industry, which should comprise universal banks, should be divided into three categories is an interesting one; the first category would meet the highest requirements as regards solvency and would pay the lowest premiums for deposit insurance and the lowest rediscount rate. The reserves these banks would be obliged to hold would also be the lowest. The third category would not be covered by deposit insurance or rediscounting and would not participate in the payments system.

I wonder whether this system would not simply constitute a death sentence for banks in the third category. Who would want to keep a deposit account with a bank described as having the lowest possible standing even though it offered higher deposit rates? It would be better simply to prohibit banks which do not meet clear requirements, including those regarding the reliability of the directors. I agree with the authors, however, that the evolving regulation of banks by the EU could act as a good example to Eastern Europe.

Part III of the book deals with the actual reforms in Central Europe, beginning with the transformation of the GDR into an integral part of the Federal Republic of Germany. The authors are frank in their views: currency union was a correct decision and the exchange rate of 1:1 is not responsible for the high unemployment in Eastern Germany. I should like to add that it would have been impossible to explain to the public a conversion rate of, for example, 2:1. It should also be borne in mind that a different conversion rate would in any case have been overtaken by wage rises. Gros and Steinherr are not enthusiastic about the Treuhand agency: a better solution to the privatisation issue would have been simply to hand over the housing stock, rural properties and small businesses to the East German people. The authors point out that income transfers have assumed enormous proportions but advocate in this context a "marginal employment subsidy" involving negotiable coupons for the unemployed, to be sold in return for work or training. On the basis of the high level of investment in the former GDR, Gros and Steinherr

anticipate that in 10 to 15 years' time the region will have caught up with Western Germany to such an extent that it will be producing 60-70% of GNP per capita in the West.

The following chapter concerns the transformation of the former Czechoslovakia, Hungary and Poland and is based on contributions from a number of IMF officials. The conclusions rightly state that: "The interplay of structural and macroeconomic problems across the different sectors of the economy makes the formulation of policy particularly onerous, especially since these economies are pioneers in facing the challenges of systemic transformation to the market" (page 314). The conclusions also stress the problem of privatisation in the light of the many, sometimes contradictory, objectives of government policy. Attention is also devoted to the importance of good bankruptcy regulations and the burden imposed on the state by unemployment benefit, the need for which arises from the dismissal of superfluous employees in industry. The authors also warn us not to forget the need for a complete overhaul of the tax system. Pending the development of capital markets, the financing of government deficits and company investment will largely be the responsibility of the banks, which must also be subject to proper supervision.

My overall conclusion from this chapter is that the Visegrad countries have achieved a lot since the revolution of 1989. Inflation, for example, has fallen sharply and the share of GDP accounted for by the private sector in Czechoslovakia increased from almost zero in 1989 to 60% in 1994. In the case of Hungary the corresponding figures are 16% and 55% and in the case of Poland 28-30% and 55% (page 282).

The final chapter of Part III concerns the former Yugoslavia. It is impossible for it to be up-to-date, in view of the civil war that has ravaged the country since 1991/92. One would be wrong, however, to ignore this part of the book. Considerable emphasis is given to worker self-management. An enterprise run in this way could theoretically even be better than a capitalist enterprise but in order for this to be so the workers would have to have transferable rights of ownership and this was not the case in Yugoslavia. If rights of ownership are transferable there is an incentive to reinvest rather than creaming off the profits in the form of cash. Another mistake was the negative real interest rate, with all its consequences for the allocation of the factors of production. There was also a liberalisation process which came to a halt half-way through, and like others before them, the authors stress how the six republics were growing away from one another. The fact that the governments of the individual republics had far too little eye for their mutual interdependence and pursued autarchic policies is seen as a major mistake.

Part IV of the book looks at the former Soviet Union and its disintegration, a process which reached a climax in 1991 (chapter 13), and the initial attempts at reform and stabilisation in Russia (chapter 14).

As regards the first problem: the authors concentrate on two, in their opinion, extreme views, namely that the new states within the territory of the Soviet Union should immediately have introduced national currencies, or alternatively that these states were so integrated that they should have retained monetary and economic union even though they had become politically independent.

The authors offer a few perceptive analyses, rendered all the more remarkable by the fact that they are based on extraordinarily weak material. The finding of one of the analyses is that there was far more trade between the Soviet republics than would have been expected if free international trade had prevailed among them. Trade between them would therefore become marginal if international markets were opened up.

As regards the possibility of a monetary union between the former republics, the following sentence from the book is interesting. "The ruble zone started to crumble once the Central Bank of the Soviet Union (called Gosbank) started to lose control over its head offices located in the 15 republics" (page 382). This indicates therefore, that no central monetary policy was established, and this would have been a precondition for monetary union.

Pending full convertibility between the currencies (assuming that no monetary union was achieved) a clearing mechanism should have been established, like the European Payments Union in Western Europe in the first few years after the war. The authors point out that an Interstate Bank was planned but that the agreement concerning it was never implemented. The same is true of a Central Bank Council for the Commonwealth of Independent States.

Personally, I am inclined to opt for the second of the two above-mentioned extreme views. That is to say that when the republics became politically independent, a monetary union should have been established, but, as stated above, with a common monetary policy. The starting point for participation in international economic relations would then have been stronger than it in fact was. Chapter 14 reads depressingly. After Russia had separated from the other republics in December 1991 attempts were made to carry out reforms and achieve stabilisation. A few quotes will suffice to give an impression of the many failures and disappointments:

"None of these programmes (1990-1991) could be implemented, however, as long as President Gorbachev did not really believe in a market economy" (page 408).

"Table 14.1 clearly shows that Russia had by far the highest price jump among the group of four economies with rapid price liberalisation" (Russia, Poland, Bulgaria and Czechoslovakia, page 410).

The following is extremely important: "The entire legal structure for a market economy did not exist in Russia. In Central Europe, large parts of the pre-war legal system had survived, at least on the books, and provided these countries with an acceptable starting point. In Russia nothing similar existed" (pages 414-415).

The authors are particularly critical of the fact that energy prices were not brought more in line with international market prices and that the government continued to subsidise import prices. One of the conclusions of this chapter is that since most of the mistakes made have now been corrected, cautious optimism is appropriate (page 441). Given what is said in the course of the chapter, I myself find this conclusion extremely optimistic.

Part IV goes on to analyse what the rest of the world and Western Europe in particular could do to support the reform process in Eastern Europe. Chapter 15 contains an appendix with detailed figures on the support actually provided. Gros and Steinherr are not happy: the financial aid which has been provided was too little and took the wrong form (export credit, for example). They believe that a kind of Marshall Plan with control over disbursement would have been and still would be better, particularly for the countries of the former Soviet Union. The problem is: "without reforms no aid, without aid no reforms" (page 474). However, the authors also believe that the aid needed is less than is often estimated and that incomes in Eastern and Central Europe should be converted in terms of equivalence of purchasing power rather than at market exchange rates.

The final chapter, chapter 16, concerns trade agreements and the enlargement of the European Union. The two issues are linked: the authors believe that the Visegrad countries (and Slovenia) have already adjusted their patterns of trade to such an extent that they could become members of the Union within a few years. A European Free Trade Zone is advocated for the other countries, including those in the former Soviet Union. This would comprise 700 million consumers and open the vast EU market to exports from Eastern Europe. A separate appendix deals with arable and livestock farming. It culminates in the following sentence: "Opening up its agricultural markets is arguably the greatest contribution Western Europe can make to Eastern European development" (page 521).

Fans of international trade issues will enjoy "Box 16.5", for example, which examines and compares the structure of trade in the European Union and Eastern Europe. "Box 16.6. The optimum size of a club", provides another interesting analysis. As elsewhere in the book, there is mention of the importance of the "gravity model", which analyses the significance of the proximity of countries and regions for trade between them. The results constantly stress the major importance of the European Union and more particularly Western Europe as a whole as the economic heart of Europe.

As regards the admission of the Visegrad countries to the European Union I should like to make one observation of a purely political nature.

When their book went to press Gros and Steinherr could not have known that the position of the Hungarian minority in Slovakia would deteriorate considerably as a result of legislative changes. It is essential that events in this regard are monitored closely.

Economic considerations aside, the European Union should contain only countries where minorities also feel at home. States where this is not yet the case could follow the example of Belgium and the way it conducts relations with its German-speaking minority in the east of the country.

I have deliberately summarised this major work on a chapter by chapter basis because it is so rich in analyses and suggestions that a shorter summary would not have been a fair reflection of it. All the problems are discussed on the basis of solid principles of economic theory using extensive statistical material from sources including the former Soviet Union, albeit that the latter is less reliable than that from the West. Each of the four Parts contains an extensive bibliography, but the literature concerned has also been thoroughly incorporated in the analyses. The authors' conclusions, which are given at the end of each chapter, mostly come over as extremely logical and common-sense, but it would do the authors insufficient justice if one were to restrict oneself to those conclusions and not look at the analyses.

In brief: this is a fascinating book, devoted to the most fascinating problem which Europe will have to deal with in the coming decades. The President of the European Investment Bank, Sir Brian Unwin, who provided a detailed introduction to the book, rightly observes: "In order to ensure that the book is not quickly outdated by the rapid evolution of politics, the authors have concentrated on issues of lasting interest" (page XI).

My final impression is that this book is economics at its best.

H.W.J. Bosman,
em. Professor Tilburg University, Netherlands

designed by

MEINBACH • DESIGN • LUXEMBOURG

Joint statement issued by the European Commission and the EIB on July 31, 1996

Since the conclusions of the European Council in Madrid in December 1995, the prospectus of all new debt instruments issued by the European Community, the European Coal and Steel Community, Euratom and the European Investment Bank have contained a clause confirming the principle of one to one continuity between the ECU and the Euro. From the start of monetary union, on 1 January 1999, all interest payments and repayments of the principal will be made in the single European currency, the Euro. The substitution will be at a rate of one for one in line with the Treaty on European Union (the Maastricht Treaty), in particular Article 109(4).

The European Commission confirms that this same principle will apply to all ECU-denominated loan instruments issued by the European institutions, including those dating from before the Madrid European Council. All outstanding loan instruments will therefore be treated in the same way at the start of monetary union.

Thus the Commission and the European Investment Bank have the same policy.

The Commission intends shortly to table proposals for Council legislation on the legal status of the Euro containing specific provisions confirming the general principle of one to one conversion for outstanding loan instruments denominated in ECU;

The total value of outstanding ECU-denominated instruments managed by the European Commission with maturity after 1 January 1999 is ECU 2 010 million. For the EIB the equivalent figure is ECU 6 000 million. This situation is clearly independent of future issues in ECU between now and December 1998.

European Investment Bank
Economics and Information Directorate
100, boulevard Konrad Adenauer L-2950 LUXEMBOURG
Fax: (352) 43 79 - 34 92