Volatility, fundamentals and economic policy

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Introduction

The central theme of this paper is the extent to which volatility on financial markets can be attributed to economic fundamentals in general and economic policy in particular. In our opinion, there is no clear connection between price dynamics on financial markets and actual economic developments or economic policy, at least not in the short term. Sometimes there is no link at all between volatility and fundamentals, but there are also periods in which (expected) developments in fundamentals do influence price dynamics on financial markets. Conversely, volatility also has implications for policy-making.

The paper is arranged as follows. The next section will give a simple account of the volatility of exchange rates and short and long-term interest rates for 1988-95, on the basis of the experiences of six ERM countries.[1] Section 2 is the main part of the paper and discusses theoretical explanations for financial market volatility. Against the background of these theories, Section 3 briefly examines the relationship between volatility and economic policy with reference to the example of the six ERM countries from Section 1.

1. Volatility in six European countries

The charts below summarise volatility on the money, bond and foreign exchange markets for six countries participating in the ERM. Interest rate volatility is calculated as the one-month moving standard deviation of the daily interest rate differentials. Exchange rate volatility is measured as the one-month moving variation coefficient in the daily exchange rate against the Deutsche Mark. This definition of the rate is chosen as the benchmark because of the Deutsche Mark's role as an anchor currency in the ERM. In the period under consideration there were no changes in the official parities between the six countries.

The charts reveal a close link between the volatility of the money and foreign exchange markets - which is not surprising in a fixed exchange rate system. Until the first ERM crisis in 1992, volatility on these markets was of little importance. Nevertheless, there was occasional tension in the ERM, and the French franc and Danish krone in particular had to be supported by intervention and limited interest rate measures in order to maintain the 2.25% band width. Exchange rate volatility in these countries and Belgium is therefore slightly higher than for the Dutch guilder and the Austrian schilling. At the time, the Dutch and Austrian monetary authorities' exchange rate policy was already aimed at a very close link with the Deutsche Mark.[2] Belgium also adopted this policy in mid-1990.

The Danish referendum on the Maastricht Treaty in June 1992 inflamed tension in the ERM, culminating in the fall of sterling and the suspension of the intervention rates by the Italian authorities on 16th September. The foreign exchange tension spread to the Danish krone and the French franc, requiring radical use of the interest rate instrument and large-scale (intramarginal) intervention to maintain the exchange rates. This infectious pattern recurred several times up to mid-1993, with other ERM currencies in the leading role. In terms of volatility, the Dutch and

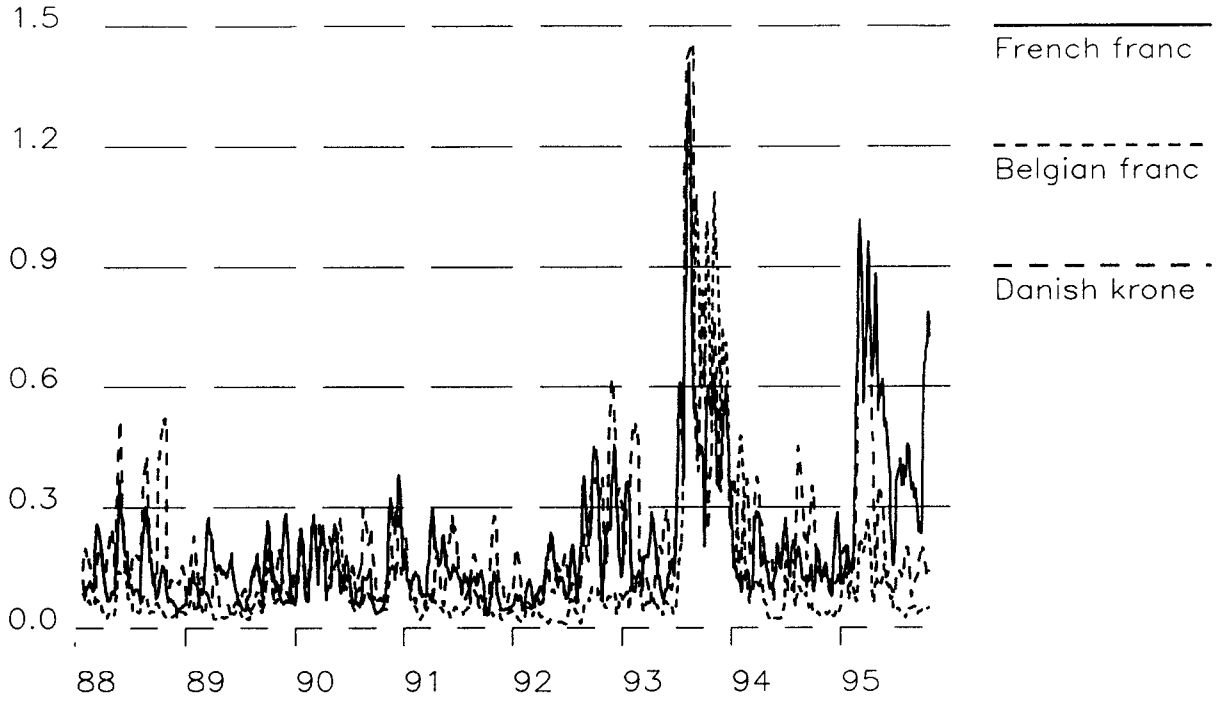
1 The six countries are Belgium, France, Germany, Denmark, Austria and the Netherlands.

2 Austria has actually participated in the ERM since the beginning of 1995.

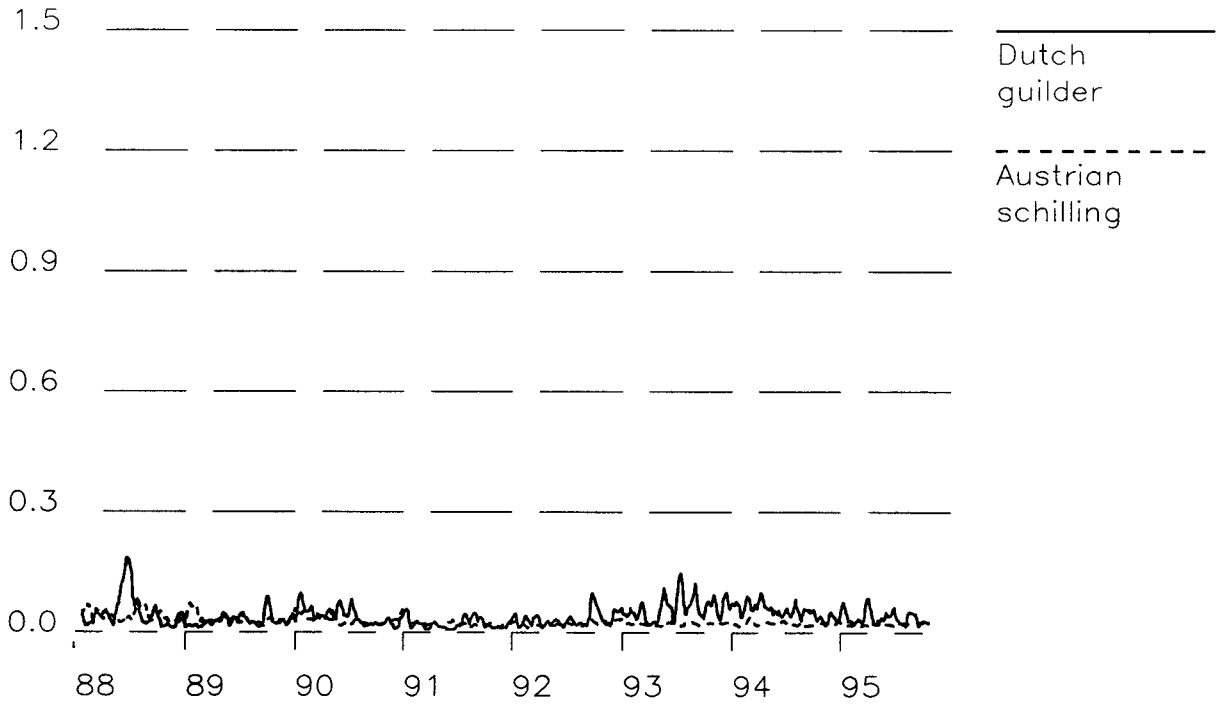
Chart 1

Volatility of exchange rates
(variation coefficient based on daily figures)

(a) French franc, Belgian franc and Danish krone



(b) Dutch guilder and Austrian schilling

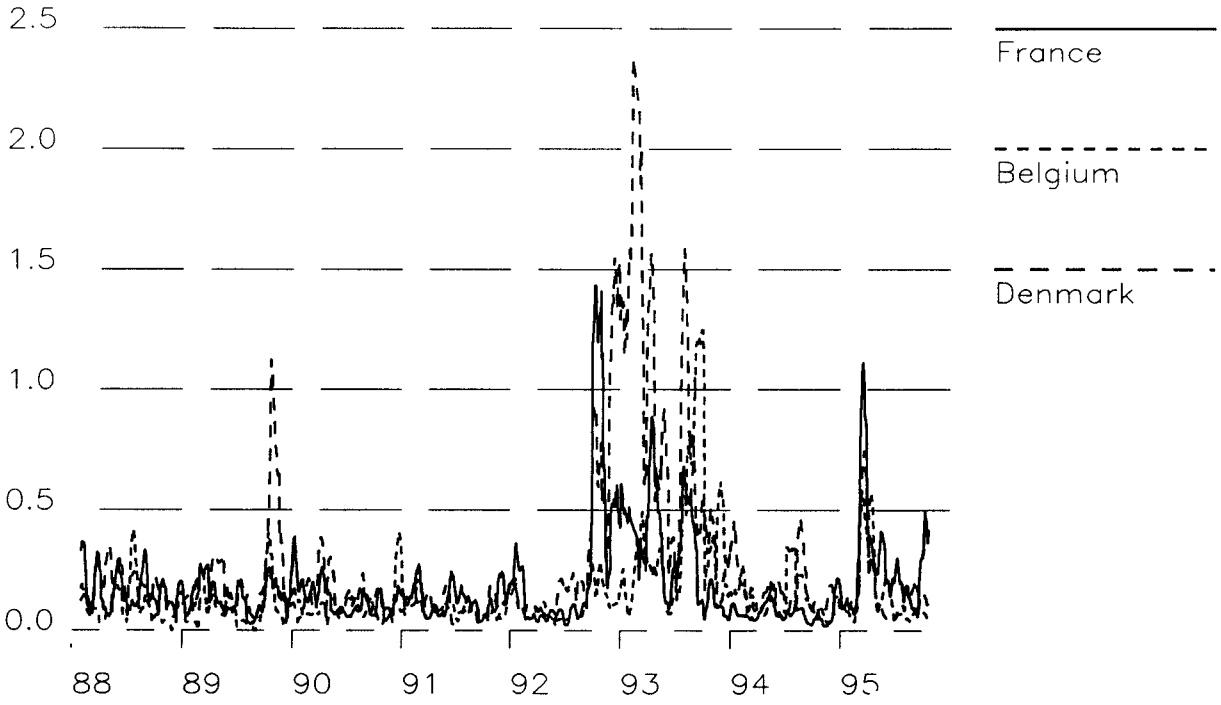


Note: All exchange rates are against the Deutsche Mark.

Chart 2

Volatility of short-term interest rates
(standard deviation based on daily figures)

(a) France, Belgium and Denmark



(b) Germany, the Netherlands and Austria

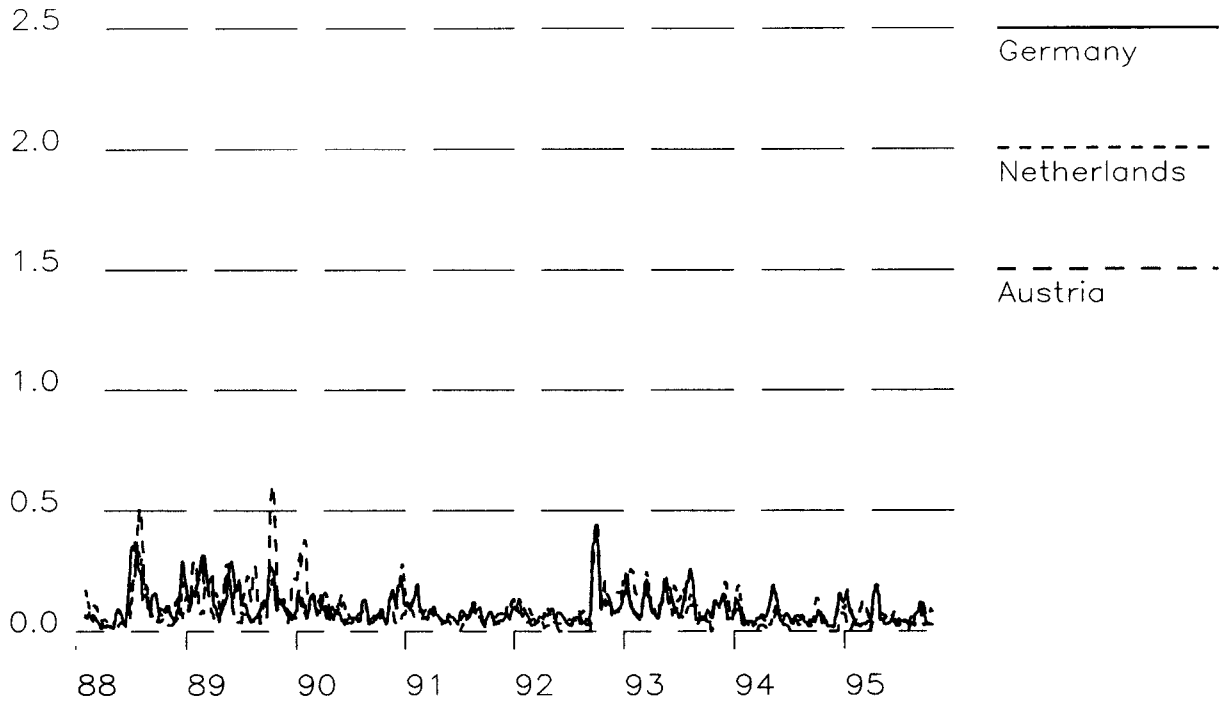
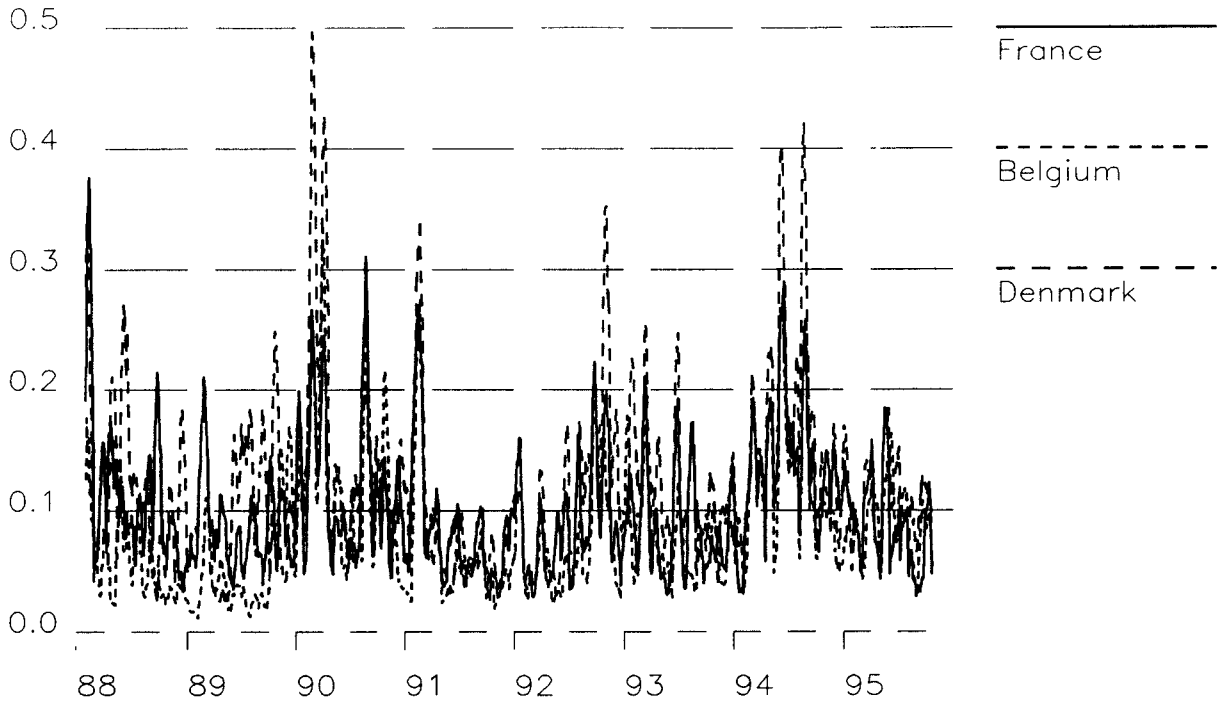


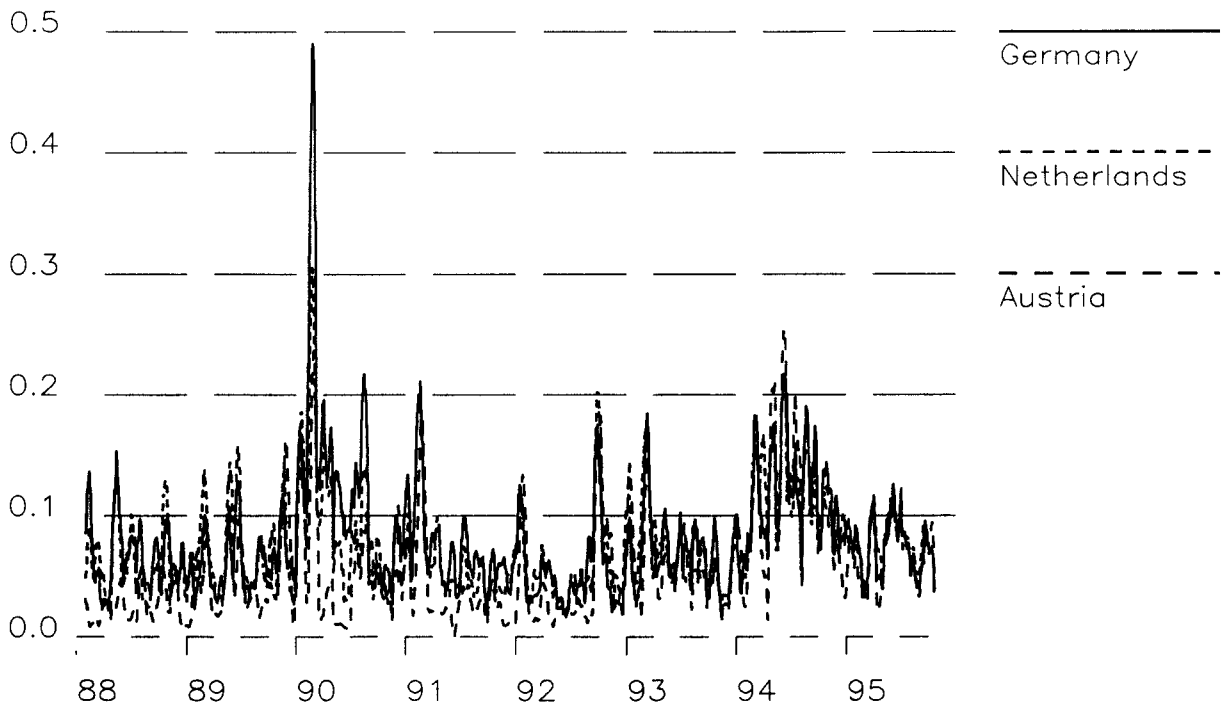
Chart 3

Volatility of long-term interest rates
(standard deviation based on daily figures)

(a) France, Belgium and Denmark



(b) Germany, the Netherlands and Austria



Austrian money and foreign exchange markets remained virtually unruffled during this period, while developments in Belgium were also largely unaffected by what was happening on partner countries' markets.

After another massive attack on exchange rate relationships in the ERM which went along with large-scale intervention and short-term interest rate increases by the French, Danish and Belgian central banks, it was decided to extend the band width to 15% with effect from 2nd August 1993. This gave the authorities concerned considerably more flexibility for coping with exchange rate tension than under the old regime. In the ensuing weeks the Belgian, French and Danish currencies weakened considerably. The six countries can be divided into two groups in terms of volatility on the money and foreign exchange markets, with Belgium, France and Denmark being more volatile than Austria and the Netherlands (and Germany, as far as the short-term interest rate is concerned). This split is interesting because the bilateral central parities between these countries did not change after January 1987, indicating that the group is relatively homogeneous. In 1994 exchange rates and money market interest rates in Europe became more settled. Volatility dropped back to the level of before mid-1992. The uncertainty surrounding the French presidential elections in the first half of 1995 was associated with problems for the French franc and to a lesser extent the Danish krone. The official rates in those countries were raised to alleviate the pressure on the exchange rates, so that short-term interest rates also increased. In Belgium the interest rate instrument was also used.

If we examine the volatility of long-term interest rates in the six countries under consideration, we do not find two distinct groups as described above. On average, the standard deviations of the long-term interest rate changes in France and Denmark, in particular, are slightly higher but over a period of time the pattern is much the same for all six countries. Since early 1988 the bond markets have twice been highly volatile. At the beginning of 1990 the European capital markets were jittery because the two Germanies were forming a monetary union. Fears that this would boost inflation led to sharp increases in German capital market interest rates, and those in other European countries followed suit. In 1994, after a gradual worldwide decline in interest rates in preceding years, interest rates moved up sharply again, bringing turmoil to the bond markets. The French and Danish bond markets experienced several upsurges in volatility outside these two periods, mostly at times when the monetary authorities felt obliged to rescue the French franc and Danish krone by intervention and interest rate measures.

A question which might arise in connection with the above volatility charts is the extent to which volatility has increased in recent years as a result of market factors such as the introduction of new financial instruments or changes in the investment behaviour of certain groups of investors (Davis (1995)). Although that question is beyond the scope of this paper, we can say that analysis of the influence of technical market factors on volatility is undeniably important and may also have implications for formulating macroeconomic policy; but such an analysis is particularly concerned with the scale of price volatility, so that the more fundamental question of the factors which explain price-setting (and thus price dynamics) on financial markets is not discussed. For a better understanding of volatility on financial markets it is therefore desirable to study the theory of pricing on financial markets in greater depth, and in particular the relationship between such pricing and underlying fundamentals such as macroeconomic policy. That is the subject of the next section.

2. Financial market volatility and the role of fundamentals

According to the efficient market hypothesis, pricing on the foreign exchange, money and bond markets should be attributable to economic fundamentals, such as GDP growth, current account, public deficits, inflation and macroeconomic policy. Just as a share price should ideally reflect the discounted value of present and future dividends, the course of the exchange rate of a national currency should merely reflect the developments in the real economy of the country concerned. Since, according to this theory, all relevant information on the fundamentals is incorporated in the price at any time, every change in the price must result from new (i.e. unpredicted) information on the

underlying real developments in the economy. Seen in this way, volatility on the financial markets, by definition, reflects the volatility of the underlying fundamentals. However, on the basis of the actual economic developments, the volatility of the prices of financial assets is many times greater than is justified by the changes in underlying real trends (for the role of expectations, see below). In the case of interest and exchange rate movements, this conclusion can be supported by elucidating the efficient market hypothesis on the basis of the purchasing power parity theory and the uncovered interest parity condition.

As we know, in the simplest version of the purchasing power parity theory a change in exchange rates between two countries results from a price level differential between those countries, and the size of the exchange rate adjustment will be precisely such that the real exchange rate does not change.[3] Empirical research (e.g. De Grauwe (1991)) indicates that purchasing power parity does not hold, certainly not in the short term: as a rule, exchange rate movements far exceed changes in relative prices. Or in other words, the real exchange rate is definitely not a constant for almost all industrial countries. Given the existence of (short-term) nominal price rigidities in the real economy, it is certainly not surprising that purchasing power parity does not exist,[4] but in the long term, too, it is often difficult to confirm purchasing power parity (but see Bartolini and Bodnar (1995)), which partly explains why it is almost impossible to reach a consensus on the long-term equilibrium value of an exchange rate.

If the efficient market hypothesis is correct, yields on securities in country A should, in principle, be the same as those in country B except for (expected) exchange rate changes and any risk premiums. If this equality holds, there is uncovered interest rate parity, and since it is assumed that the domestic and foreign yields are determined by the underlying fundamentals, the idea of efficient markets is also the basis of the uncovered interest rate parity condition. For given risk premiums, uncovered interest rate parity means that changes in the exchange rate between country A and country B must ensure identical rates of return on the financial assets in question in the two countries. There has been extensive empirical research into whether the uncovered interest rate parity holds, and in by far the majority of cases this is not the case. The exchange rate volatility observed significantly exceeds what is justified on the basis of changes in the fundamentals in the countries under consideration: the so-called excess volatility puzzle.

The trend in the actual fundamentals from 1988-95, the period considered in Section 2, does not offer a very satisfactory explanation of the exchange rate and short-term interest rate volatility observed for the six ERM countries. Broadly speaking there was nominal convergence, and the trend in real variables such as the current account balance and growth of GDP provides no obvious explanation for the increase in exchange rate and short-term interest rate volatility in three of the six countries after August 1993. In this connection, Rose (1995) finds that in general after the collapse or relaxation of a fixed exchange rate system exchange rate volatility typically increases significantly, while there is no corresponding increase in the volatility of fundamentals.

The excess volatility puzzle is at best consistent with the efficient market hypothesis if market *expectations* regarding the future course of fundamentals are taken into account (see Froot and Thaler (1990)). In principle, any form of exchange rate or interest rate change can be "justified" by regarding it as an anticipation of (policy-induced) economic shocks expected by the financial markets at any time in the future. Up to a point, for example, the ERM crises of September 1992 and August 1993 can be seen as resulting from the financial markets' expectation that certain countries would relax their monetary policy on internal grounds in the future, and therefore abandon the link with the Deutsche Mark (see also Section 4). This could explain the apparent lack of a convincing link

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3 This is also a central assumption in more elaborate variants of the purchasing power parity theory, such as the monetary model of exchange rates.

4 The assumption of sticky nominal prices in the real sector (and flexible prices in the financial sphere) forms the basis of the overshooting model, Dornbusch (1976), which does offer some explanation for short-term (exchange rate) volatility.

between volatility and actual fundamentals for countries such as Belgium, France and Denmark. Whether such expected policy changes subsequently take place in practice is of subsidiary importance. What matters is the investors' perception of a future shock. If expectations play a role, actual exchange rate and interest rate developments may deviate for quite a time from the real fundamentals.

In a world where expectations are crucial in the pricing of financial assets, individual investors will be guided partly by other market players' supposed price expectations. In principle, any form of (alleged) news can therefore influence prices in the short term. From the viewpoint of the individual investor, it can be entirely rational to contribute, willingly and knowingly, to a price trend which deviates from the fundamentals. The extensive theoretical and empirical literature on speculative bubbles (see Blanchard and Fischer (1989), p. 214 ff, and particularly Shiller (1989)) indicates that, while still assuming rational expectations and homogeneity of economic agents, the prices of financial assets may very well diverge from underlying economic trends. This means that the sole emphasis on a comparison between the volatility of financial markets and that observed in the relevant fundamentals would be rather pointless because such an analysis overlooks the working of financial markets. Assuming that bubbles are finite, then in the long term, according to this view of the way financial markets work, prices will ultimately (only) reflect the trend in actual fundamentals.

The idea that prices on financial markets have their own dynamics, different from the fundamentals, at least in the short term, is important but still tells us little about price-setting and the volatility of price movements. Moreover, this idea does not explain how the short term (e.g. fundamentals possibly not important) can be reconciled with the long term (e.g. fundamentals are decisive). However, recent, mainly theoretical research is more fruitful in addressing this kind of question.[5] By specifically assuming the heterogeneity of economic agents and the importance of the market structure in pricing, it is possible to develop a financial market model which provides a better explanation for price volatility. An essential feature of this type of model it is that individual investors take account of the (possible) actions of other investors. As the agents are heterogeneous, differing opinions can influence one another and individual investors may change their opinion, depending on the behaviour of other investors. The market structure is important in these models because (as with actual financial markets) in the absence of any central pricing the institutional arrangement of trade can influence price dynamics. Finally, in this model the possibility of imitating the behaviour of other traders permits herd behaviour.

In practice, the basic principles of the model can be explained by the following example (Kirman (1995), p. 290). Suppose that there are two groups of investors on a foreign exchange market, chartists and fundamentalists.[6] Chartists base their behaviour on extrapolating the exchange rate developments and fundamentalists are guided by the trend in economic fundamentals. There is no central pricing and the chance of an individual investor remaining or becoming a chartist or fundamentalist is *positively* dependent on the opinion of the other investors with whom this individual deals. In this connection it is important that the trade takes place decentrally and sequentially. This opinion-forming mechanism creates the possibility of self-reinforcing expectations, and it can be shown that in that case virtually all investors will be either chartist or fundamentalist at any given moment. From the point of view of financial market volatility, it is interesting that the foreign exchange market can switch en masse from chartism to fundamentalism and vice versa at moments which cannot be predicted. Such swings in market sentiment imply, almost by definition, a short-term increase[7] in price volatility. The example also shows that all swings in market sentiment are temporary so that it is only a matter of time before a chartist market becomes a market consisting primarily of fundamentalists. This therefore means that the market will always revert (if only

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5 The passage below is based on Kirman (1993, 1995) and Frankel and Froot (1990).

6 The same mechanisms may also be found to a large extent on securities markets. See also Davis (1995) for a list of the reasons which may lead to herd behaviour among institutional investors.

7 The relevant time-scale may be very short because the bulk of foreign exchange market dealing concerns intraday transactions.

temporarily) to pricing based on fundamentals. However, the moment at which this happens is *indeterminate* so that in the short term it is not rational for an individual foreign exchange dealer to gear his investment behaviour constantly to the trend in the fundamentals: "there is little to be gained from taking a position on the basis of a return to fundamentals at some indeterminate time in the future" (Kirman (1995), p. 290).

The theories on which the above example is based lead to an important conclusion regarding volatility on financial markets. In contrast to what is stated by the efficient market hypothesis, volatility on financial markets (i.e. changes in financial prices) is not necessarily due to underlying economic developments. Recent theoretical findings indicate why volatility on financial markets can to some extent deviate from the trend in fundamentals, and also why such deviations may be entirely rational from the standpoint of the individual agent. At the same time, the modern literature tells us that there are periods in which the financial markets are (again) influenced by fundamentals and that changes in financial prices are connected with the fundamentals after all. One fundamental which is relevant from the point of view of, for instance, the central bank is macroeconomic policy. The next section will offer a brief sketch of the possible influence of policy on financial market volatility.

3. Price dynamics and economic policy

Before examining the connection between policy and volatility, it is useful first to consider whether financial market volatility (whether or not policy-induced) may have negative implications for the functioning of the real economy. In the theoretical world of the efficient market hypothesis, perfect market efficiency is linked to perfect foresight (or its stochastic equivalent, rational expectations), which means that individual agents are always fully informed of current and future developments in all economic variables. In other words, there is no uncertainty and the degree of price volatility has absolutely no influence on economic decisions. The question whether economic policy promotes price volatility then becomes a non-issue. However, if we assume that there is uncertainty or incomplete information, price volatility may actually have negative real implications. In that case great variability of (nominal) financial prices such as exchange rates and interest rates may disrupt the basic allocation of resources. The possible negative repercussions of financial market volatility for international trade and, more generally, savings and investment decisions, often quoted in the literature, are ultimately based on this idea. If volatility has negative effects on the real economy, it is naturally important to know whether the policy promotes financial market volatility and, more generally, what is the relationship between volatility and economic policy.

To start with, it is important that policy itself does not heighten uncertainty. This means a policy which (regardless of the specific policy objective) is not constantly modified and is aimed at the medium term. As the 1992 and 1993 ERM crises also taught us, unclear policy signals may prompt an abrupt response by investors, increasing volatility in the liberalised financial markets of today. In the terminology of the preceding section, an expected policy adjustment will increase volatility because of a switch to a new model of the economy concerned. The possibility (see BIS (1995)) that investors may over-react to (supposed) news about economic policy provides a further reason for trying to pursue a policy aimed at stability.

A second link between policy and volatility concerns policy differences between countries and the lack of mutual policy cooperation. The high degree of international capital mobility undeniably acts as a (rather imperfect) disciplinary device for the national policy-maker. Experience has shown that this increased mobility means that national policy differences may encourage substantial capital movements and hence volatile prices on financial markets. This underlines the importance of international policy coordination. In the European context (see Buiter (1995)) the aim of a single currency can therefore be seen to some extent as a consequence of the fact that national monetary policy has to be increasingly conducted in a (potentially) volatile environment.

A next question in this paper is how the theories described in Section 2 and the above general ideas on the relationship between policy and volatility can be illustrated using the charts presented in Section 1. All six countries considered produce roughly the same pattern of long-term interest rate volatility (see Charts 3a and 3b). The scale of the volatility (measured by the standard deviation) is also more or less the same. The two volatility peaks, 1990 and 1994, are partly due to a change in the investor model in that existing, apparently fixed ideas on policy and/or economic developments came under discussion. The greater uncertainty associated with such a change was expressed in increased volatility. In the early 1990s, the shock of the "collapse of the Berlin wall" led to an adjustment of the model and in 1994 a turnaround in the business cycle and greater uncertainty over macroeconomic policy led to increased volatility.[8] In both examples the fundamentals therefore suffered a shock but, in line with the theories in Section 2, this certainly cannot explain day-to-day volatility. Apart from these two episodes it is often very difficult to find a direct relationship between long-term interest rate volatility and changes in fundamentals. The fact that, *ex post*, investors do connect virtually any price movement on the international bond markets with fundamentals, as we read in the financial press every day, does nothing to alter this finding.

The reasonably uniform trend in long-term interest rate volatility for the six ERM countries can be largely explained by the high degree of international capital mobility. The exchange rate and the short-term interest rate volatility seem, however, more determined by national (policy) variables. Evidently, the exchange rate objective has direct implications for exchange rate volatility and also, in principle, for the volatility of the short-term interest rate. One might expect an inverse relation between the volatility of the exchange rate and that of short-term interest rates but, as indicated in the charts, an increase in exchange rate volatility is often also associated with an increase in short-term interest rate volatility, so that there is not necessarily a clear trade-off (see also EMI (1995)). For three of the six countries, France, Belgium and Denmark, the period around August 1993 represents a watershed in the volatility of the exchange rate and short-term interest rate. After the widening of the ERM margins there was an increase in volatility in these countries in contrast to the Netherlands and Austria, and Germany as regards short-term interest rates (see Charts 2a and 2b). It is conceivable that financial markets saw the wider ERM fluctuation margins for France, Belgium and Denmark as a transition to a new model in which there was (initial) uncertainty over the importance which would be assigned to the exchange rate objective in the future. As regards the Netherlands and Austria, the fact that (exchange rate) volatility remained as low as ever might indicate that investors considered that the exchange rate policy in both countries was highly credible and assumed there was be no change of model.[9] For the Netherlands and Austria there seems to be only one model. Although the expansion of the ERM fluctuation margins may be seen as an institutional shock which may (to some extent)[10] explain the increased volatility for a number of ERM countries, it is still true that, as in the case of long-term interest rate volatility and in line with the theories explained in Section 2, the development of volatility is very difficult if not impossible to discern in the short term.

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8 Also, in bear markets (such as in 1994) volatility is greater on average.

9 Note that the expansion of the fluctuation margins as such did not apply to these two countries. The Netherlands stayed with the "old" 2.25% margin while Austria was still not formally a member of the ERM in 1993.

10 As pointed out earlier, compared with the volatility of the dollar/Deutsche Mark rate, for example, exchange rate volatility in the ERM was still very low after August 1993.

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