

Modelling shocks and adjustment mechanisms in EMU

EMU study by Dr Peter Westaway



HM TREASURY

EXECUTIVE SUMMARY

1 This study looks at the macroeconomic implications of the UK joining Economic and Monetary Union (EMU). It considers how the UK's macroeconomic costs of adjustment to economic shocks compare inside and outside of EMU. The study focuses on the current policy environment where UK interest rates are available to respond to economic shocks and the bilateral nominal sterling-euro exchange rate is free to vary. It compares this with the alternative inside EMU where UK interest rates would be determined by the European Central Bank (ECB)'s single monetary policy and the bilateral sterling-euro exchange rate would be irrevocably fixed.

2 The major contribution of this study is the application of a new stylised model specifically designed to analyse adjustment processes in and out of EMU with possible UK entry into EMU in mind. As such, this model offers advantages over models adopted in previous work and allows several relevant policy questions to be addressed.

Evaluating existing empirical evidence on cyclical divergences

3 Different empirical evidence and analytical tools have typically been used in the academic literature on the desirability of monetary unions. One approach analyses the correlation between business cycles in the UK and euro area. Whatever the methodology – straightforward growth rate correlations, correlations of business cycle turning points or output gaps – this approach suggests that, historically, UK and euro area business cycles have differed significantly.

4 This analysis does not, however, indicate why such differences exist. So another strand of empirical work develops modelling techniques to disentangle the influence of asymmetries in shocks and structures on business cycles in different countries. An example using an approach pioneered by Bayoumi and Eichengreen (1993) suggests different responses to demand and supply shocks in the UK and the euro area.

5 However, both these approaches relate to the past, and so are of limited use when considering the question of possible UK entry to EMU. In EMU, it would be likely that the UK response to shocks would change; for example, due to the different monetary policy regime or to changes in trade patterns. Moreover, the nature of shocks could also change, perhaps due to changes in production structures or due to the loss of an independent exchange rate (which some argue is itself a source of shocks).

6 To analyse the UK response to shocks in EMU, it is necessary to use different tools: structural macroeconomic models. These allow researchers to control explicitly for changes in the monetary policy regime, as well as the private sector responses to the different policy environment. This study considers the National Institute Global Macroeconometric Model (NiGEM) and the IMF Multimod model.

7 Although these models are empirically estimated, they predict some differences in how the UK economy might respond to shocks compared to the euro area. Since these models are fairly large and complex, it is difficult to disentangle all the causes of these differences.

Understanding business cycles using a stylised model

8 To address this, a simple stylised macroeconomic model is used in this study as a diagnostic tool. One of the key advantages of this approach in the policy context is that the results are transparent and easier to interpret. The model adopted has very conventional properties in the spirit of recent models used in the analysis of monetary policy in a single-country context (see Clarida *et al.*, 1999, for example). But it is specifically tailored to reveal the key aspects of the possible interactions between the UK and euro area economies.

9 This systematic analysis of the possible response of the UK economy to shocks inside EMU compared to outside is similar in motivation to analysis carried out in the original ‘One Market, One Money’ study (see European Commission, 1990). And it addresses many of the same issues highlighted in recent work, for example by Blanchard (2001), which considers the extent to which macroeconomic divergences within EMU since 1999 can be explained by these intra-EMU adjustment mechanisms being played out.

10 The diagnostic model developed here has three stylised country blocks: the UK, the euro area economies and the rest of the world. Since these country blocks can be characterised as small, medium and large, the model is known as the ‘Three Bears’ model. It incorporates forward-looking and lagged behavioural responses and features:

- a simple IS curve where aggregate demand depends on the real interest rate and the real exchange rate (separating out influences from the real exchange rates of the different trading partners for each country);
- a simple Phillips curve where changes in inflation are driven by the output gap augmented by an influence from the real exchange rate to incorporate effects from overseas prices;
- bilateral nominal exchange rates assumed to be determined by the appropriate uncovered interest parity (UIP) condition; and
- a simple policy rule for determining the path of nominal interest rates.

Modelling the responses to shocks, in and out of EMU

11 One of the key insights is the different way that the UK adjusts to shocks in EMU compared to when it is outside, particularly in the face of shocks that are specific to the UK. Outside EMU, with an independent monetary authority targeting UK inflation, the UK price level is allowed to ‘slip’ in the face of shocks, with the nominal exchange rate playing a role in facilitating re-adjustments in the real exchange rate between the UK and the euro area.

12 Inside EMU, the monetary policy authority targets euro area inflation, so would take account of UK inflation only in as much as it contributed to the aggregate euro area inflation rate (where the contribution would be roughly a fifth, based on the UK’s weight in euro area GDP). So UK real interest rates would no longer play the primary adjustment role and may sometimes even be destabilising. This would occur when the ECB’s nominal interest rate response to a shock is less than the effect of the shock on UK inflation itself. So for inflationary shocks that are specific to the UK, real interest rates in the UK will fall, potentially reinforcing the effects of the original shock.

13 Instead, without an independent monetary policy or a nominal exchange rate between the UK and the euro area, the burden of adjustment would be on the real exchange rate (i.e. the relative price between the UK and the euro area.). In this case, the euro area price level would act as a nominal anchor for the UK price level with little slippage. So UK inflation would need to differ from inflation in the euro area for as long as necessary to bring about the required relative price change. This would necessitate greater fluctuations in UK output relative to potential as a consequence.

14 Because of these changes to the adjustment mechanisms inside EMU compared to outside, the model suggests that, inside EMU, the UK real exchange rate adjustment would not be as smooth but would follow a more oscillatory path compared to outside. This tendency may be moderated if firms and households respond more to long-term measures of real interest rates. But the destabilising tendency may be aggravated if firms and consumers respond slowly to interest rate changes.

- Other adjustment mechanisms: (i) fiscal policy** **15** Although the independent interest rate and variable nominal exchange rate would be lost on EMU entry, other adjustment mechanisms would still be available. The model shows that fiscal policy can be designed to stabilise the response of the economy to shocks when the UK is in EMU. In practice there are of course problems with designing effective discretionary fiscal policies. The stylised analysis of fiscal policy in this study does not attempt to address the practical questions that would need to be addressed if effective discretionary fiscal policy were to be implemented.
- (ii) greater wage and price flexibility** **16** Ultimately wage-price flexibility might offer the most effective means of avoiding output costs inside EMU, though inflation variability may be higher as a result. The basic model in this study assumes a reasonable degree of wage and price rigidity. Wage contracts, menu costs and backward-looking inflation expectations prevent immediate adjustment to a shock. If this assumption were relaxed, so that prices were assumed to be fully flexible, then in the face of symmetric demand shocks, inflation would remain on target with no adverse implications for output stability in both the UK and the euro area.
- Implications of different types of structural asymmetry** **17** The ‘Three Bears’ model builds in structural asymmetries associated with different degrees of international openness and patterns of trade between the UK and the euro area. But it assumes no behavioural asymmetries. This is a simplifying assumption, partly motivated by the empirical literature, partly by the argument that any differences that do exist may diminish in EMU through the process of endogenous convergence; that is the process whereby UK behavioural responses become more similar to those in the rest of the euro area.
- 18** But it can also be argued that behavioural asymmetries between the UK and the euro area would remain if the UK were to join EMU. So sensitivity analysis is undertaken on some of the key structural features of the model:
- for example, making demand more sensitive to interest rates in the UK than in the euro area (reflecting, for example, the importance of housing in the UK transmission mechanism) means that the real interest rate channel would be more pronounced for the UK in EMU, leading to more vigorous output responses inside EMU compared to outside; or
 - making prices more flexible in the UK than in the euro area makes UK inflation volatility higher in the face of asymmetric shocks inside EMU. But this additional volatility would be less the more flexible is price setting in the euro area. This diagnostic exercise highlights the potential importance of the degree of flexibility in the UK and the euro area, not just in absolute terms but in relative terms too.
- Calculating the potential costs of EMU membership** **19** The implications of different modelling assumptions for expected macroeconomic outcomes highlight the importance of considering policymakers’ output-inflation preferences when examining possible entry to EMU. An explicit measure of the costs of macroeconomic volatility needs to be defined if the potential size of overall macroeconomic costs is to be compared with that associated with remaining outside. Moreover, if EMU entry does change the nature of macroeconomic volatility, this may have implications for the level of output in the UK,¹ although this study does not attempt to quantify these long-run effects. All these influences need to be considered alongside the potential benefits from EMU entry, which are examined in detail in other EMU studies.

¹ For example, paragraph 2.2 of the 2002 Budget (HM Treasury, 2002) states that “*Large and unpredictable fluctuations in output, employment and inflation impose significant economic and social costs and can hold back the economy’s long-term growth potential*”.

20 The potential macroeconomic costs of EMU entry are estimated in this study using a technique known as stochastic simulation analysis. This requires a model of the behaviour of the economies in question; and of the statistical distribution of all relevant shocks expected to hit those economies. Macroeconomic volatility is evaluated and compared across policy regimes by examining the implications for the variability of inflation from target and of output from potential. The question of the appropriate relative weighting to be placed on inflation and output variability is a policy choice beyond the scope of this study, as is the question of whether other objectives should be considered.

Estimates of the costs of EMU

21 Two recent studies, using different models, evaluate the macroeconomic costs or benefits of UK membership. Barrell and Dury (2000) find that, under a range of assumptions, inflation variability is predicted to be lower inside EMU, while output volatility is estimated to be higher. By contrast, Minford (2001) predicts that both inflation variability and output volatility would increase inside EMU, markedly so in the case of inflation volatility.

22 There are many reasons for the divergence in results. One relates to the assumed properties of the adopted models. With more flexible prices, as in Minford (2001), more reliance is placed on inflation as the primary adjustment mechanism inside EMU. Another explanation lies in the treatment of exchange rate shocks and how they are assumed to evolve were the UK to join EMU. Overall macroeconomic volatility could fall if the shocks to the exchange rate were assumed to become more benign for the UK, for example because shocks to sterling as a separate currency would be absent. But volatility might rise if the shocks impinging on the euro (and hence on the UK's exchange rate inside EMU) were more volatile than those sterling had experienced outside EMU.

Estimates from the stylised model

23 Stochastic simulation exercises are also undertaken on the 'Three Bears' model. First, they are used to show how different types of shocks affect inflation and output volatility inside EMU compared to outside. Second, different calibrations of the model and of the estimated shocks to the model illustrate how overall macroeconomic volatility might be affected by UK membership in the face of plausible combinations of shocks inside and outside EMU.

24 The main conclusion is that, under a range of assumptions, UK inflation and output volatility is predicted to increase if the UK were to join EMU relative to staying outside. This increase can be modified if fiscal policy is used actively inside EMU as an additional adjustment mechanism. And the increase in volatility can be reversed altogether if exchange rate shocks outside EMU are estimated to have been particularly detrimental. So under that assumption, volatility could diminish if the UK were to join EMU.

25 Overall the analysis confirms the prediction that, on *a priori* grounds, it is not possible to say whether macroeconomic volatility in the UK would increase or decrease inside EMU compared to outside. But the analysis provides a conceptual framework which helps to explain how different assumptions about the workings of the macroeconomic environment can lead to different conclusions regarding the degree of macroeconomic volatility inside EMU compared to outside.

26 Again, it is important to emphasise that this study focuses on the likely scale of the ongoing costs associated with adjustment to shocks inside EMU compared to outside. It does not attempt to estimate how any such change in macroeconomic volatility might affect the long-run level of productive potential in the UK. Nor does it compare these costs with the potential benefits which EMU entry offers. The overall assessment of the economic case for UK entry to EMU makes this comparison.

27 This study informs the assessment of the convergence test, the first of the Government's five economic tests for EMU entry; the flexibility test, the second test; and the growth, stability and jobs test, the fifth test.