4 Empirical Evidence on the Stabilising Role of Exchange Rates

The relation between exchange rate movements and the business cycle appears fairly weak. But with the exception of the early 1980s, nominal exchange rate movements do not appear to have destabilised the economy.

Academic research has found that macroeconomic volatility is largely unrelated to whether a country has a fixed or floating exchange rate.

Econometric analysis of the unexpected movements in UK output, prices and exchange rates does not support the proposition that a flexible exchange rate provides an additional source of shocks to the economy.

Without observing the counter-factual of what would have happened if the exchange rate had not moved, it is difficult to say how big a shock absorbing role it plays.

But it is likely that adopting a permanently fixed exchange rate (as in EMU) would mean that pressures that are currently absorbed by the exchange rate would have to be absorbed by other adjustment mechanisms.

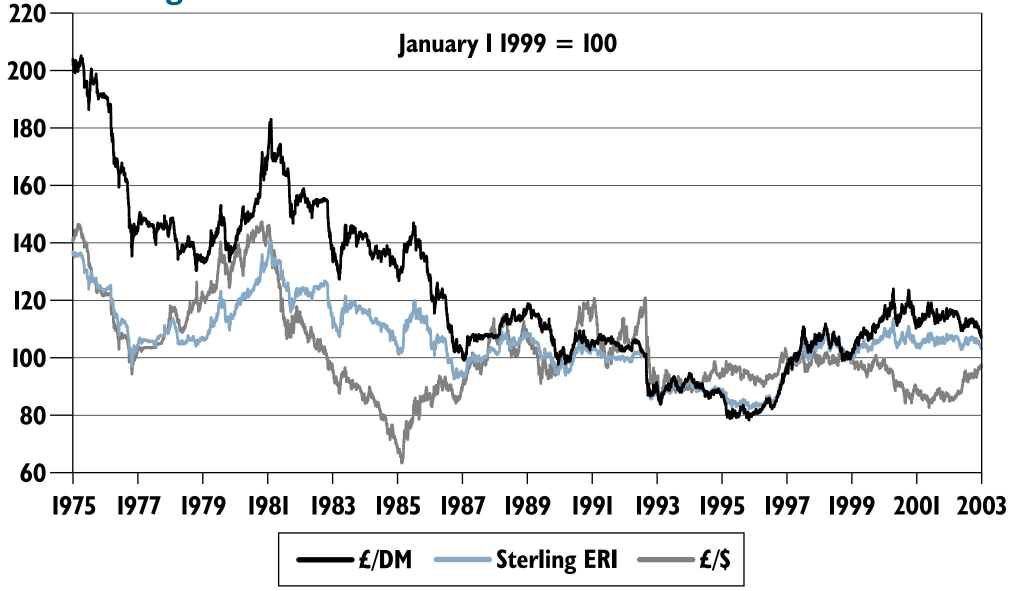
4.1 This section considers various methods that have been used to analyse the extent to which movements in nominal exchange rates have helped to stabilise or destabilise the economy, with particular reference to the UK.

4.2 The problem that empirical studies of this issue face is how to distinguish between warranted and unwarranted movements of the exchange rate. This turns out to be less straightforward to do than it might appear. This section first presents and reviews some descriptive analyses of exchange rate movements over the past thirty years. It then goes on to review econometric studies that use more technically sophisticated econometric techniques to consider this question.

4.3 Sterling's nominal exchange rate has fluctuated considerably over the past thirty years. Between 1975 and 1995 it depreciated by 29 per cent against the US dollar and 59 per cent against the deutschmark, and between 1995 and 2002 it depreciated by a further 5 per cent against the US dollar but appreciated by 38 per cent against the deutschmark (Chart 4.1). These movements, and those of sterling against the UK's other trading partners are reflected in the sterling exchange rate index (ERI). When sterling moves in a different direction against the dollar than against the euro, the exchange rate index will be less volatile than the bilateral exchange rate, as has been the case, for example, since 1999.[1] During the 1970s, nominal and real exchange rate movements were weakly correlated, as inflation outcomes in the UK differed substantially from those in other major economies. More recently, the narrowing of inflation differentials has meant that the correlation between the nominal and real exchange rate has strengthened (Chart 4.2).

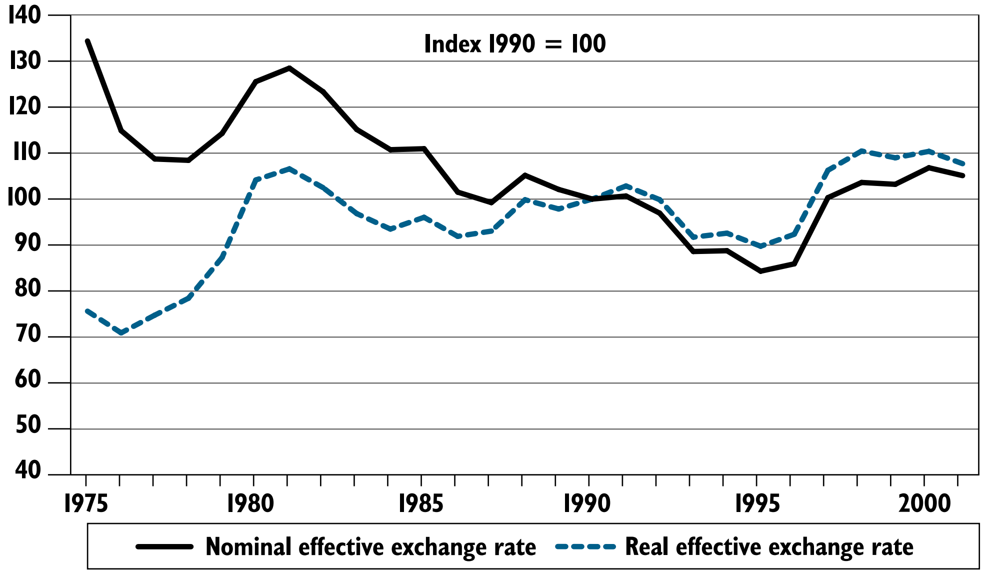
[1] The ERI is an example of an effective exchange rate index (see Box 1.1). Annex B illustrates how different weighting schemes affect the volatility of such measures.

Chart 4.1: Sterling-deutschmark (sterling-euro from 1 January 1999) and sterling-US dollar bilateral exchange rates and sterling ERI



Source: Bloomberg, Bank of England and HM Treasury calculations.

Chart 4.2: UK nominal and real effective exchange rate



Source: HM Treasury.

Exchange rate movements and the business cycle

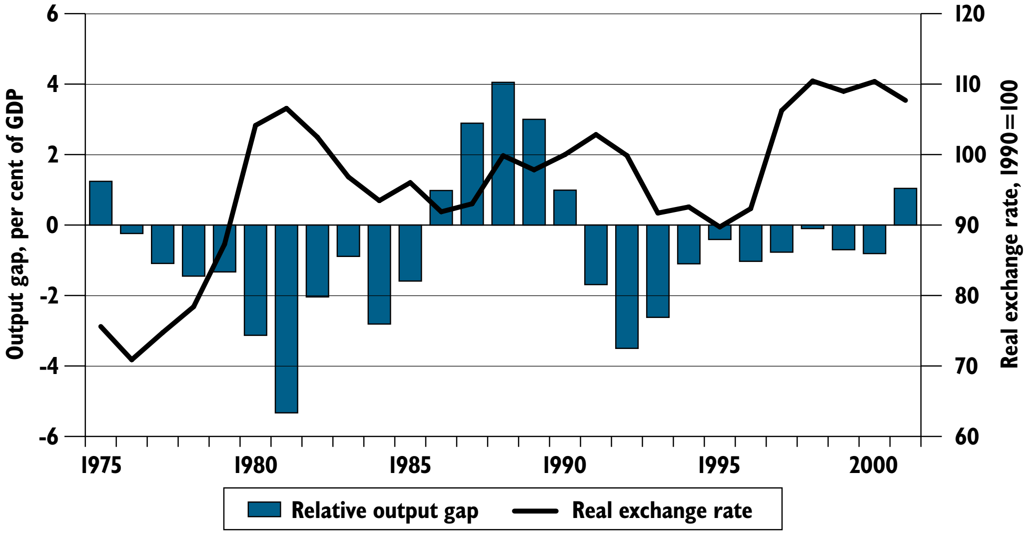
4.4 In order to stabilise economic activity, sterling's real exchange rate should, other things equal, appreciate when demand is stronger in the UK than in its main trading partners, and depreciate when it is weaker.

Exchange rate movements and the business cycle

4.5 In practice, the correlation between sterling's exchange rate and its relative demand (measured by its relative output gap[2]), has been weak (Charts 4.3 and 4.4). That said, with two notable exceptions, sterling's movements do not seem to have been particularly destabilising. Indeed, over extended periods it has moved in a direction consistent with the UK's relative cyclical position:

- between 1981 and 1986 the UK's relative cyclical position was weak and sterling depreciated in both nominal and real terms;
- between 1986 and 1990 the real exchange rate appreciated when the UK relative cyclical position was strong. The nominal exchange rate was broadly stable over this period, with most of the real appreciation attributable to higher inflation in the UK than in our main trading partners;
- between 1992 and 1993 the real exchange rate depreciated when the UK relative cyclical position was weak. The nominal exchange rate depreciation after sterling left the ERM was an important component of the real depreciation; and
- between 1994 and 1996 and also between 1998 and 2002 the UK cyclical position was broadly the same as in other major countries and sterling's exchange rate remained approximately stable in both real and nominal terms.

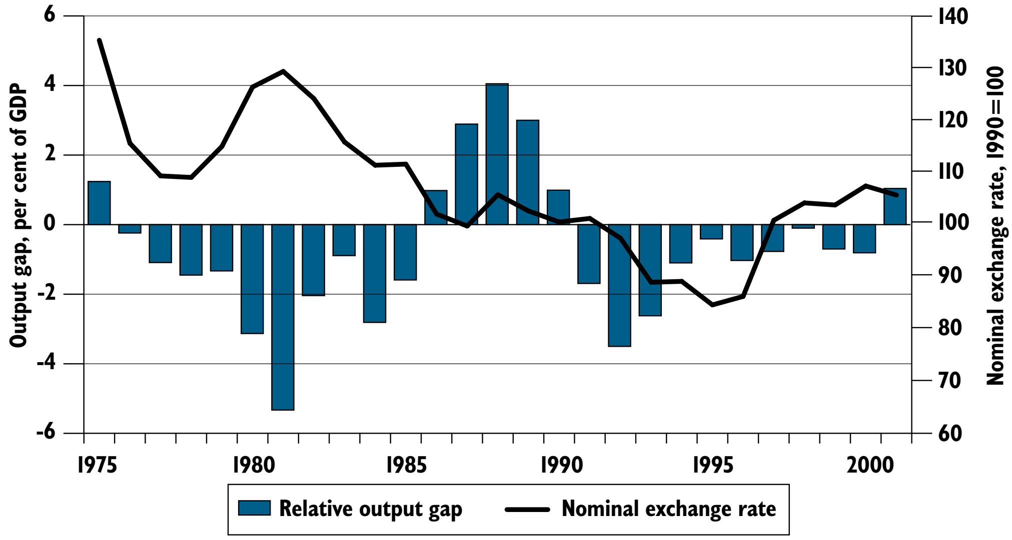
Chart 4.3: UK real exchange rate and relative output gap



Source: OECD, JP Morgan, HM Treasury calculations.

[2] The relative output gap for the UK is its output gap (the difference between its actual and potential output) minus the weighted average output gap of the US, Germany and Japan, using GDP weights.

Chart 4.4: UK nominal exchange rate and relative output gap



Source: OECD, JP Morgan, HM Treasury calculations.

4.6 The two episodes where the real exchange rate change appears to have been destabilising were:

- between 1978 and 1981, when the exchange rate appreciated sharply even though the UK cyclical position was relatively weak. During this period, there were strong upward pressures from the rapid improvement in the UK's balance of payments on oil, and from the tight monetary policy stance; and
- between 1990 and 1992, when the real exchange rate remained approximately constant despite the UK's relatively weak cyclical position. During this period, sterling's nominal exchange rate was constrained by participation in the ERM.

4.7 The other striking feature of this analysis is that sterling's strong appreciation between 1996 and 1998 appears unrelated to the cyclical position. With the relative output gap close to zero between 1995 and 1998, an appreciation of this scale does not appear to have been needed to stabilise the cyclical position. But nor did the appreciation cause the cyclical position to deteriorate.

4.8 On balance, this evidence does not offer much support to the view that nominal exchange rate movements tend to be a significant source of shocks to the economy. But the extent to which nominal exchange rate movements help to stabilise the economy appears to vary over time. Nominal depreciations in the early 1980s and after 1992, and the nominal appreciation between 1996 and 1998, were key components of the respective real exchange rate adjustments, while at other times real exchange rates have tended to be driven by differences between UK and foreign inflation.

4.9 In a similar analysis of exchange rate changes and the business cycle in the main industrial economies, the IMF (1998) reached similar conclusions:

> "*there does appear to be a positive correlation between currency movements and the business cycle in several prominent episodes. ... At other times, however, the correlation between exchange rates and the cycle is less apparent or even negative*" (page 62).

Exchange rate changes and monetary policy

4.10 Cobham (2002) argues that exchange rate changes have not generally helped to stabilise the economy. He analyses whether movements in sterling were expected or welcomed by the UK monetary authorities, and concludes:

> "*... the exchange rate has not generally functioned as a useful automatic equilibrating mechanism or as a useful policy instrument; ... in nearly every phase there were movements of the exchange rate, or pressures on it, which for the authorities were unexpected and unwelcome. Thus the exchange rate has typically been a source of extraneous shocks*" (page 70).

4.11 Cobham's analysis is based on deviations of the real exchange rate from its long-run average, and does not include explicit consideration of the cyclical position of the economy. For the real exchange rate to act as a stabilising mechanism, it should be expected to depart from its equilibrium level when there is either excess supply or excess demand in the economy. Departures of the exchange rate from its long run average do not necessarily equate to destabilising movements, just as departures of the interest rate from a neutral policy stance are not necessarily destabilising. Without relating exchange rate movements to the underlying cyclical position, it is not possible to reach a meaningful conclusion as to whether particular movements are acting as an equilibrating mechanism.

4.12 Neither does the observation that exchange rate movements were unexpected and unwelcome to the authorities help to resolve the question as to whether the exchange rate is a source of extraneous shocks. While consistent with the proposition that the exchange rate is a source of shocks, it is also consistent with the alternative proposition that exchange rate movements are one of the channels through which shocks to the economy are transmitted. Either way, the fact that exchange rate movements are unexpected is consistent with the efficient markets hypothesis, which implies that exchange rate movements should be unpredictable (see Section 2). The finding that the authorities do not tend to welcome exchange rate movements is consistent with their existing policy stance having already been aligned with their previous reading of economic conditions.

4.13 Hence while Cobham's analysis provides interesting insights into the history of UK monetary policy, the evidence it provides does not prove that the exchange rate has typically been a source of extraneous shocks.

Macroeconomic volatility under different exchange rate arrangements

Macroeconomic volatility under different exchange rate arrangements

4.14 Flood and Rose (1999) note that a number of researchers have attempted to assess whether countries with flexible exchange rates are more vulnerable to economic shocks than countries with fixed exchange rates. They summarise these studies as follows:

> "*there is remarkably little evidence of a systematic relationship between the exchange rate and measurable macroeconomic phenomena…Simply put…countries with fixed exchange rates have less volatile exchange rates than floating countries, but macro-economies that are equally volatile*" (page 661).

4.15 This evidence could be interpreted as showing that having a flexible exchange rate does not expose countries to additional sources of shocks. But it could also be interpreted as showing that flexible exchange rates are no better at absorbing shocks than fixed regimes.

4.16 These interpretations are not mutually exclusive, particularly if the existing configuration of exchange rate regimes broadly satisfies the optimal currency area criteria. If this is the case, then countries with fixed exchange rate regimes should be able to absorb shocks without the need for nominal exchange rate adjustment, while countries with flexible rates should find it easier to allow some adjustment through the nominal exchange rate.

Econometric identification of the source of shocks

Econometric analyses: the SAVR technique

4.17 Another way to analyse exchange rate volatility is to use econometric techniques to identify how different shocks impact on the economy. Various studies have used the technique of structural vector autoregressions (SVAR) to do this. The SVAR technique uses statistical methods to analyse the relationship between a set of variables and the shocks that impinge on them. In the analyses considered below the set of variables generally includes measures of the exchange rate, output and inflation, and in some cases, the interest rate.

4.18 A number of studies have used this technique to investigate the extent to which exchange rate movements tend to be associated with movements in other economic variables either immediately or in the longer-term:

- a finding that large exchange rate changes tend to have big effects on output and prices, and that it tends to move in an inappropriate direction, (i.e. to appreciate when the currency was weak or depreciate when it was strong), would indicate that exchange rate movements tend to be destabilising;
- a finding that large exchange rate movements tend to have big effects on output and prices, and tend to move in an appropriate direction would be consistent with exchange rate movements having a strong stabilising role; and
- a finding that large exchange rate movements tend not to be associated with movements in other economic variables would be consistent with it acting as a shock absorber. This is because a shock absorber should take the impact of forces that would otherwise have other effects.

4.19 A number of approaches have been used to analyse the relation between the exchange rate and other variables. These are described in more detail below and in Annex A, which describes a model constructed by HM Treasury. This model investigates the interaction of UK output, prices, the short-term interest rate and the real exchange rate. It uses two different approaches to identify shocks that loosely follow the approaches of Clarida and Gali (1994) and Artis and Ehrmann (2000), which are explained in Box 4.1 and Box 4.2.

4.20 Despite the differences in approach, the various studies find that large exchange rate changes are not typically associated with changes in output or the price level. This finding is most consistent with the shock absorber explanation. It suggests that exchange rate changes tend to deflect some of the impact that demand shocks might otherwise have had.

Box 4.1: Clarida and Gali's SVAR model

Clarida and Gali (1994) used the SVAR methodology to investigate the relationship between real exchange rates, relative output and relative price levels for a number of countries, including the UK. They identified three structural shocks as follows:

- **relative supply shocks comprising all shocks that had a permanent effect on the level of output in the UK relative to output in the US;**
- **relative demand shocks comprising all remaining shocks that had a permanent effect on the level of the real exchange rate; and**
- **relative nominal shocks comprising all remaining shocks.**

These definitions mean that all three structural shocks can have permanent effects on relative price levels, whereas only supply and demand shocks can permanently affect the real exchange rate, and only supply shocks can permanently affect relative output levels. These restrictions only apply to permanent effects. This means that all three structural shocks may have a temporary effect on output, prices or the real exchange rate. These 'temporary' effects may be quite long-lasting. They are temporary in the sense that they are not permanent, rather than in the sense that they only persist for a short period.

Exchange rate volatility

4.21 The SVAR technique can be used to analyse the extent to which the economy responds to particular shocks. This is done by considering the contribution of each shock to the errors made in forecasting each variable. Studies of the UK exchange rate have tended to attribute a high proportion of unexpected exchange rate movements to asymmetric demand shocks (Tables 4.1 and 4.2). The exception to this is Artis and Ehrmann, who define demand shocks differently from the other studies (see Box 4.2). The HM Treasury SVAR model can replicate both findings, by defining demand shocks in a similar fashion to Clarida and Gali (HM Treasury 1) or in a similar fashion to Artis and Ehrmann (HM Treasury 2).[3] The Treasury SVAR model is described in Box 4.3 and in more detail in Annex A.

[3] Annex A shows that the properties of the exchange rate shock in the HM Treasury 2 breakdown and the demand shock in the HM Treasury 1 breakdown are similar, despite the difference in their labels. See Labhard and Westaway (2002) for a more detailed investigation of this finding.

Box 4.2: Artis and Ehrmann's SVAR model

Artis and Ehrmann (2000) use the SVAR approach to identify the source of shocks and their impact on four economies – Denmark, Sweden, Canada and the UK. Each of these economies has large neighbours with whom a monetary union has been mooted at some point. Their analysis measures the effect on output in these economies of monetary policy, inflation, the exchange rate and other exogenous shocks.

Artis and Ehrmann apply the SVAR methodology differently from the Clarida-Gali approach:

- they analyse more variables (output, price level, domestic interest and foreign interest rates and the nominal exchange rate);
- they model the nominal exchange rate rather than real exchange rate;
- they model UK output and price levels independently of output and prices in other countries, whereas Clarida and Gali modelled the difference between UK and US output and the difference between UK and US prices. As a result, Artis and Ehrmann's model captures all shocks to UK output and prices, whereas Clarida and Gali only capture shocks that have a different effect on output and prices in the UK compared with other contries; and
- they define demand shocks as being all shocks, other than supply shocks, that have an immediate impact on GDP. This differs from the Clarida and Gali definition, which identifies demand shocks as all shocks, other than supply shocks, that have a permanent effect on the real exchange rate.

These differences imply:

- that some of their 'nominal shocks' have permanent effects on real exchange rates – and hence would be defined as 'demand shocks' if Clarida and Gali's definitions were used; and
- that their nominal shocks also include effects of German supply and demand shocks (since these do not affect UK output in the long run nor UK output immediately, but should impact on the exchange rate).[a]

Artis and Ehrmann's results are strikingly different from those in the Clarida-Gali tradition. In particular, they find that exchange rate unpredictability is predominantly due to nominal shocks rather than demand shocks (Tables 4.1 and 4.2).

Artis and Ehrmann's decomposition identifies three nominal shocks: a domestic monetary policy shock, a foreign monetary policy shock, and an exchange rate shock. The exchange rate shock accounts for all exchange rate movements that are not associated with a UK supply shock, UK demand shock or policy shocks in the UK or Germany. Artis and Ehrmann find that pure exchange rate shocks account for around three-fifths of exchange rate volatility, at both short and longer term forecast horizons.

[a] See Labhard and Westaway (2002) for a detailed exposition of this point.

Table 4.1: Contribution of shocks to forecasting errors for forecasts of sterling exchange rates in three months time.

Study	Per cent contribution to forecast error variance			
	Supply shock	Demand shock	Nominal shock	Exchange rate shock
Clarida and Gali	1	97	2	n.a
Astley and Garratt	9	72	19	n.a
Funke	19	70	11	n.a
HM Treasury 1	2	95	3	n.a
Artis and Ehrmann	3	6	30	61
HM Treasury 2	2	11	0	88

Clarida and Gali (1994) model the real exchange rate against the US dollar; Astley and Garratt (1996) model the real rate against the deutschmark; Funke (2000) models the real rate against the euro; Artis and Ehrmann (2000) model the nominal rate against the deutschmark. HM Treasury models the real exchange rate against a basket of other currencies.

4.22 In principle, the contributions of each shock could be different at longer time horizons than at short horizons. But these studies find that the shocks that contribute to errors in forecasting exchange rates at the three-month horizon remain the dominant source of errors for five year ahead forecasts (Table 4.2).

Table 4.2: Contribution of shocks to forecasting errors for forecasts of sterling exchange rates in five years time.

Study	Per cent contribution to forecast error variance			
	Supply shock	Demand shock	Nominal shock	Exchange rate shock
Clarida and Gali	4	95	2	n.a
Astley and Garratt	17	81	1	n.a
Funke	18	64	18	n.a
HM Treasury 1	9	88	3	n.a
Artis and Ehrmann	2	1	34	63
HM Treasury 2	9	5	3	83

See Table 4.1 for details of studies. Results for Artis and Ehrmann are for six year ahead forecasts.

Box 4.3: HM Treasury SVAR model

HM Treasury has constructed an SVAR model to illustrate how alternative approaches to deriving the underlying shocks to the economy provide different perspectives on their effects on the exchange rate and other macroeconomic variables. Like Artis and Ehrmann (2000), the model analyses UK GDP and prices, and hence illustrates the effects of all shocks impacting on the UK, whereas Clarida and Gali's model only captures asymmetric shocks (that is shocks that have a greater or lesser effect on UK output and prices than they do in other countries).

Two alternative approaches have been used to derive the underlying shocks to the economy. Both approaches identify supply shocks as all shocks that have a permanent effect on the level of UK output, but they differ in the way that they derive the remaining shocks.

The first approach (HM Treasury 1) derives a shock that accounts for all remaining shocks that have a permanent effect on the level of the real exchange rate, as in Clarida and Gali (1994). This accounts for a high proportion of exchange rate unpredictability, both in the short term and over longer term horizons (Tables 4.1 and 4.2). This result closely resembles that of the original Clarida and Gali study.

The second approach (HM Treasury 2) derives a demand shock that accounts for all shocks, other than the supply shock, that have an immediate effect on the level of output, and an exchange rate shock that accounts for remaining unexplained movements in the real exchange rate. These definitions broadly follow those used by Artis and Ehrmann (2000). Under this scheme, the exchange rate shocks account for most of the unpredictability of exchange rates (Tables 4.1 and 4.2). This result closely resembles that of Artis and Ehrmann.

Comparison of the two schemes shows that they identify shocks with broadly similar properties, although by different routes. In particular, both schemes identify a single shock that accounts for almost all of the variation in the exchange rate. And in both schemes this shock has moderate effects on output, prices and interest rates. In other words, both approaches imply that exchange rate changes have not been a significant source of shocks to the wider economy.

Annex A contains more details about the model and how it illustrates the effects of different shocks on the economy.

Output volatility

4.23 Most studies find that supply shocks are the main contributor to the unpredictability of output in three month ahead forecasts (Table 4.3). The HM Treasury SVAR is an exception in this respect. This may be because Clarida and Gali, Astley and Garratt and Funke all model the difference in output between the UK and other countries, whereas the HM Treasury SVAR models the level of UK output. However, Artis and Ehrmann also model the level of UK output, but still find that a relatively high proportion of output variability can be accounted for by supply shocks.

Table 4.3: Contribution of shocks to forecasting errors for forecasts of GDP in three months time.

Study	Per cent contribution to forecast error variance			
	Supply shock	Demand shock	Nominal shock	Exchange rate shock
Clarida and Gali	84	3	13	n.a
Funke	89	4	7	n.a
HM Treasury 1	11	13	75	n.a
Artis and Ehrmann	70	30	0	0
HM Treasury 2	11	89	0	0

Clarida and Gali (1994) model UK GDP relative to US GDP; Funke (2000) models UK GDP relative to euro area GDP; Artis and Ehrmann (2000) and HM Treasury both model UK GDP. Details of HM Treasury models are in Annex A.

4.24 Differences between the models become less stark when forecasting over longer time horizons. There is a broad agreement between the studies that supply shocks are the main contributor to forecasting errors for GDP five years ahead (Table 4.4). However as noted above, the studies find that supply shocks account for little of the error in forecasting exchange rates. The implication is that the shocks that move exchange rates have in general, limited effects on future output.

Table 4.4: Contribution of shocks to forecasting errors for forecasts of GDP in five years' time.

Study	Per cent contribution to forecast error variance			
	Supply shock	Demand shock	Nominal shock	Exchange rate shock
Clarida and Gali	n.a	n.a	n.a	n.a
Funke	90	3	7	n.a
HM Treasury 1	78	6	16	n.a
Artis and Ehrmann	86	5	8	1
HM Treasury 2	78	21	1	0

See Table 4.3 for details of studies. Results for Artis and Ehrmann are for six year ahead forecasts.

4.25 The finding that shocks that move the exchange rate do not have impacts on the wider economy is consistent with it being a shock absorber. But the difficulty is that these analyses do not provide definitive findings of what would have happened in the counter-factual case where the exchange rate had not moved. If the exchange rate is responding to real demand shocks, as implied by a number of studies, then in the absence of an exchange rate movement, these might be expected to have more of an impact on the UK price level.

Implications for UK and EMU

4.26 Both Funke (2000) and Artis and Ehrmann (2000) draw conclusions from their studies on whether it would be advisable for the UK to join EMU. Artis and Ehrmann argue that their results provide grounds both in favour of joining and against it. Monetary policy in the UK is found to have an impact on the real economy and so can be a useful stabiliser – this is evidence of costs to UK entry.

4.27 On the other hand, they argue that other findings (that exchange rate movements are largely driven by shocks to the exchange rate itself, are not responsive to supply and demand shocks, but do affect output and prices) suggest that the exchange rate has a limited stabilising role. Consequently, they argue that the loss of exchange rate flexibility in joining a monetary union would not be costly. Funke (2000) also interprets his findings as suggesting that the exchange rate has not played a shock absorber role.

4.28 But the conclusion that these studies demonstrate that the exchange rate is not a significant shock absorber is puzzling. Artis and Ehrmann argue that "*if variable X perfectly stabilises shocks which could impinge on variable Y then the ex post data will reveal variations in X but none in Y but it would be a mistake to conclude that X was ineffective as a shock absorber!*" (page 6). Yet having made this point, they appear to ignore it when they evaluate the role of the exchange rate.

4.29 This strand of analysis cannot conclusively resolve the question as to whether the exchange rate is or is not a shock absorber, since we can only observe what happens when the exchange rate actually moves. But the presumption that all other variables would be unaffected (and hence that the exchange rate is not responding to an otherwise unobserved shock) is a strong one. Without evidence that demonstrates that other variables would have been unaffected if the exchange rate had not moved, the conclusion that the exchange rate fails to act as a shock absorber is, at best, unproven.

Conclusions

4.30 The evidence considered in this section suggests that nominal exchange rate flexibility does not typically generate additional macroeconomic volatility. Econometric studies using the SVAR technique suggest that exchange rate movements do not, in general, destabilise the economy. This supports the conclusion drawn from more qualitative analysis of the relation between exchange rates and the relative cyclical position. On balance, there is little evidence to support the proposition that exchange rate flexibility provides an additional source of shocks.

4.31 Whether exchange rate flexibility is a significant stabilising mechanism or not is harder to resolve. The econometric evidence finds that large exchange rate movements do not typically affect other macroeconomic variables. This could be because they are helping to absorb an otherwise unobserved shock. But it could be that observed exchange rate movements are purely extraneous. Without observing what would have happened had the exchange rate not moved, it is not possible to resolve the question conclusively. But it seems unlikely that real exchange movements would not have real effects, and therefore likely that observed exchange rate changes have helped to absorb shocks that might otherwise have impacted on either output or prices.

4.32 The finding that countries with fixed exchange rate regimes do not experience higher macroeconomic volatility than countries with flexible exchange rates confirms the insight from OCA theory that fixed regimes are viable, provided that alternative mechanisms (for example, wage and price flexibility, flexible redeployment of resources to alternative uses and fiscal stabilisation) enable a rapid adjustment to economic shocks.

5 An Interpretation of the Strength of Sterling since 1996

In recent years, sterling remained persistently above most estimates of its sustainable rate against the euro. Nonetheless, at a whole economy level, the effects on UK output and prices appeared limited. This section considers whether these outcomes provide grounds for thinking that the sustainable exchange rate has appreciated in recent years, or for thinking that a temporary appreciation relative to the longer-term sustainable rate may have been warranted.

The macroeconomic balance framework defines the sustainable exchange rate as the rate that should prevail when the economy satisfies two conditions, representing internal balance (aggregate demand matches aggregate potential supply) and external balance (the external current account flows can be sustainably financed). Neither condition need hold at a particular point in time, although when either condition fails, prices and quantities will tend to adjust to eliminate the imbalances over time. While these adjustment processes are operating, deviations of the actual exchange rate from its sustainable rate may be warranted. Both the magnitude and the duration of deviations of the actual rate from its sustainable level will depend on the extent and persistence of the factors causing the internal and external balance conditions to fail.

During the past few years, demand for UK goods and services has been relatively strong compared with demand for euro area goods and services, in part reflecting the relative strength of UK domestic demand. This differential in relative demand has warranted a degree of sterling real exchange rate appreciation against the euro, both to prevent the UK economy overheating and to bolster demand for euro area production.

With both the UK and the euro area monetary authorities pursuing broadly similar price stability objectives, real exchange rate movements between the two currency areas were mainly achieved by movements in the nominal exchange rate. By contrast, if the UK had been in EMU, any real exchange rate change between the UK and the current euro area countries would have needed to occur through differential price movements. It is likely that UK inflation would have been higher than it was.

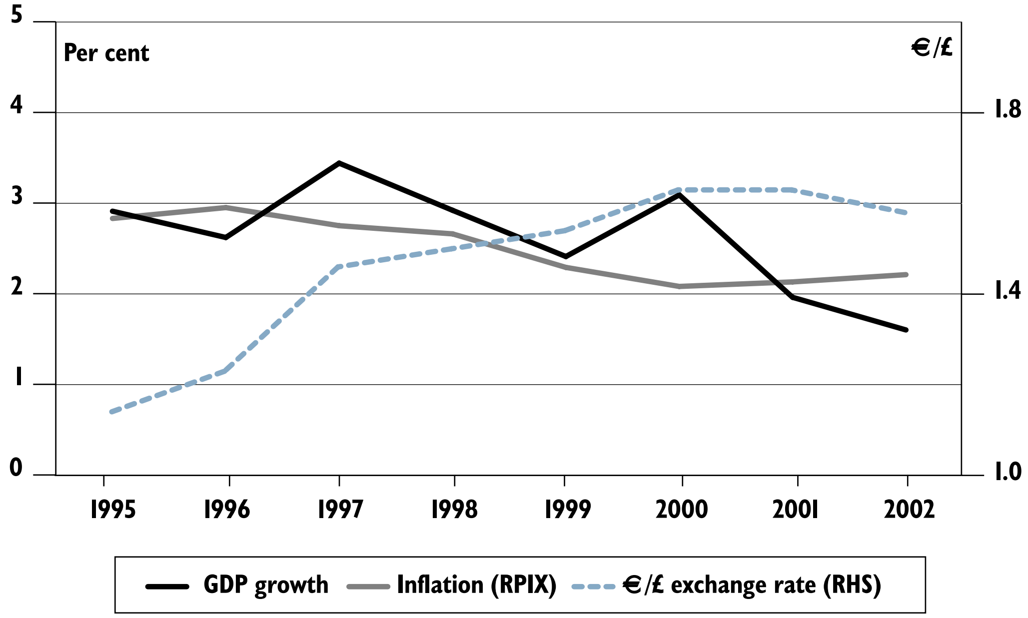
Up until the end of 2002, some argued that sterling's equilibrium real exchange rate had appreciated relative to the range of previous estimates. However, sterling's depreciation during early 2003 is more supportive of the view that its strength in recent years may have been a temporary, albeit protracted, move away from longer-term equilibrium. It is important to emphasise that interpretation of recent movements is made more difficult by uncertainties about both the scale and persistence of market reactions to the particularly high degree of global political and economic uncertainty.

Nonetheless, this appreciation may have been warranted by a persistent decrease in net national saving, associated with relatively strong domestic demand growth in the UK compared with the euro area. These explanations are considered further in the convergence test – the first of the Government's five economic tests for EMU entry.

1996-2002: strong sterling and a strong economy

5.1 In recent years, sterling's exchange rate against the euro exceeded most estimates of its sustainable exchange rate for an extended period. Nonetheless, the economy continued to perform well on most indicators (Chart 5.1). GDP growth averaged 2.6 per cent a year between 1996 and 2002, inflation remained close to its target and unemployment fell from 7.5 per cent in January 1997 to 5.1 per cent in November 2002. This performance is consistent with the conclusion from Section 4 that large exchange rate movements have not typically been a source of shocks to the economy.

Chart 5.1: UK GDP growth, inflation and the sterling-euro exchange rate



Source: Office for National Statistics, Bloomberg.

5.2 That said, the strong exchange rate clearly affected the performance of certain sectors. The volume of exports of goods and services grew by 4.3 per cent a year between 1996 and 2002 compared with import growth of 7.1 per cent a year, and manufacturing output grew more slowly than services output and actually declined in 2001 and 2002. Nonetheless, overall macroeconomic performance held up well, despite the difficulties experienced by individual sectors. One interpretation of this is that a real exchange rate appreciation may have been needed in order to maintain macroeconomic balance, by attracting labour and other resources into the industries where they were most needed.

5.3 Understanding recent trends is an important part of assessing what might be the appropriate rate at which sterling should be fixed against the euro, were a decision taken to join EMU. The EMU study by Professor Simon Wren-Lewis *Estimates of equilibrium exchange rates for sterling against the euro* highlights that fixing at too high an exchange rate could mean that the early years of EMU membership would be characterised by low output growth in order to obtain the low inflation needed to secure a real depreciation within EMU. By contrast, entering at too low an exchange rate could mean that the early years of EMU membership would see relatively high UK inflation and a real exchange rate appreciation. These scenarios, together with possible policy responses, are illustrated in detail in the EMU study *Modelling the transition to EMU*. The EMU study *Modelling shocks and adjustment mechanisms in EMU* illustrates real exchange rate adjustment within EMU itself.

5.4 The analysis in this section uses recent exchange rate history to illustrate why actual exchange rates may deviate from their estimated sustainable rates for extended periods of time. The analysis focuses on sterling's exchange rate against the euro. This is in large part because sterling has moved more sharply against the euro than against the US dollar in recent years. Indeed, sterling has tended to depreciate against the US dollar when it has appreciated against the euro, and to appreciate against the US dollar when it has depreciated against the euro, so that movements in the trade-weighted exchange rate have been more muted than sterling's movements against the euro. Although the focus of this section is on the sterling-euro exchange rate, the principles discussed can be used to analyse exchange rate movements more generally.

5.5 Bilateral exchange rates are a relative price: the sterling-euro exchange rate is the price of sterling in terms of euro. As such, movements in the exchange rate reflect economic conditions in both currency areas.

5.6 The Government believes that exchange rate stability can only be achieved on the basis of sound economic fundamentals, in particular low and steady inflation, steady and sustainable growth and sound public finances. The exchange rate is, therefore, an outcome that reflects other economic policies, both in the UK and in other countries.

Price stability and changes in the real exchange rate

5.7 An important point to note is that both the UK and the European monetary authorities were pursuing price stability in their respective currency areas during the period considered in this analysis. As a result, there was limited scope for inflation differences to bring about any real exchange rate change between the UK and Europe that may have been needed. This meant that nominal exchange rate movements were the main channel for securing real exchange rate changes.

5.8 In other words, the foreign exchange rate market plays an important role in achieving real exchange adjustment when monetary authorities are committed to achieving price stability in their respective currency areas. This is especially the case when the required change in the real exchange rate is large. For example, in the absence of any nominal exchange rate change, a 10 per cent real appreciation in the sterling-euro real exchange rate would require either a 10 per cent increase in the UK price level or a 10 per cent fall in the euro area price level, or an appropriate combination of price level movements in the two areas. In any of these scenarios, monetary authorities would find it difficult to convince the public that they still had a strong and credible commitment to maintaining price stability.

Deviations of the exchange rate from sustainable medium-term levels

Sterling's ERM parity: unsustainably high…

5.9 The sharp depreciation of sterling that followed its exit from the ERM in September 1992 appeared consistent with the view that the ERM parity of 2.95 DM/£ was unsustainably high (Wren-Lewis *et al.*, 1991). Sterling remained below 2.50 DM/£ for most of the following four years.

...or not ?

5.10 But towards the end of 1996 sterling began to appreciate again. By July 1997, the exchange rate had risen back above the 2.95 DM/£ level, reaching a peak of over 3.30 DM/£ in May 2000, and averaging 1.62 €/£ (equivalent to 3.16 DM/£) between 2000 and 2002. This level was well above estimates of the sustainable exchange rate, many of which ranged between 1.2 and 1.4 €/£, equivalent to 2.35 and 2.74 DM/£, respectively.[1] Estimates based on past data have tended to provide lower figures for the equilibrium rate than other estimates, such as surveys of City economists, some of which have suggested that the sustainable rate could be as high as 1.55 €/£ (3.03 DM/£). But even these estimates imply that sterling was trading above its equilibrium rate between 1998 and 2002. Its subsequent depreciation during early 2003 has brought it within the range indicated by the survey evidence, although remaining, in mid March, above the 1.4 €/£ level.

5.11 This prompts the question as to why sterling deviated from estimates of its sustainable rate for so long. Explanations can be divided into two categories:

- estimates of the sustainable medium-term exchange rate remained valid, but there were strong and persistent pressures that took the actual exchange rate away from its sustainable level for an extended period; and

- alternatively, the sustainable exchange rate may have been higher than previously estimated. For example, an analysis by the IMF concluded that "*the persistence of the real exchange rate appreciation observed in the United Kingdom over the past few years ... suggests that the equilibrium real exchange rate may have appreciated*" (IMF, 2002, page 68).

What do estimates of the sustainable exchange rate show?

5.12 Estimates of the sustainable exchange rate provide an indication of the exchange rate that is expected to prevail when economic adjustment to shocks has run its course and any associated imbalances have been eliminated. For example, the estimates derived by Professor Simon Wren-Lewis in his EMU study *Estimates of equilibrium exchange rates for sterling against the euro* are derived on the basis that there is no imbalance between aggregate demand and aggregate supply, and that net national saving (that is national saving less national investment) is at a sustainable level. Neither condition need apply at any particular moment, and the actual exchange rate may deviate from its estimated equilibrium rate until both conditions are satisfied.

5.13 In the macroeconomic balance framework, deviations of the actual exchange rate from its longer-term rate are warranted when either the internal balance or external balance conditions are not satisfied. Under current arrangements, UK and European interest rates are aimed at maintaining or restoring internal balance within their respective currency areas. Meanwhile, net national saving, which affects the external balance condition, reflects the interaction of private and public sector net saving, or in other words is partly determined by fiscal policy and partly by private sector behaviour.

5.14 Estimates of the sustainable exchange rate derived using the macroeconomic balance approach are often derived by making an assumption about the sustainable level of net national saving. But the time horizon over which this sustainable level should apply is not well defined. The factors that determine national saving may be highly persistent, and when this is the case then persistent deviations of the exchange rate from its longer-term sustainable rate may be warranted.

[1] See the EMU study by Professor Simon Wren-Lewis *Estimates of equilibrium exchange rates for sterling against the euro*, and the estimates cited in Walton and Broadbent (2003).

5.15 National saving is determined by factors such as the demographic composition of the population, the level of wealth, the level of expected income and hence expected wealth, the population's attitude to risk and their rate of time preference (that is the extent to which their current spending behaviour is influenced by their expectations of future outcomes). National investment is determined by expected returns against expected costs of investment. These, in turn, are affected by a range of factors, including expectations about productivity, future demand and the risk attached both to particular projects and to the wider macroeconomic climate. Net national saving will depend on conditions both within the UK and abroad, since UK saving can be used to finance investment either in the UK or abroad, while UK investment may be financed by either UK or foreign saving.

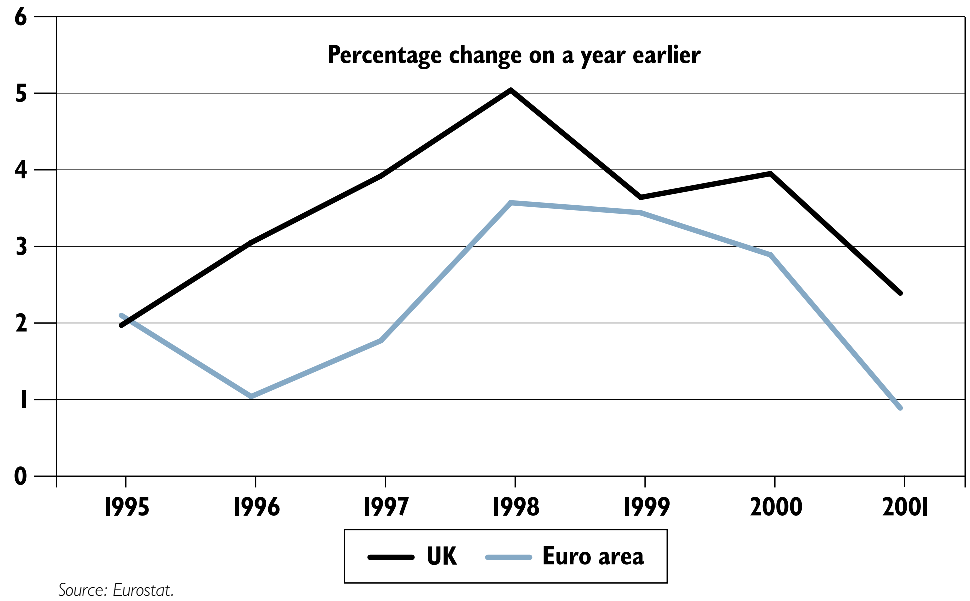
5.16 These considerations suggest that it is important to look at the short-term as well as longer-term influences on the exchange rate. Such influences are often difficult to pinpoint, and may only become apparent after the event. Since the determinants of net national saving are not directly observed, but only indirectly observed through the effect that they have on the exchange rate itself, it is only possible to construct a suggestive rather than a definitive account of past exchange rate movements.

Relative demand strength in the UK and the euro area

Strong demand in the UK ...

5.17 Examination of the respective positions of the UK and the euro area economies in the late 1990s points to reasons why sterling might have needed to appreciate against the euro. By 1997, the UK economy was recovering well from the recession of 1990-92. That recession had left the UK economy with significant excess aggregate supply, requiring a stimulus to aggregate demand. This was achieved by a combination of fiscal and monetary easing and by exchange rate depreciation. By 1997, it had become clear that demand growth risked becoming excessive (Chart 5.2). Monetary and fiscal policy were both tightened in order to restrain domestic demand. The accompanying appreciation of the real sterling-euro exchange rate provided an additional restraint, but it also provided a stimulus to the euro area economies.

Chart 5.2: Domestic demand in the UK and euro area



Source: Eurostat.

... compared with the euro area

5.18 In the euro area, German reunification had provided a short-lived stimulus to demand at the start of the 1990s, that exacerbated tensions within the ERM. By the mid 1990s, many countries in the euro area were tightening their fiscal policies, with the Maastricht criteria for government deficits providing a strong incentive for countries to ensure that borrowing was brought back to sustainable levels. Other things equal, a tighter fiscal policy implies a lower real exchange rate. Domestic demand remained subdued in the euro area as a whole, although experiences varied across countries.

5.19 It is relatively easy to describe the symptoms of the relative strength of demand in the UK economy, and less easy to identify its underlying causes. Domestic demand in the UK has benefited from a self-sustaining recovery in consumer and investor confidence, which has seen employment and spending hold up well despite the various shocks that have hit the economy, including the Asian and Russian financial crises, a tripling in the oil price and a sharp correction in equity prices. The strength of confidence in the UK is also apparent in the rapid increase in house prices since 1997, which itself helped to reinforce consumer confidence. The rise in equity prices in the late 1990s was a further indication of an improvement in investor confidence, although since euro area equity prices also rose strongly, the extent to which this may have contributed to differential demand pressures is unclear. In contrast to the UK, some, but by no means all of the euro area economies have found it difficult to generate strong self-sustaining increases in domestic demand.

5.20 Other things equal, strong consumer spending and investment in the UK would translate into a decline in desired net national saving, which would tend to reduce UK demand for foreign currency, including the euro. Similarly, relatively weak domestic demand in the euro area would translate into an increase in desired net saving in the euro area, increasing demand for other currencies, including sterling. Net national saving must sum to zero across the world, with exchange rates moving to balance the supply of and demand for individual currencies.[2]

5.21 A complication in this analysis is that exchange rate movements themselves modify desired saving and investment flows, by curbing demand for the appreciating currency and encouraging demand for the depreciating currency. Since saving and investment outcomes reflect the interaction of initial pressures acting on the exchange rate and the feedback from the exchange rate reaction on saving and investment decisions, it is difficult to ascertain the extent of the initial pressures themselves. That said, the relative strength of UK domestic demand compared with the euro area, together with the strength of sterling's appreciation against the euro, suggests that shifts in desired net national saving in the two currency areas may have contributed to sterling's appreciation. If this was indeed the case, then the duration of sterling's appreciation would depend on the persistence of the trends in desired net national saving.

... suggests that sterling real appreciation may have been warranted in the short term

5.22 If sterling's appreciation against the euro had been unwarranted, then the UK would have been pushed towards recession, and the euro area would have risked overheating. In fact, UK economic performance remained relatively strong and the euro area showed little sign of overheating. Hence, on this occasion, the exchange rate movement appears to have been largely warranted.

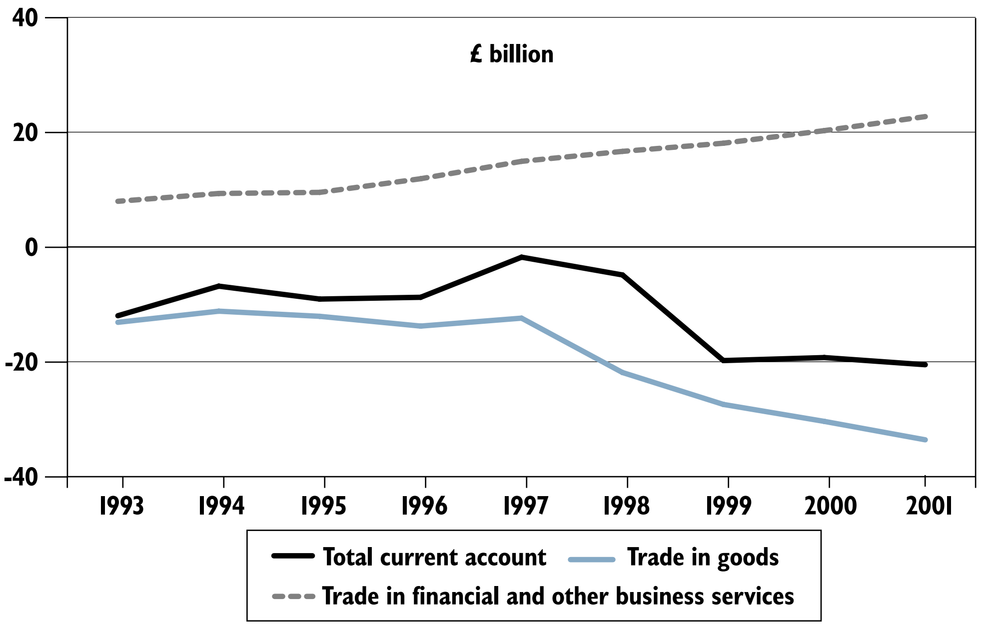
[2] Official statistics show that net national saving does not sum to zero across the world. This reflects difficulties in measuring all international transactions accurately.

5.23 Analysis by the Bank of England is consistent with the view that strong domestic demand may have contributed to sterling's strength. The February 2002 Inflation Report noted that sterling's strength could be attributed to the relative strength of domestic demand in the UK compared with the euro area, and stated that:

> "*Were a correction to private spending to materialise, there is a risk of an associated fall in the sterling exchange rate*" (page 48).

5.24 The preceding argument attributes much of sterling's appreciation to differences in the strength of domestic demand. Analysis of the external balance of payments suggests that strong foreign demand for UK financial and business services and for investment in the UK may also have contributed to sterling's appreciation after 1995. Although the overall current account balance was negative, the annual average trade balance on financial and other business services improved by £11 billion between 1993-95 and 1999-2001, despite sterling's appreciation (Chart 5.3). These trends were offset by the deterioration in the balance on goods trade, where the annual average balance deteriorated by £14 billion over the same period.

Chart 5.3: UK balance of payments



Source: Office for National Statistics.

Financial market sentiment

5.25 Even though sterling's appreciation appears consistent with relative demand pressures between the UK and the euro area, both the size and the speed of its appreciation remain difficult to explain. Buiter and Grafe in their contribution to the EMU study *Submissions on EMU from leading academics* argue that:

> *"There are no conceivable developments in the fundamentals of the real economy that called for such huge swings in relative prices and costs. These episodes are evidence of the havoc financial asset markets can create when they go off on their periodic peregrinations into misplaced euphoria and unwarranted gloom."*

5.26 As noted in Section 2, the exchange rate is largely determined by expectations of the future, which may reasonably switch from euphoria to gloom. Asset market prices are particularly prone to such swings when there is heightened uncertainty about future outcomes. Uncertainty about the relative performance of economies in the longer term will weaken investors' confidence that a particular exchange rate level is appropriate. In such circumstances, financial market sentiment may cause the exchange rate to drift further away from its sustainable level than may appear warranted. This effect may have exacerbated sterling's appreciation since 1996.

Monetary policy reaction

5.27 The level of the exchange rate is an important element in the overall stance of monetary conditions, and hence exchange rate movements influence the interest rate decisions of the monetary authorities. For example, Mervyn King, the Deputy Governor of the Bank of England has said[3]

> *"although there is little that the MPC can do to influence the exchange rate, it can take its movements into account when setting interest rates. That it most certainly does. Because of the strength of sterling, interest rates have almost certainly been lower than would otherwise have been the case."*

5.28 As a result the relationship between domestic demand, the exchange rate and interest rates is a complicated mix of underlying developments in supply and demand and, savers' and investors' expectation of future economic developments in different currency areas, including the expectations of how macroeconomic policy will respond.

Medium-term influences on the exchange rate

5.29 To recap, the preceding analysis has suggested that sterling's strength in recent years may be attributed to the relative strength of demand for UK production compared with euro area production during this period. This raises two questions:

- Could these trends be purely temporary phenomena?
- If they are permanent, what are the implications for the sustainable exchange rate?

Trends taking the exchange rate back towards its equilibrium

5.30 Medium to long-term explanations of the exchange rate rely on the prediction that sustained deviations of the exchange rate from its sustainable rate will generate trends that will eventually bring the exchange rate back to its equilibrium. But these theories are generally unable to predict how rapidly the exchange rate will reach its medium to long-term level. This is particularly the case when there is uncertainty about the size and persistence of the shifts in supply and demand that are acting to keep the exchange rate away from its longer-term equilibrium.

5.31 Sterling's strength over the past few years illustrates these points. Few observers expected sterling to remain as strong for as long. Nonetheless, this continued strength contributed to a steady deterioration in the balance of trade in goods, which has increasingly acted as a counterweight to the upward pressures on sterling from other sources. This is consistent with the prediction that prolonged deviations from the medium-term exchange rate will generate trends that help to bring the exchange rate back to its sustainable level.

[3] Speech entitled "Monetary policy and manufacturing industry", March 2000. Published on the Bank of England website: www.bankofengland.co.uk.

Sterling depreciation in 2003

5.32 These considerations provide a number of explanations for the depreciation of sterling in early 2003:

- the pressures that contributed to sterling's appreciation may have themselves faded. For example, weaker domestic demand in the UK may have reversed some of the upward pressure on sterling seen in recent years;
- earlier pressures may still remain, but other pressures may be acting to push sterling down. So, for example, it could be the case that demand for UK business services remains strong, but demand for sterling relating to other transactions has weakened; and
- related to the previous point, it may be that the deterioration in the trade in goods balance, that is in part a consequence of sterling's previous strength, has become sufficiently strong to outweigh upward pressures from other sources.

5.33 These explanations are not mutually inconsistent, and it may be that each provides part of the total explanation. As always, it is difficult to identify how important each element is, since the underlying influences on currency transactions are not directly observed with sufficient precision. These problems have been exacerbated by the recent high degree of global uncertainty, which has increased the volatility of financial asset markets including currency markets.

Implications for the equilbrium exchange rate

5.34 Up until the end of 2002, some argued that sterling's equilibrium real exchange rate had appreciated relative to the range of previous estimates. However, sterling's depreciation during early 2003 is more supportive of the view that its strength in recent years may have been a temporary, albeit protracted, move away from longer-term equilibrium. It is important to emphasise that interpretation of recent movements is made more difficult by uncertainties about both the scale and persistence of market reactions to the particularly high degree of global political and economic uncertainty.

5.35 Nonetheless, this appreciation may have been warranted by a persistent decrease in net national saving, associated with relatively strong domestic demand growth in the UK compared with the euro area. These explanations are considered further in the convergence test – the first of the Government's five economic tests for EMU entry.