



BANK OF ENGLAND

Mark Carney
Governor

Rt Hon Andrew Tyrie MP
House of Commons
London
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Dear Andrew,

At the Treasury Committee's hearing on the economic and financial costs and benefits of UK's EU membership on 8th March, Rachel Reeves MP cited comments by some external economists that sterling's exchange rate might fall by 20% were the United Kingdom to leave the European Union and asked what economic effects such a decline would have. During the hearing I said that I did not want to endorse any specific magnitude for possible effects on sterling in the event of a vote to leave the EU. With the strong caveat that, in general, the impact of a change in the exchange rate depends on the underlying causes, I agreed in response to Ms Reeves' request to provide "ready reckoners" of the impact of changes in the currency on inflation.

Ms Reeves asked specifically: (i) what the Bank's models would suggest the impact of a 20% fall in sterling would be on inflation, everything else equal; and (ii) what are the other ways in which a 20% decline could affect both financial markets and the real economy as well.¹ The primary purpose of this letter is to provide "ready reckoners" from the Bank's model, and associated caveats. In addition, I have also attached a copy of an article from the Bank's 2013Q2 *Quarterly Bulletin*, 'Macroeconomic uncertainty: what is it, how can we measure it and why does it matter?', as promised at the hearing.

To be clear at the outset, the Bank's Monetary Policy Committee (MPC) has not made a forecast for what might happen either to sterling or the economy over the horizon relevant to monetary policy in the event of a vote in the referendum to leave the EU. More generally, whatever the outcome of the referendum, the MPC will retain its tools and operational independence, leaving unchanged its ability to set monetary policy to meet the inflation target.

Sterling and inflation – a mechanical modelling exercise

There is no one particular numerical relationship between the exchange rate and inflation. Either can move for all manner of reasons. Different underlying developments in the economy will affect the exchange rate, inflation and other macroeconomic variables in different ways at different times resulting in different relationships between the exchange rate and inflation. Therefore, any estimate of the effects of a given change in sterling on inflation must make an assumption about the underlying cause or, in economic parlance, the particular 'shock' that triggered the exchange rate to move in the first place. The simulated paths for the exchange rate and inflation from any particular economic model depend on the combination of this assumption and the model's dynamic properties.²

¹ Q993 of the hearing transcript: Rachel Reeves: "What would be useful is, first of all, everything else being equal, what the impact would be of a 20% reduction in sterling on inflation. Also, as you say, if there was a 20% reduction in sterling, what are the other ways in which it could affect both financial markets and the real economy as well?"

² The box on pages 28-29 of the November 2015 *Inflation Report* discusses how firms pricing decisions might differ depending on the underlying cause of changes in sterling. And *External MPC Unit Discussion Paper No. 43* by Kristin

The Bank's models contain many such candidate shocks, each pertaining to different underlying economic disturbances. As a starting point it can be useful to consider one of these in a simple mechanical exercise in which the initial level of sterling is moved up or down in isolation, or 'exogenously', with the subsequent impact on growth and inflation determined by the model's dynamics. This is a purely mechanical way to explore the first question posed by Ms Reeves.

In this mechanical exercise, a persistent 10% depreciation (or appreciation) of the sterling effective exchange rate (ERI) increases (or decreases) annual consumer price inflation by around $\frac{3}{4}$ pp over the baseline path after two to three years, and the price level by around $2\frac{3}{4}$ % over four years. Monetary policy is assumed to be held constant in this experiment. The model is linear, so a 20% change in the exchange rate would double these estimates. This is a "ready reckoner" of the type I referred to at the Treasury Committee hearing. It comes with strong caveats and assumes, unrealistically in this case, that the exchange rate moves for purely 'exogenous' or un-modelled reasons. It also assumes that there are no other shocks and that expectations of future inflation remain anchored to the MPC's inflation target.

In this exercise, this exogenous shock works through two channels. First, there is a direct effect on the prices of imported goods, which, excluding energy, constitute a little under 30% of the CPI basket. Firms can ultimately be expected to pass through higher costs to consumers, resulting in higher prices. This direct effect, according to the mechanical model, is likely to be the dominant influence on inflation. Second, in addition, there is an indirect effect which arises as a result of the impact of changes in the exchange rate on the balance between aggregate demand and aggregate supply. A fall in the exchange rate implies a reduction in the price of UK output relative to world exports, boosting demand for UK exports. It would also encourage UK households and firms to substitute away from imported goods and services to domestically produced ones. Offsetting that, however, the increase in import prices would lower real incomes for UK consumers, reducing their demand for UK output as well as for imports. The Bank's forecasting model suggests that, overall, the substitution effect outweighs the income effect in this mechanical exercise. In addition to these demand-side effects, a depreciation could also affect the supply side. For example, a significant proportion of UK investment uses imported capital goods, which would become more expensive following a depreciation. The resulting lower path for investment would imply a lower path for potential output. So, all else equal, these indirect channels would also tend to boost inflation.

As with all model estimates there is considerable uncertainty around the size and persistence of both the direct and indirect effects.

The persistence of the direct effect on inflation largely reflects the empirical finding that the pass-through of changes in import prices to consumer prices is gradual, making these dynamics relevant to the time horizon over which monetary policy is typically concerned. These effects could easily be more or less front-loaded depending on how firms choose to respond to the change in their costs. They could also vary depending on the mix of currencies against which sterling moves.

The balance of the indirect effects depends on a number of factors, including the reason for the move in the exchange rate in the first place and the response of monetary policy. The modelled response described above assumes unrealistically that there are no independent impacts on either demand or supply over and above those arising purely from the exchange rate change. Nor does it model how monetary policy would respond.

These are important caveats because, in the context of Ms Reeves' question – namely what might happen if the UK were to vote to leave the EU and the exchange rate fell sharply – it is not realistic to assume that the effects on demand and supply would be limited to those arising indirectly from a change in the exchange rate. From a modelling perspective, there would likely be important additional effects on demand and supply arising through other channels. Some of these are discussed below.

Beyond the mechanical exercise – the underlying cause of the move matters

At the Treasury Committee hearing I noted that if sterling were to fall following a vote to leave the European Union, and if increased uncertainty were a key underlying cause of this depreciation, aggregate demand might be affected. Specifically, it is possible that a vote to leave could result in a potentially extended period of greater uncertainty about the economic outlook, including about the prospects for UK

Forbes and co-authors, 'The shocks matter: improving our estimates of exchange rate pass-through', also explores how macroeconomic outcomes depend on what drives the exchange rate.

export growth, as the outcomes of future withdrawal negotiations with the European Union and future trading arrangements with other countries could be initially unclear. Greater uncertainty could lead firms to postpone some investment projects and households to defer some spending. Both would push down on overall demand and inflation.

In addition to weighing on the exchange rate, a rise in uncertainty could weigh on other asset prices, such as corporate bond and equity prices, tightening financial conditions. Put another way, the compensation required in international markets for the risk of holding sterling assets could rise. If these risk premia were to rise, this would also depress activity.

Equally, a fall in sterling following a leave vote could itself reflect the net impact on the supply side of any alterations to product or labour market regulation, adjustments in labour flows, or changes in the rate of technology adoption as a result of different arrangements governing foreign trade and capital flows. For given demand, net lower supply would mean upward pressure on inflation, and vice versa for net higher supply.

In these cases, any positive impact of a depreciation on activity resulting from a changed relative price would need to be set against any net negative impacts (whether on investment, consumption, exports or potential supply) stemming from the underlying cause of the depreciation. There are plausible scenarios where the combined effects of the exchange rate move and its drivers on aggregate demand, aggregate supply and exchange rate pass through lead to a lower path for growth and a higher path for inflation. The Bank's 2014 stress test is a severe variant of such a scenario.

In any event, the MPC would have to make careful judgements about the implications of an exchange rate move for the outlook for inflation and set policy accordingly. Ultimately, monetary policy would be set to deliver a path for aggregate demand consistent with aggregate supply in order to meet the inflation target, while also ensuring that inflation expectations remain well anchored. Whatever the outcome of the referendum, the MPC will retain its tools and operational independence, leaving unchanged its ability to achieve its remit.

Conclusion

There is no simple relationship between the exchange rate, inflation and other macroeconomic variables. These relationships will differ depending on the underlying drivers of change in the economy, with a wide range of different channels potentially operating. In the mechanical exercise described above, the initial level of sterling was moved down in isolation. The results obtained from this sort of exercise can be useful to forecasters – particularly when the underlying drivers of the economy are hard to identify in real time – but they necessarily present a partial picture of future developments and come with strong caveats.

The overall impact on activity and inflation of a fall in sterling would also depend on how monetary policy was set in response. That, in turn, would depend on the MPC's judgements about the underlying drivers of developments in the economy, both on the demand and the supply side, together with any adjustments to monetary policy that would follow, as judged necessary by the MPC in order to achieve the inflation target.

I trust this letter addresses the issues raised by Ms Reeves at the hearing in March.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'M Carney', with a long horizontal flourish underneath.