



BANK OF ENGLAND

Speech

The economic impact of sterling's recent moves: more than a midsummer night's dream

Speech given by

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Last summer I had the pleasure of seeing my first play at The Globe – A Midsummer Night’s Dream. Speaking before you tonight reminds me of that special experience. Last summer, as I waited for the play to begin, I was humbled by the history embodied in the theatre and Shakespeare’s legacy as a pioneering playwright. Tonight I am also impressed by the backgrounds of this distinguished group. You have managed to excel in an industry where women are too rare. Not quite as rare as a female in Shakespeare’s plays, but in some companies in this industry, not far off.

And just as Puck was set loose to create mischief in the forest in A Midsummer Night’s Dream, I must confess that I also feel a bit mischievous by discussing the exchange rate. In the US government, there is such trepidation about how a single comment on the dollar by a senior official could cause gyrations in currency markets, there is a strict rule that no one except the President and the Treasury Secretary can speak publicly about the exchange rate. Even the President and Treasury Secretary are careful never to veer from very simple, carefully vetted, and largely meaningless talking points. Needless to say, in my former position focusing on international economic issues at the White House, this was a difficult rule to follow. I am looking forward to being able to speak intelligently and directly about an issue that can have such an important effect on the economy. But unlike Puck, whose venture created confusion and misunderstanding in the forest, my goal is to create clarity and understanding on one issue: the economic impact of sterling’s recent moves.

Before I embark on this venture, however, I want to emphasize one critically important point. My comments tonight will cover the recent movements in sterling, the effects on the UK economy, and the resulting implications for monetary policy. My comments should not – in any way – be interpreted as providing any analysis or even hints on where sterling may move next. As an economist, I know better than to try to predict exchange rate movements. Many hundreds – if not thousands – of academic papers have been written to show that this is not a productive venture.

My comments should also not – in any way – be interpreted as suggesting any change from current Bank of England policy that we do not target the exchange rate. Instead, my comments today should be interpreted as supporting Governor Carney’s summary of Bank of England policy that, “The absence of a target for the exchange rate does not mean a central bank should be indifferent to exchange rate movements.”¹ Tonight I hope to help clarify some of the ways in which recent movements in sterling have affected exports, aggregate demand, and prices, thereby feeding through into our decisions about the appropriate course for monetary policy.

For the investors in the room who were hoping to leave tonight with an insight on where sterling might move next – or even ready to start executing trades subtly under the table based on some hint I might give – I’m sorry to disappoint you. But it will not be as disappointing as in A Midsummer Night’s Dream when Hermia

¹ <http://www.bankofengland.co.uk/publications/Documents/other/treasurycommittee/other/carneytsc.pdf>

learned that the man she had just eloped with was madly in love with someone else. Potentially more important than predicting where sterling will go tomorrow morning, or next week, or next month, is understanding the multifaceted effects that past movements are having on the economy today – and will continue to have in the future. The US dollar has recently appreciated by about 3%, less than a quarter of sterling's appreciation since early 2013, and this has already prompted analysis and discussion by the Federal Reserve Board of how this could present challenges for the economy and US monetary policy.²

The impact of exchange rate movements is even greater for the more open United Kingdom. Traded goods and services constitute over 60% of the UK economy. Currency movements directly affect the competitiveness of exports and import-competing domestic firms, and therefore production, employment, and profitability in both of these sectors. About 80% of sales by companies in the FTSE 100 are earned overseas.³ Currency movements directly affect how these international profits are translated back into sterling, and therefore stock market valuations and dividend payments – and thereby investors and individuals with equity exposure through their pension funds. About 30% of the main price index is imported goods. Currency movements directly affect many prices and how far a family's paycheck can go, thereby influencing the appropriate path for monetary policy in order for the Bank of England to reach its inflation target.

Just as the characters in *A Midsummer Night's Dream* learned to appreciate the powers of the fairies, all workers, consumers, producers, and investors should appreciate the power of the exchange rate to influence multiple aspects of the economy and their daily lives.

Recent Trends

Before discussing how the exchange rate affects the economy, however, it is useful to begin by reviewing what has recently happened to sterling. Figure 1 graphs two indices for the sterling effective exchange rate since its recent trough at the start of 2009. These indices weight movements in sterling relative to other countries' currencies by the other countries' share of UK trade. The blue line is the nominal exchange rate index and the red line is the real exchange rate index (which adjusts for inflation differentials between the UK and other countries). Although both measures of the exchange rate index have recently weakened slightly, these movements are overshadowed by the sharp nominal appreciation of 14.5% from March 2013 to July 2014.⁴ The effects of exchange rate movements generally take a substantial amount of time to play out – and so it is the lagged impact of this appreciation which is affecting the economy today and which will continue to be the primary impact of sterling on the economy over the next few quarters.

² For example, see comments by William Dudley on September 22, 2014 to Bloomberg, summarized at: <http://www.businessweek.com/news/2014-09-24/dudley-opens-new-front-for-fed-doves-with-dollar-warning>

³ Cited in "Soaring Sterling Knocks Stuffing out of Global Players", *The Sunday Times*, 27/07/14.

⁴ Movements in sterling have been fairly broad-based and are not driven by large movements relative to a few currencies. The appreciation of sterling that is the focus of these comments has been smaller relative to the euro, however, than relative to other advanced economies and emerging markets.

While this recent appreciation is substantial and has had wide-ranging effects, it is also useful to put it in the context of sterling's historic movements and volatility. Figure 2 graphs the same nominal exchange rate index, but now begins in 1990. This graph also includes bands showing standard deviations during different periods. Sterling has fluctuated within fairly narrow bands since 1990, punctuated by four large movements. Sterling depreciated sharply when the UK left the ERM in 1992 (by 20%)⁵, and even more sharply during the recent financial crisis (by 27%). The pound appreciated quickly between mid-1996 and late 1997 (by 27%), and then most recently from March 2013 to July 2014.

Figure 1: Sterling effective exchange rate since 2009

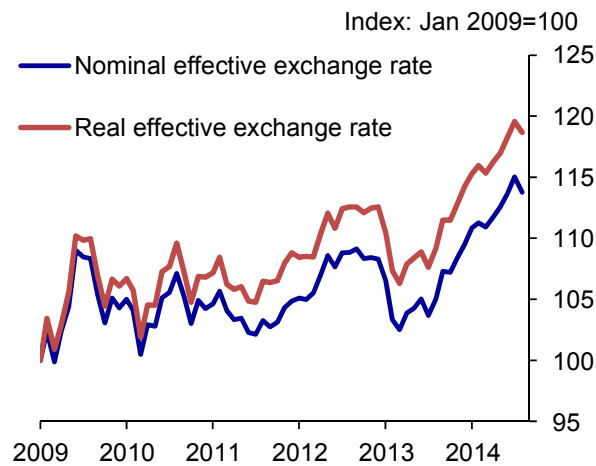
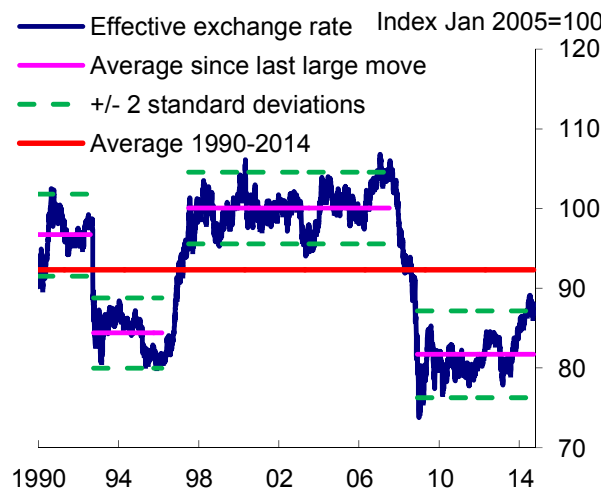


Figure 2: Sterling nominal effective exchange rate since 1990



This figure putting sterling's recent moves in the historic context shows that even though the recent appreciation is substantial, it only partially offsets the much larger depreciation that occurred during the financial crisis. In fact, despite sterling's recent strength, the exchange rate index is still below its average value of 92 since 1990 (shown by the thick red line in the graph). This should not be used to evaluate if sterling is overvalued or undervalued – to make that assessment would require a full analysis of the “equilibrium” exchange rate – but simply to highlight that sterling does not appear to be substantially out-of-line with where it has traditionally been.

What do these movements mean for the UK economy? Although the sharp depreciation during the crisis is what stands out in this graph, most of the effects of this movement have already filtered through the UK economy. The primary effects on the economy today result from the appreciation from March 2013 to July 2014 – and therefore I will spend the rest of my comments focusing on these effects. There has been some volatility in sterling recently, especially around the time of the Scottish referendum, but sterling is currently only 1% weaker than its recent peak in July 2014, which should have minimal effect on the key points discussed below.

⁵ The cited exchange rate movements refer to changes between monthly averages of the sterling nominal effective exchange rate.

More specifically, I will focus on the effects of sterling's appreciation in three areas: exports and profits; the trade balance, demand, and employment; and prices and inflation. These are not the only effects of exchange rate movements, but the effects that are currently most important for the UK.⁶ I will close by linking this discussion to recent trends in domestic inflation and the implications for monetary policy.

Effects on Exports and Profits

When a country's currency strengthens, the effect that generally receives the most immediate attention is that on exports and profits. A stronger currency will – holding all else equal – make domestic producers less competitive relative to foreign producers. This can present challenges not only for exporting firms, but also for some domestic producers, as consumers can shift to imported substitutes that are now relatively cheaper. Firms may choose to keep sterling prices constant, and thereby risk losing market share as their items will be more expensive than foreign items. Or they can choose to lower prices in order to remain competitive, but thereby accept lower markups and profits.

A stronger exchange rate will not only have these direct effects on sales and profits – but can also have nominal effects related to currency translations. A stronger pound reduces the value of foreign earnings when translated back into sterling using the current exchange rate. As a result, even if a firm listed on the FTSE produces and sells abroad, so that currency movements do not affect its relative costs, sales, or profits, these profits will be worth a smaller amount of sterling. Although this translation effect may appear to just be an accounting issue, it can have real effects on an economy by affecting price/earnings ratios, stock prices, and dividend payments. Capita Asset Services estimates that the effects of stronger sterling will cut the dividends paid out by UK companies by £4.4 billion this year – thereby affecting pensions, retail investors, and anyone who holds shares in these companies. Analysis by Goldman Sachs argues that the primary factor behind the FTSE's underperformance relative to other major developed economies has been sterling's strength.

All of these effects of a stronger currency were apparent this summer. In August, the CEO of WPP complained of the "ravages" of the strong pound. Diageo and British American Tobacco reported that currency effects had reduced operating profits by about £350 million and almost £400 million, respectively. Other companies that cited a significant drag on profits resulting from sterling's appreciation included: Rolls-Royce (engines), Regus (service office provider), Croda (specialty chemicals), Bunzl (distribution), National Express (travel), Spectris (electrical equipment), Burberry (luxury retailer), GlaxoSmithKline (pharmaceuticals), Weir (pumps and valves), and Mothercare. (I figure I had to include the last one for this audience.) This shows the range of companies and industries that have been impacted. The

⁶ For example, in some countries one of the biggest risks from exchange rate movements is on "currency mismatches", i.e., when companies, individuals, or banks borrow in foreign currency but rely on earnings in domestic currency. With these types of currency mismatches, currency depreciations can make it difficult to repay debt and lead to widespread insolvencies. This is not currently a major risk in the UK, not only because sterling has recently appreciated rather than depreciated, but also because most consumers transact only in sterling and most companies and banks that are vulnerable to these risks are able to hedge – either through their trade patterns or foreign exchange markets. Smaller and medium-sized companies, however, may be more vulnerable to depreciations.

Financial Times estimates that the stronger pound has “wiped more than £1 billion off profits of big UK groups.”⁷ Ernst and Young estimate that 14% of Q2 2014 profit warnings by UK publicly listed companies appealed to the adverse effect of exchange rate movements.⁸

My discussions with UK businesses, as well as reports from Bank of England Agents based around the country, provided further information on how companies have been affected by a stronger currency. For many exporters, especially in the goods sector, the primary impact to date has been through reduced margins and the translation effect of converting foreign profits into sterling. Figure 3 reports these results from a survey by Bank of England Agents of over 300 exporters during June and July of this summer. Most firms, especially in services, reported that sterling’s moves had not yet substantially affected trade volumes. In fact, over 60% of service-exporting firms reported that sterling’s appreciation had not had any effect. For most firms in both goods and services, export growth over the last three months had been stronger than a year ago – and most expect the next year to be even stronger.

Figure 3: Impact of sterling appreciation, last 12 months

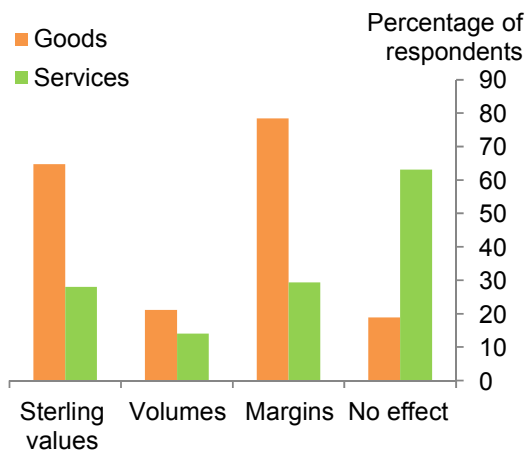
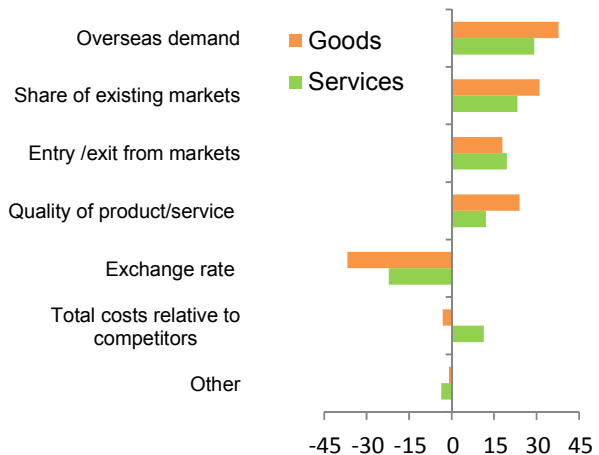


Figure 4: Factors affecting exports, next 12 months



Companies offered several explanations for why sterling’s strength had so far been manageable. Some mentioned that fixed-price contracts and hedging (either in financial markets or by country-sourcing of inputs⁹) had provided some protection. Others – especially those who primarily export to Asia and the Middle East – claimed that since they price most of their trade in dollars, movements in sterling had little effect on demand. Others cited cheaper imports (including oil and other inputs) and low wage growth as helping maintain competitiveness and thereby compensate for stronger sterling.¹⁰ Still other firms pointed out that even though the currency had appreciated by 10%, this followed an even larger depreciation during the crisis, so that sterling was still more competitive than pre-crisis. As shown in Figure 4, although almost

⁷ *Financial Times*, “Groups take £1bn hit from strong pound,” 02/08/14.

⁸ Ernst and Young, “Analysis of Profit Warnings”, Q2 2014.

⁹ For example, Burberry sources materials locally, therefore matching the currency of costs and sales.

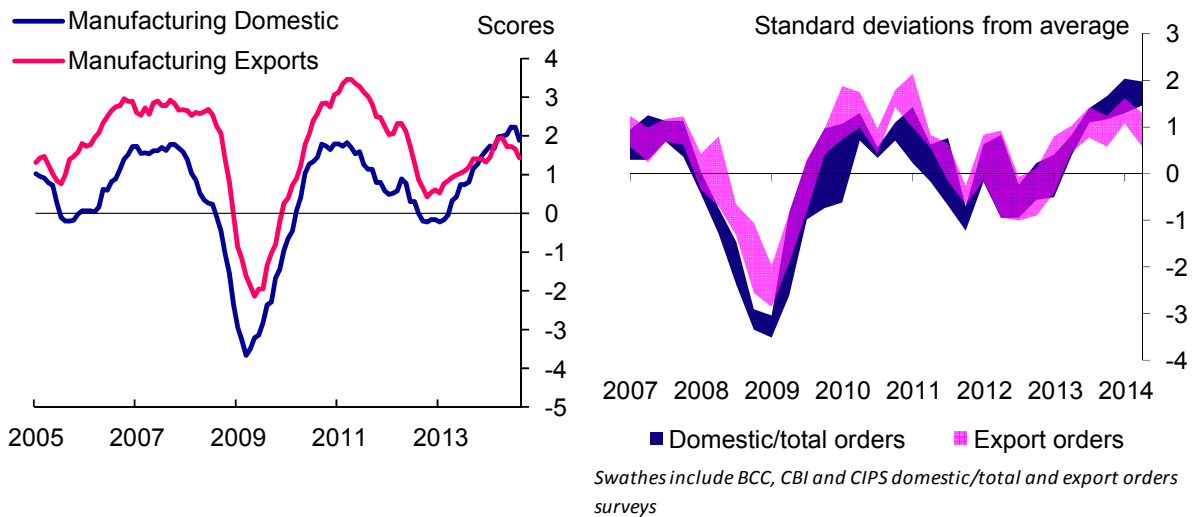
¹⁰ OECD input-output tables indicate that UK exports’ import intensity was 21% in 2010 and 32% for manufacturing.

40% of the goods exporters interviewed by Bank of England Agents worried that sterling's appreciation would reduce exports over the next year, many highlighted other factors that could counteract this – especially an improvement in overseas demand.

Some of the challenges related to a stronger currency may still take more time to play out and affect prices, volumes, and sales. Some companies mentioned that the hedging and fixed-term contracts that initially helped insulate them from sterling's appreciation are starting to roll off. Others mentioned that although they were able to squeeze margins to maintain market share, this is not sustainable and is limiting their ability to fund needed investments.

Some recent data is consistent with these lagged effects. For example, the left side of Figure 5 shows that manufacturers traditionally reported higher growth for exports than domestic use since 2005, but when sterling began its sharp appreciation in March 2013, this pattern began to reverse. Manufacturers are now reporting stronger growth in the domestic market than abroad. The figure on the right shows survey results indicating that export orders have been weakening relative to domestic orders. It is impossible to tell, however, how much of this relative weakening in manufacturing exports' growth and orders relative to domestic manufacturing reflects a stronger currency, or simply stronger growth and demand in the UK relative to its main export markets (especially the euro zone).

Figure 5: Agents' scores for manufacturing output growth (LHS) and surveys of domestic and export orders (RHS)

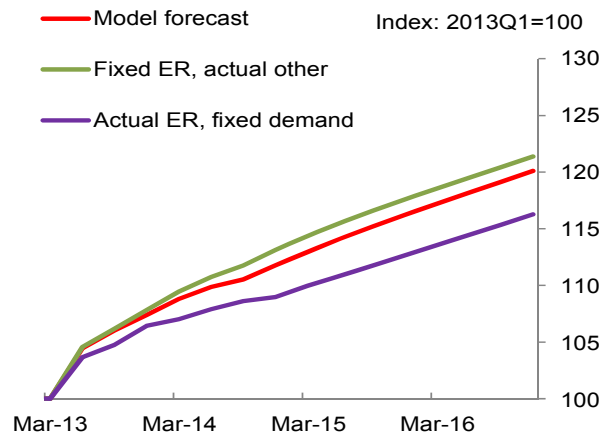


Therefore, to better isolate the current and expected future impact of sterling's appreciation on exports, it is helpful to use formal models. We estimated an error-correction model predicting UK exports (excluding financial services) over the short-term (one quarter) and long-term as a function of movements in the exchange rate, demand in the UK and its trading partners, and other variables. The results based on quarterly data from 1976 through 2007q2 (just before the crisis) are reported in the Appendix. Changes in

the real exchange rate do not initially have a significant effect on total exports. Over periods longer than one quarter, however, a stronger real exchange rate is correlated with a significant fall in total exports. Although the estimates should only be interpreted as a rough guide to the magnitude of this effect, they suggest it is meaningful; a 10% appreciation of sterling – holding all else equal – is predicted to cause a 3.1% fall in export volumes over the long term. The effect is estimated to be more important for goods exports than services. The results also highlight the important role of growth in UK export markets. Stronger demand in UK trading partners has a significant positive effect on UK exports in both the short- and long-term, and the estimated magnitude of the effect is even greater than that from a similar percent change in sterling's value.

To put this in context, Figure 6 uses the model's estimated coefficients to predict the path of goods exports from when the recent appreciation started in 2013Q1 through today under three scenarios. The red line is the predicted path of exports given sterling's 8% appreciation over the period 2013Q1 to 2014Q2.¹¹ The green line shows the predicted path of exports if the exchange rate had not appreciated and instead remained fixed at its 2013Q1 level. Exports would have been slightly stronger – but the effect is small.

Figure 6: Predicted UK goods exports



The export forecasts beyond 2014Q2 are conditioned on the August 2014 Inflation Report forecasts for UK trade-weighted world GDP and the sterling nominal effective exchange rate. Relative export prices are kept constant, while world imports are based on the forecast of world GDP, accounting for the different trends in the two series.

In contrast, the purple line shows the predicted path of exports if sterling had appreciated on the observed path, but global demand (with countries weighted by their share of UK exports) had not increased and instead remained at its lower level from March 2013. Exports would have been substantially lower. This reinforces a key point raised by many companies and confirmed by looking at differences in export patterns to different regions. Growth and demand in trading partners is critically important in supporting exports and can more than compensate for any changes in competitiveness resulting from sterling's recent movements.

Effects on Growth and Employment

What does all this mean for growth and employment? The previous discussion suggested that sterling's appreciation could affect overall demand through several channels: lower reported profits (which translate into lower equity valuations and dividends, thereby affecting spending), lower exports, and lower domestic

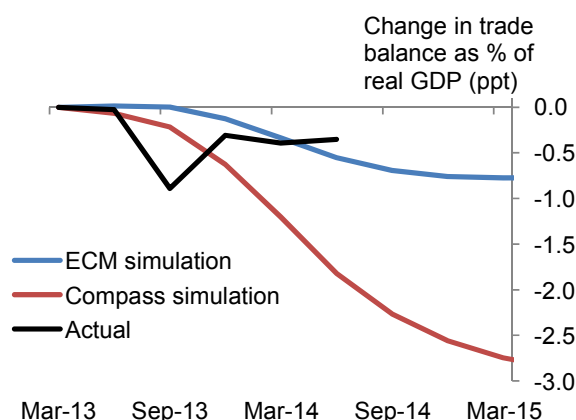
¹¹ This is the appreciation between 2013 Q1 and 2014 Q2 if one uses quarterly averages, which we use for estimating all models discussed in these comments.

production in import-competing sectors. Another effect could be lower reported income on prior investments in foreign bonds, equities, and other forms of investment – whether made by individuals, pension funds, or companies. Any reduction in this type of investment income – even if it just resulted from currency translations and not real changes in income – would reduce the current account balance¹² and the incomes earned by those holding these investments. A final set of channels by which sterling’s movements affect the economy is through import prices, the overall price level, and thereby monetary policy.

I will leave the effects on prices and monetary policy for the last part of my comments. As for the other channels by which sterling’s movements could affect growth and employment, most important is likely to be the effects working through changes in exports and imports. All else equal, stronger sterling will correspond to a reduction in exports and increase in imports, both of which would contribute to a deterioration in the trade deficit. But how large is this effect? Two different approaches for assessing the magnitude show the range of estimated effects.

First, we use the coefficient estimates in the ECM model discussed above (and in the Appendix) to estimate the effect on total exports and total imports of the 8% appreciation (based on quarterly averages). Total exports would fall by 1.5% (with goods exports down 1.4% and service exports by 1.1%). Total imports would increase by 2.5%. The blue line in Figure 7 shows the resulting decline in the trade balance of 0.8 percentage points, with most of the adjustment occurring within a year.¹³

Figure 7: Estimated impact of sterling appreciation on trade balance



An alternative approach to estimating these effects is to use a more complicated dynamic general

equilibrium model that should better capture the various ways in which exchange rate movements affect various prices and demand. To do this, we use the COMPASS model, which underlies many of the Bank of England’s forecasts.¹⁴ In order to analyze the effect of a movement in sterling, it is necessary to make an assumption about what causes this movement. To simplify the analysis, we assume that sterling’s

¹² The current account balance is the trade balance plus net investment income (the return on foreign assets less payments on domestic assets held by foreigners) plus a component called current transfers. The UK has experienced a sharp deterioration in its net investment income, such that this deficit has recently contributed more to its current account deficit than the trade deficit. It is unclear, however, how much of this deterioration in net investment income has resulted from currency movements or from slower growth and other factors that lower asset returns in areas constituting a large share of UK foreign investment (namely the euro zone). For a recent analysis of the UK current account deficit, see the speech by Ben Broadbent at: <http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech750.pdf>.

¹³ This estimation also involves making several assumptions. For example, we assume that there is 90% pass-through for import prices and 60% for export prices (which are consistent with the post-crisis evidence). We also assume that all variables except trade volumes and the exchange rate remain constant – therefore ignoring subsequent changes to demand in trading partners.

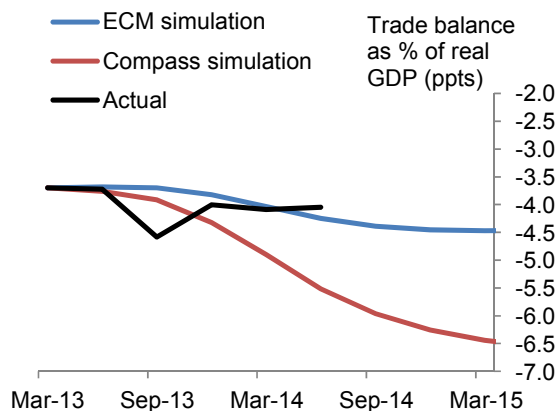
¹⁴ See <http://www.bankofengland.co.uk/research/Documents/workingpapers/2013/wp471.pdf> for more information on the COMPASS model.

appreciation was exogenous and persistent, and therefore we do not incorporate that the recent appreciation might reflect the perceived strength of the UK relative to its trading partners. We estimate the effect of the recent appreciation on the trade balance, and assume no other shocks or policy responses (including no adjustments to monetary policy). The simulated effect is shown in the red line in the same Figure 7. It shows a larger and more prolonged effect on the trade balance – with a gradual decline of just over 2.5 percentage points after about two years.

These simulations indicate that stronger sterling will affect some exports and import-competing firms, and have some effect on the trade balance.¹⁵ To put these simulations in context, the real trade deficit (excluding financial services) was £14 billion at the start of Q1 2013, or 3.7% of GDP.¹⁶ The estimates above indicate that as of Q2 2014, the appreciation could have reduced total net exports by between £4.4 billion and £7 billion, reducing the trade deficit from -3.7% to a range of -4.2% to -5.5% of GDP. These estimated effects – if not balanced by other factors – could have a meaningful effect on aggregate demand. Figure 8 shows the actual change in the trade balance over this period (in black) and the effect that is estimated to correspond to sterling’s appreciation (in the red and blue lines, using the two different models). The trade deficit has not deteriorated as much as predicted in the COMPASS model, but shown a moderate deterioration comparable to that predicted in the ECM model.

The corresponding effects of this source of a reduction in aggregate demand from a decline in the trade balance on overall employment and economic growth would be meaningful. This is confirmed by simulations using the general-equilibrium model cited above.¹⁷ These estimates should be interpreted as maximum possible effects given that the trade balance has not deteriorated as much as predicted in the model and that the recent appreciation is probably not entirely exogenous to economic developments (as assumed in the model).

Figure 8: Actual and predicted trade balance



With these caveats, the simulation indicates that sterling’s appreciation would have reduced total hours worked (which incorporates both the number of people employed as well as hours worked) by at most 0.4% and the level of GDP by at most 0.4% as of 2014 Q2. These effects of sterling’s appreciation would have

¹⁵ It is worth noting that these various approaches all overestimated the impact of the depreciation after the crisis on net exports, especially for the United Kingdom, so they may also be overestimating the impact of the recent appreciation. For example, see De Schryder and Lewis (2014), which highlights the lack of responsiveness of UK exports.

¹⁶ The nominal trade deficit including financial services, which is the headline statistic published by the ONS, was -1.6% of nominal GDP in Q1 2013. All numbers on the trade balance quoted in this speech were updated before ONS revisions were published on 30th September 2014.

¹⁷ These include two additional effects compared to the ECM model: (1) the drag on demand which occurs because lower net exports would lower incomes (and therefore consumption and investment); and (2) the boost from cheaper imports on purchasing power and income.

been spread over several quarters. For comparison, total hours worked has actually increased by 3.7% and the level of GDP by 3.8% since 2013 Q1. Therefore, the estimates indicate that employment and demand would have been moderately higher without sterling's appreciation, but these effects are small in relation to the recovery in other components of demand that have supported growth in employment and the overall economy.

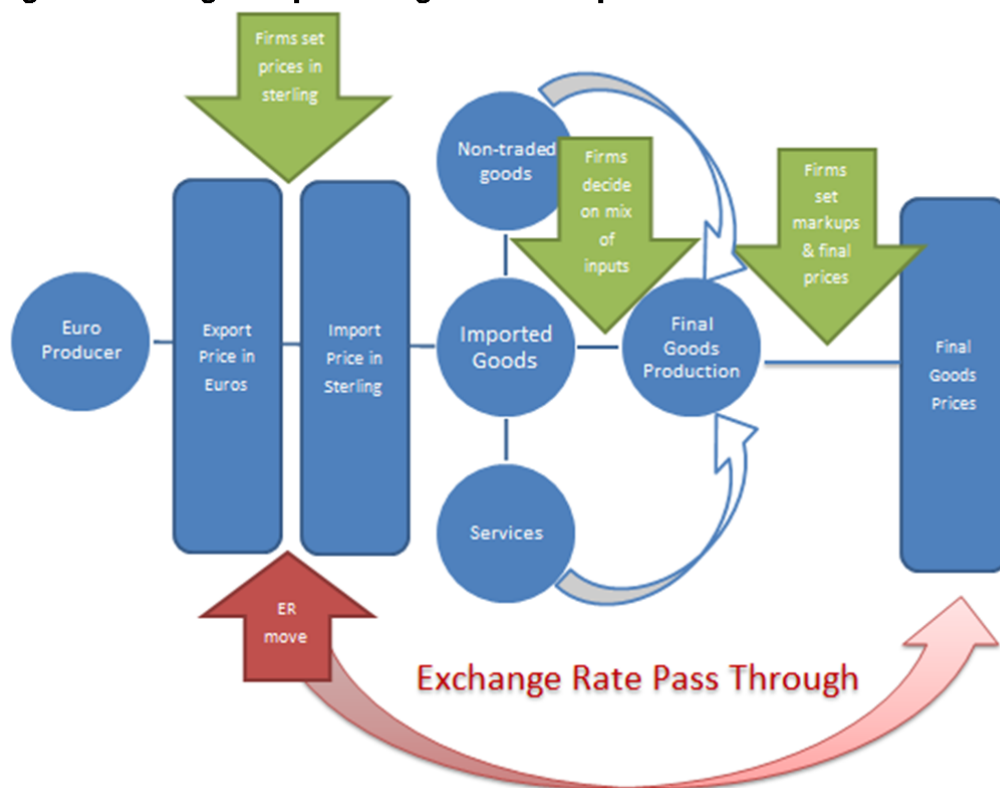
Of course, for those individuals and companies which are most directly affected, the appreciation of sterling has presented substantive challenges. I do not want to understate these challenges – especially for a company which may have had to shut down or an employee that may have been laid off. But it is worth noting that the strength in the domestic recovery and corresponding hiring and boost to demand has far outweighed these effects on aggregate. Small improvements in growth abroad would also far outweigh the negative effects of sterling's recent appreciation.

Effects on Prices and Inflation

Although the effect of sterling's recent appreciation on growth and employment is moderate, the impact on prices and inflation is more substantive and has the most important implications for monetary policy today. Economists use the term "pass through" to capture how changes in the exchange rate "pass through" first to import prices, and then to the broader price level and corresponding rate of inflation. Although the concept is simple, predicting exactly how exchange rate movements affect prices is less straightforward, as many factors can influence this relationship. Figure 9 gives you an idea of the various mechanisms that are in play. Not surprisingly, empirical estimates of the size of pass-through from exchange rates to prices have varied widely across countries, goods, and time periods.

Given the importance of these relationships to understanding inflation and the appropriate path for monetary policy, an extensive academic literature attempts to measure pass through. This literature has made substantial advances over the past decade, thanks to the availability of massive data sets with detailed price information. I distinctly remember sitting through an academic conference at which we spent an embarrassing amount of time arguing whether Grade A brown eggs should be a separate category from Grade A white eggs or Cage-Free Grade A brown eggs. Needless to say, this is one area of economics where we can no longer complain that the data is not sufficiently detailed.

Figure 9: Exchange rate pass-through - euro example



Thanks partially to this wealth of data, the academic literature provides a number of important insights for understanding pass-through from sterling's recent appreciation. Let me highlight three that are particularly relevant.¹⁸

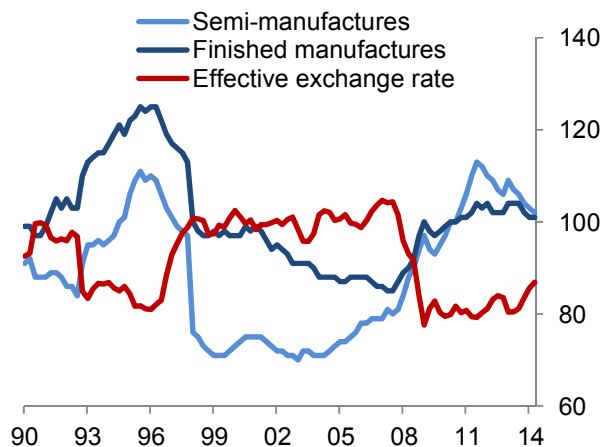
First, the extent of pass-through depends on the currency in which importers set their prices.¹⁹ If UK importers agree on what they will pay to foreigners based on dollar or euro prices, then movements in sterling will more quickly affect domestic prices. If UK importers instead negotiate their prices in sterling, they will be slower to adjust prices after any currency movements. Although it is difficult to get precise numbers, a large share of UK importers are believed to set their prices in dollars and euros. This would imply that movements in sterling quickly affect domestic import prices. This sensitivity of import prices to exchange rate movements may have grown even stronger recently if the advent of the euro caused some importers to shift from pricing in sterling to euros.

¹⁸ There are other factors that are important for determining the extent of pass through, such as the origin and type of the shock which generated the initial exchange rate move. Also important is the country's framework for monetary policy – with evidence that countries such as the UK with credible inflation-targeting regimes tend to have lower rates of pass-through. See Burnstein and Gopinath (2013) for a recent overview of the academic literature on pass-through and Mishkin (2008) for a discussion of exchange-rate pass through and the implications for monetary policy.

¹⁹ For example, see Gopinath et al. (2010).

Second, the extent of pass-through depends on the degree of competition and therefore varies across sectors of the economy.²⁰ In less competitive sectors, companies can more easily adjust margins to absorb any gains or losses from exchange rate movements, without needing to adjust the prices they charge. In more competitive sectors, margins tend to be much tighter, so companies do not have the ability to absorb the effects of exchange rate movements and they more quickly adjust prices. Figure 10 shows these differential effects for semi-manufactured goods (such as steel) and finished manufactured goods (such as cars). Importers of semi-manufactures are subject to more intense price competition and have less pricing

Figure 10: Sterling effective exchange rate and import prices of semi- and finished manufactures



power than importers of finished manufactures. Therefore, importers of semi-manufactures adjust prices more rapidly in response to exchange rate movements (both depreciations and appreciations). These patterns also apply to importers of goods relative to services; service companies often have more pricing power than goods importers, and therefore greater flexibility not to immediately adjust prices in response to exchange rate movements.²¹

Third and finally, if there are any costs to adjusting prices – what are referred to as “menu costs” – then it may not make sense for importers and exporters to adjust prices in response to small currency

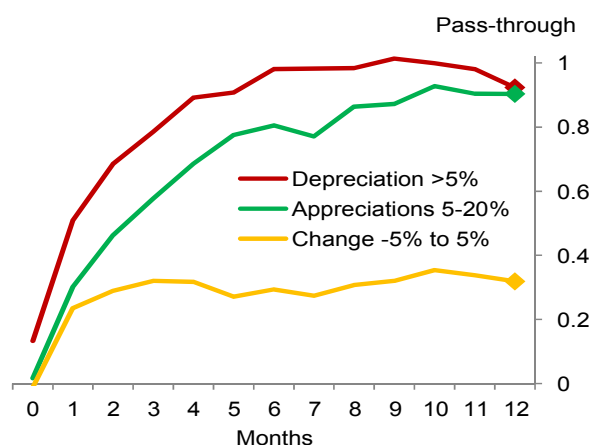
movements. For larger movements, however, it would be worth the cost of adjusting their order forms or websites – or whatever costs they incur to adjust prices. This leads to nonlinear effects of exchange rate movements on prices. Figure 11 shows evidence of this in the United Kingdom based on Bank of England research using micro-level data.²² The yellow line shows that exchange rate movements smaller than 5% (in either direction) tend to have minimal effect on import prices. In contrast, appreciations and depreciations greater than 5% (the red and green lines, respectively) have much larger effects. In fact, these effects of large exchange rate movements on import prices occur rather quickly – with most of the effect within 6 months and no additional impact after 12 months. Translating these results into implications for sterling’s recent appreciation, the 8% appreciation would have caused import prices to decrease by about 7% within 12 months (8% appreciation x 90% pass through).

²⁰ For example, see Goldberg and Campa (2010).

²¹ I recently spoke to a service company that confirmed this effect; the manager volunteered that since they sell “skills and talent”, currency movements had little effect on their export pricing.

²² Research results from John Lewis at the Bank of England.

Figure 11: Panel regression estimates for pass-through for small and large exchange rate movements



While these estimates focus on how exchange rates affect import prices, what has more direct implications for monetary policy is how these changes in import prices feed through into the overall price level and inflation. Bank of England analysis indicates that all changes in import prices eventually feed through into overall prices – what is called “full pass-through”. The process, however, tends to be very slow and takes about 3 to 4 years before the change in import prices influences aggregate prices.

A key factor determining by how much changes in import prices affect overall prices is the import intensity of the economy. For countries in which

consumers and companies allocate a significant share of their spending to items imported from abroad, changes in import prices will have a greater effect on the price level. For the UK, the import intensity of the consumer price index (CPI) is about 30%.²³ When combined with the baseline estimate (discussed above) of 90% pass through from large exchange rate movements into import prices, this generates an overall pass-through coefficient of around 27%. In other words, a 10% appreciation of sterling would reduce the level of the consumer price index by about 2.7 percentage points. This would be a large effect if it implied a corresponding reduction in inflation in one month, but the effect is likely to be spread out gradually over a period of 3 to 4 years. Bank of England estimates suggest that less than half of the adjustment would occur over the first year, and most of the adjustment by the end of the third year.

Even if these effects of exchange rate movements on inflation are spread out over time, however, they could still be critically important if they mask underlying price pressures that only become apparent when the exchange rate effects fade. Monthly CPI inflation is currently 1.5%. Does this incorporate a substantial drag from the past appreciation of sterling? If so, inflation could increase quickly as the drag fades, suggesting tighter monetary policy could be appropriate. Or is any such drag currently small or likely to persist for an extended period? If so, inflationary pressures could remain muted, thereby providing more time before an adjustment of monetary policy is appropriate.

To better understand these effects, and especially their timing, the Bank of England’s COMPASS model is helpful. Figure 12 shows the simulated effect of sterling’s actual appreciation from 2013Q1 through 2014Q2

²³ This can change over time based on changes in demand, relative prices, and trade patterns. This can also change in response to exchange rate movements. For example, the large exchange rate depreciation during the crisis may have increased the relative price of imports, shifting demand away from imports, and thereby reducing the import intensity of the CPI since then. Unfortunately, detailed data on the import-intensity of the overall economy is only available with a substantial lag.

on import prices.²⁴ The model predicts that the immediate impact of this appreciation was a sharp fall in import prices, with the effect peaking at about -4 percentage points around now (in the 3rd and 4th quarter of this year). This drag on import prices will persist, but fade throughout 2015.

Figure 12: Import price inflation deviation from trend

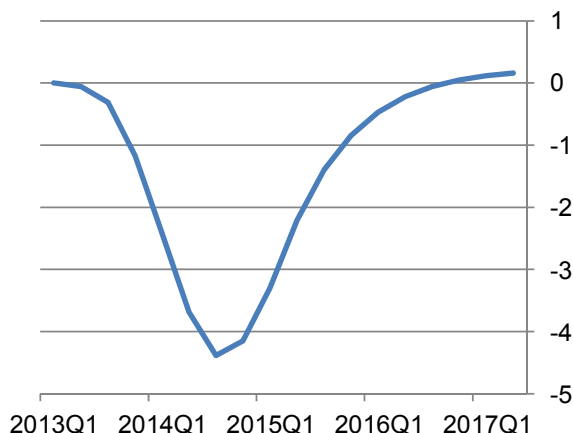
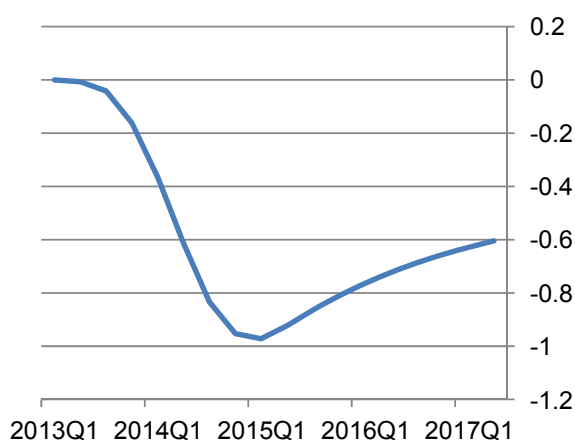


Figure 13: Consumer price inflation deviation from trend



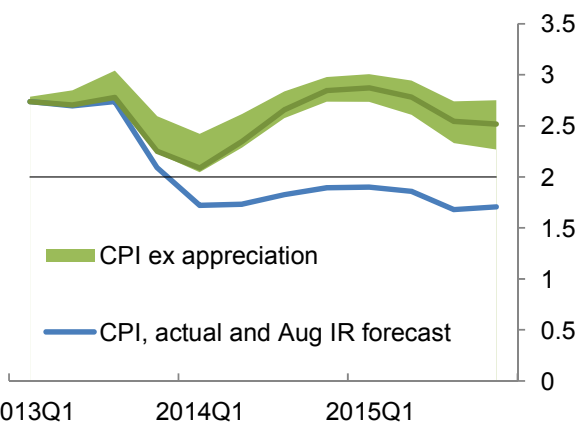
What does this mean for overall inflation? Figure 13 shows the corresponding simulated direct and indirect drag on CPI inflation over the four years after sterling began to appreciate.²⁵ It shows that the impact is slow to build – with a maximum drag occurring in late 2014 and early 2015. The magnitude of the effect is estimated to be large – although it is important to remember that these estimates assume an exogenous appreciation and therefore might not be directly comparable to the actual effect of the recent strengthening of sterling. These types of exercises are also imprecise – especially after the crisis when many economic relationships may have changed and as the appreciation follows in the wake of a large depreciation. With these important caveats, the simulation suggests that inflation is about 0.8 percentage points lower today relative to what it would have been if sterling had not appreciated and stayed at its level from early 2013. By the end of this year, inflation could be close to 1 percentage point lower than without the lagged effect of sterling’s past appreciation. Although this dampening effect fades over time, the simulations suggest that the drag could persist for several more quarters.²⁶ I would place less weight on the model’s predictions farther into the future, however, as they build on general equilibrium mechanisms that do not fully incorporate the complexity of the economy.

²⁴ For this exercise, I continue using the assumption discussed above that the exchange rate movement occurs due to an exogenous, unanticipated change in exchange rate risk premia and the appreciation is persistent. No other shocks or policies affect the economy over this period, including no adjustments to monetary policy. See previous section for more information on the model and assumptions.

²⁵ COMPASS is a general equilibrium model and the appreciation has general equilibrium implications which imply an indirect drag on inflation, on top of the direct drag from import prices.

²⁶ This persistence results from the model’s assumption that lower import prices cause final output producers to substitute towards imports, reducing domestic demand and thus hours worked. The reduced demand decreases the rental rate of capital, marginal cost of production, and value-added inflation, and when combined with lower import prices, leads to lower production costs and output inflation. These estimates assume no monetary policy response to lower inflation.

Figure 14: Actual and predicted consumer price inflation, with and without drag from exchange rate appreciation



The green swathe shows COMPASS' predictions of CPI inflation had the exchange rate remained at its 2013Q1 level, under different degrees of persistence of the exchange rate appreciation. The appreciation is assumed to be exogenous, no other shocks are assumed to hit, and policies are assumed not to change.

Keeping in mind these many important caveats and cautions not to take the point estimate from this exercise as precise, the key implication is that sterling's appreciation that began early last year is still dampening inflation today. Figure 14 clarifies this important point. The blue line shows actual and forecast CPI inflation (according to the Bank of England's August *Inflation Report*). The green band shows simulated CPI inflation excluding both the direct and indirect impact of sterling's appreciation from 2013 through 2014Q2.²⁷ Although this cannot be interpreted as a counterfactual due to how the model works, and the point estimates should again be interpreted as rough guides given the model uncertainties discussed above, it suggests that if one chose to look through the effects of the past appreciation, inflation pressures would be greater than indicated by the headline CPI statistics.

This generates a number of important questions for monetary policy. Can we find supporting evidence that underlying inflationary pressures are as high as suggested in the chart above? Or could the extent of pass-through from sterling's recent appreciation be lower than the simulated results, suggesting lower underlying inflation? If exchange rate movements are significantly affecting prices, should we look through these effects – as has been suggested by some members of the MPC in the past? As this drag on inflation from sterling's appreciation fades, will any underlying domestic inflationary pressures cause prices to increase faster than expected? Given the lags between when any adjustments in monetary policy filter through into the economy, these questions are critically important in order to adjust monetary policy in advance of any underlying cost pressures feeding through into headline inflation. But the appropriate path for monetary policy also hinges on the answer to a final, critical question; are there signs that domestic inflation is elevated if one looks through any effect of exchange rate movements?

Domestic Inflation and Implications for Monetary Policy

To try to understand the extent of any such underlying and more persistent inflationary pressure, the Bank of England often looks at measures of domestically-generated inflation (DGI). These measures focus

²⁷ The bands incorporate different assumptions about the persistence of the shock driving sterling's appreciation. This band is included primarily to highlight the uncertainty around these estimates given the number of assumptions required to perform these simulations. There are a number of other assumptions which one could modify to generate different bands.

on prices that should be less directly affected by exchange rate movements and imported inflation.²⁸ It is important to note, however, that these measures are not quite the same as inflation in the absence of exchange rate effects. For example, changes in import prices affect real incomes and exports (amongst other variables) – which in turn all affect wages and domestic inflation.

There is no perfect measure of DGI, and since each measure has its advantages and disadvantages, I've found it useful to look at a “dashboard” (to borrow Janet Yellen's terminology) of seven measures to capture overall trends:

- *Services inflation (Core CPI Services measure)*: because services are generally less import intensive than goods.²⁹
- *Import-Adjusted Inflation (Import-weighted CPI)*: Inflation with each component weighted by its share in the CPI basket and then inversely weighted by the share of imported content.³⁰
- *Unit Labour Costs (ULC)*: labour costs for the whole economy, including National Insurance and pension contributions.
- *Unit Wage Costs (UWC)*: using average weekly earnings in the private sector.
- *Gross Value Added Deflator excluding government goods and services (GVA deflator ex govt)*: to capture inflation in domestic production.
- *GDP Deflator (GDP deflator ex exports)*: that focuses on expenditure components excluding exports.
- *Services-Producer Price Inflation (SPPI gross)*: inflation in services sold to businesses and the government.

Figure 15 shows the most recent values for these 7 measures of domestic inflation relative to their pre-crisis averages (indicated by the blue boxes and calculated from 1998-2007). The chart shows that domestically-generated inflation is well below pre-crisis averages for 5 of the 7 measures. When combined with the continued drag on inflation from sterling's past appreciation, it would be easy to interpret this chart as indicating little sign of inflationary pressures – both from domestic and external sources.

But, is this comparison to the pre-crisis period from 1998-2007 appropriate? This was a period during which dangerous vulnerabilities built up – so I am always wary of using this pre-crisis period as a benchmark. Another logical benchmark against which to compare the seven measures of domestic inflation is instead the 2% inflation target, which is expressed as the dashed line in the graph. Before discussing the results, it is important to highlight that this comparison should not be interpreted as implying that there is an imminent risk of CPI inflation above target if some of these measures of domestically-generated inflation are above 2%.

²⁸ This includes imported inflation through imported final consumption goods and services as well as through the imported components of domestically produced goods and services.

²⁹ This measure excludes VAT effects, education, and air fares and holiday packages.

³⁰ More specifically, each item is weighted by its traditional share in the CPI index as a fraction of the imported component in production. To be concrete, alcoholic beverages have an imported content of 40% and CPI weight of 20, so would be weighted by $(1 / 0.4) * 20 = 50$ in the index (and then expressed as a fraction of the sum of all component weights).

For example, if average weekly earnings grew at over 2%, but this was combined with sufficient productivity growth, this could still keep inflationary pressures related to wages below 2%. Similarly, inflation in service prices for businesses could be absorbed in business margins and not be passed through into their final prices. With this important caveat, this comparison indicates that domestically-generated inflation is higher than the 2% benchmark for three of the measures, and lower than the benchmark for the other four.

The measures that particularly stand out in both of these comparisons are for unit labour costs (ULC) and unit wage costs (UWC). Growth in these measures is well below the other measures of domestically-generated inflation, and surprisingly low given the strength of the recovery in growth and employment. Domestic wage growth is also a key component of medium-term inflation, as well as critically important to ensuring a balanced and sustainable recovery. This highlights an issue which the MPC has been pondering; why is wage growth – especially as measured by average-weekly earnings (AWE) – so low relative to other measures of inflation and given the recovery in the broader economy and especially the labour market?

Figure 15: Measures of domestically-generated inflation relative to pre-crisis

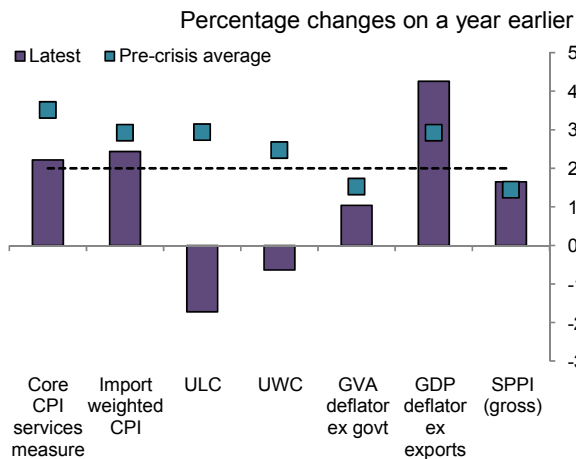
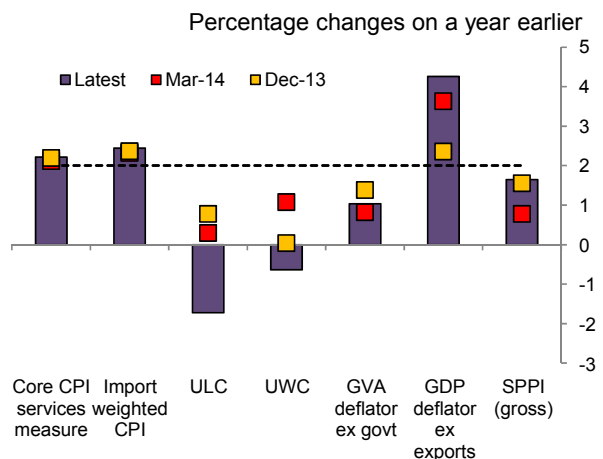


Figure 16: Measures of domestically-generated inflation

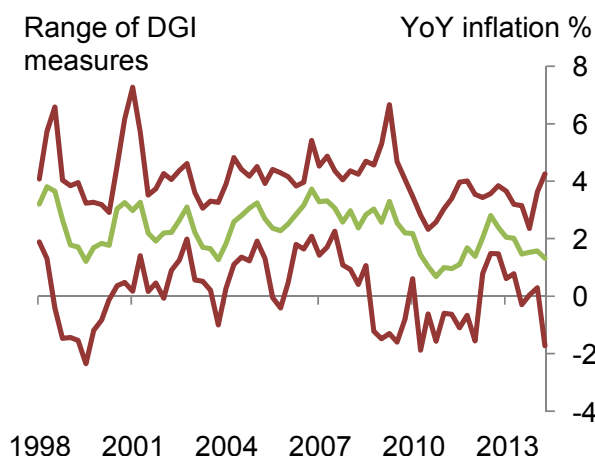


Another key issue to consider when evaluating domestic inflationary pressures is not just indicators of past inflation – but also its prospective path. Even if current inflationary pressures are muted, are there signs that they have already started to pick up or could pick up soon? One way to assess this is to focus not on the levels of these variables, but on how they have recently changed. For example, even if the *Core CPI Services Measure* of inflation is close to 2% today, does that reflect a sharp increase from a depressed level – in which case a continuation of the trend would indicate underlying inflationary pressures? Or has the current level been fairly constant – suggesting less incipient pressures?

To assess this, Figure 16 replicates the values of the seven DGI measures as shown on the last graph. Now, instead of comparing these measures to historic values from the pre-crisis period in the boxes, it compares them to the same indicators as of December 2013 (in yellow boxes) and as of March 2014 (in red boxes). This shows that some of the indicators of DGI have been fairly stable since December and March, while others indicate a recent fall in inflationary pressures (such as in unit wage costs since March), and still others indicate a recent increase (such as in the GDP deflator since December).

In an effort to better summarize these trends, Figure 17 shows the range of all seven measures of domestically-generated inflation since 1998 – with the red lines indicating the highest and lowest values, and the green line indicating the mean. This graph shows that recently domestic inflationary pressures have been muted – in both the level and the trend – with average price pressures near the lows of the series and showing no signs of accelerating. This is a remarkably low degree of domestic inflationary pressures – especially as the indicators attempt to parse out the direct, additional drag on inflation from the lagged effect of sterling’s recent appreciation.

Figure 17: Mean and range of measures of domestically-generated inflation



The red lines in Figure 17 also show, however, that the dispersion in the indicators is large. This highlights the challenges in interpreting different signals provided by different measures of domestically-generated inflation. This also shows why different people may draw different conclusions on the risks of prospective inflation. If a person focuses on the measures that have been declining recently (such as unit wage costs) – he or she would see no sign of inflation picking up. But if the person focuses on the measures at the top of the band (such as the GDP deflator), he or she would see accelerating price pressures.

An even bigger challenge with interpreting these indicators is their timeliness – or lack thereof. Five of the seven measures in this “dashboard” of domestically-generated inflation are only available on a quarterly basis, with at least a month after the quarter ends before the data is available. Four of these measures – the GDP deflator, GVA deflator, ULC and UWC series – are not reported until 3 months after the quarter ends. For these three measures, if there was a spike in the data at the beginning of the quarter, it would not be reflected in available data until 6 months afterward! As a result, although these indicators are useful to understand the past, they only have limited value in assessing prospective trends and risks. Of the 7 measures of domestically-generated inflation, two of the statistics (for *Services Inflation* and *Import-Adjusted Inflation*) are available on a monthly basis, with the data reported within the following month. Although still lagged, this gives more timely information on current trends. These more timely statistics are shown in the

left two bars of Figure 16. They indicate that domestic inflation is around 2% and has recently showed no signs of either accelerating or decelerating.

Therefore, in order to gauge future – and even current – trends, it is useful to focus on the more timely data and on surveys – albeit with full knowledge that surveys also present their own set of challenges. Surveys can provide another indication of what businesses and consumers are not only currently experiencing, but also expecting. Recent survey results, however, also provide varied signals. Surveys of medium-term inflation expectations (such as the Bank of England/NOP Inflation Attitudes Survey and Barclays Basix surveys) suggest that inflation expectations are contained and well in line with historic averages.

Settlements data show that companies have recently increased wages by 1.7% (which is a little lower than the 2.1% rate from one year ago). The Confederation of British Industry (CBI) reports that over the next 12 months, firms expect their wage/salary costs per person employed (which includes overtime and bonuses) to increase by 1.5%. All of these indicators suggest that wage growth will remain positive, but do not indicate imminent risks of inflation greater than the Bank of England's 2% target.

Other forward indicators of wage growth, however, suggest wage pressures may be increasing more rapidly. For example, the latest REC survey reports that 65% of firms increased average salaries/average hourly pay awarded to new staff placed in permanent positions (up from 56% a year ago). The Bank of England Agents' score for growth in total labour costs per employee has picked up over the last year, and Agents report increasing recruitment difficulties and evidence of emerging pressures on pay. Some firms report providing greater compensation in forms other than higher wages – which could explain the lower growth rate in wages relative to total compensation. Taken all together, these surveys could be indicating that the low levels of domestically-generated inflation, especially in wages, are unlikely to persist for much longer.

But surveys are often noisy indicators of future trends³¹ and some of these survey indicators have been predicting a pickup in wage growth for several months – a prediction which has not yet played out. This is even after accounting for the historic lag between when surveys of expectations are reflected in the actual data. Are surveys less useful indicators of prospective wage and inflationary pressures than in the past? Or has the lag between survey indicators and changes in the economy simply lengthened (possibly due to the severity of the crisis) and we will soon see the expected wage pickup? If the lag is simply longer – will wages and other indicators of domestically-generated inflation pickup just as the dampening effect from sterling's appreciation fades – thereby seeing inflation accelerate even more quickly?

Conclusion

This leads us back to where my comments began. Inflation – the primary target for the MPC – is driven by an external component (largely the exchange rate) and a domestic component (largely unit labour costs). Exchange rate movements can have powerful and multifaceted effects on an economy. Just as Puck

³¹ For evidence, see Lui, Mitchell, and Weale (2011),

created substantial havoc – and even terror – in the forest in a Midsummer Night's Dream, sharp movements in the exchange rate can create substantial challenges for businesses, especially exporters.

But although the results of Puck's evening antics came as a surprise in the play, exchange rate movements are observable and largely understandable thanks to substantial advances in academic research. I discussed how sterling's strength has created some drag on the trade balance, and thereby aggregate demand, growth, and employment. These drags on growth are estimated to have been meaningful, but partially balanced by improved growth abroad and small in relation to the strong rebound in consumption and investment that have driven the recovery.

Where sterling's recent moves may have had the greatest economic impact is on prices and inflation. A "top down" analysis estimating the pass-through from exchange rate movements to prices suggests that the lagged effect of sterling's appreciation during 2013 and early 2014 may have acted as a powerful dampening effect on inflation. Although model simulations may be overestimating the magnitude of the effect, sterling's past moves have reduced the risk of inflation increasing sharply, despite the strong growth in employment and the overall economy.

This dampening effect of sterling's past appreciation, however, will peak at the end of 2014 and then begin to fade. As a result, it is becoming increasingly important to monitor trends in domestically-generated inflation – and especially unit labour costs – so that monetary policy can be adjusted appropriately and also be allowed to work through the economy with its own set of lags. Unfortunately, understanding recent trends in the domestic component of inflation – especially the slow growth in wages – has been challenging. A "bottom up" analysis of inflation that focuses on current measures of domestically-generated inflation (which attempt to minimize the dampening effect of sterling's moves) show price pressures that are well contained and little evidence of imminent inflationary risks.

These "bottom up" indicators present a very different story than the "top down" estimates of inflation after adjusting for sterling's recent appreciation. Has sterling's appreciation had less of a dampening effect on prices than has traditionally occurred – perhaps due to structural changes in the UK or global economy? Or are the measures of domestic inflation understating current inflationary risks – perhaps due to the long lags before timely data is available? To answer these questions, it is critically important to monitor measures of prospective inflation to determine the appropriate path for monetary policy.

Just as Lysander tells Hermia that: "The course of true love never did run smooth," the same could be said for the course of inflation in the UK. When buffeted by large exchange rate movements, inflation will also not "run smooth". The effects of sterling's appreciation in 2013 through early 2014 will also not fade away as quickly as a midsummer night's dream. But as these calming effects on inflation gradually dissipate, it will become even more important to monitor prospective signs of domestic price pressures to avoid the troublesome inflation sprite.

Appendix: Error-correction model of UK exports and imports

We use standard formulations of export and import equations based on the imperfect substitutes model of international trade presented in Goldstein and Khan (1985). In such equations, trade volumes are expressed as functions of the export/import market's demand and the real exchange rate. The equations are then estimated using a single equation error correction framework (Stock, 1987).

In addition to the two core determinants – external demand and the real exchange rate – our long-run relationship includes a dummy for the period after 2001 to account for a higher trend in world trade, associated with greater international trade integration of a few large emerging economies. We also control for the higher ratio of world trade to world exports before and after 2001.

Table 1: Regression results for pre-crisis period (1976-2007Q2)

	Total exports (ex. financial services)	Goods	Services exports (ex. financial)		Total imports (ex. financial services)
Short-run coefficients					
<i>Log changes in:</i>					
Lagged exports	-0.27***	-0.23**	-0.19**	Lagged imports	0.13*
World import demand	0.81***	0.84***	0.62***	UK import demand	0.68***
Real exchange rate	-0.12	-0.11	-0.13	Relative import prices	-0.08
Error correction term	-0.33***	-0.41***	-0.25***	Error correction term	-0.47***
Long-run coefficients					
<i>Lagged logs of:</i>					
Constant	7.75***	6.01***	10.33***	Constant	7.47***
World import demand	0.77***	1.09***	-0.08	UK import demand	0.92***
Real exchange rate	-0.31**	-0.29**	-0.26	Relative import prices	-0.36***
Post-2001 dummy^(a)	-0.09***	-0.12***	0.02	Post 2001 dummy^(a)	-0.02
World imports/ World GDP post-2001^(b)	-0.28	-1.05***	1.68***	World imports/ World GDP post-2001^(b)	0.10
World imports/ World GDP pre-2001^(b)	0.16	-0.41	1.72***	World Imports/ World GDP pre-2001^(b)	0.32***
<i>Sample</i>	1976q1 - 2007q2	1976q1 - 2007q2	1976q1 - 2007q2		1976q1 - 2007q2
<i>Adj. R-squared</i>	0.32	0.32	0.18		0.44

*** indicates that a coefficient is significant at 1%; ** indicates that a coefficient is significant at 5%

* indicates that a coefficient is significant at 10%

Table 2: List of variables

Name	Description
Exports/imports	Real exports/imports in millions of pounds
World import demand	Average of imports across countries weighted by those countries respective shares in UK trade
UK import demand	UK GDP expenditure components, weighted by their import intensities
Real exchange rate	Nominal sterling effective exchange rate, multiplied by the ratio of the UK exports deflator and the average of export prices across countries weighted by those countries respective shares in UK trade
Relative import prices	UK import price deflator/GDP deflator
Post-2001 dummy	Equals 1 from January 2001 onwards and 0 before that
World imports/world GDP post-2001	Ratio of average imports and total output across countries, weighted by those countries respective shares in UK trade; multiplied by the post-2001 dummy
World imports/world GDP pre-2001	Ratio of average imports and total output across countries, weighted by those countries respective shares in UK trade; multiplied by the pre-2001 dummy

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