

## Andrew G Haldane: Drag and drop

Speech by Mr Andrew G Haldane, Executive Director and Chief Economist of the Bank of England, at BizClub lunch, Rutland, 19 March 2015.

\* \* \*

*The views are not necessarily those of the Bank of England or the Monetary Policy Committee. I would like to thank Gareth Anderson, Jeremy Franklin, Richard Harrison, Riccardo Masolo, Becky Maule, Roland Meeks and especially Tom Smith for their assistance in preparing the text. I would also like to thank Rebecca Burnham, Rupert de Vincent-Humphreys, Will Dison, Fernando Eguren Martin, David Elliott, Nicholas Fawcett, Bob Gilhooly, Jeremy Harrison, Simon Hayes, Chris Jackson, Phil King, Jenny Lam, David Miles, Francesca Monti, Liam Parker, Kate Reinold, Gareth Ramsey, Matt Roberts-Sklar, Magda Rutkowska, Ali Schomberg, Kate Stratford, Rahul Thakrar, Ryland Thomas, Dan Wales and Madeleine Warwick for their comments and contributions.*

In March 2009 the Bank of England cut official UK interest rates to 0.5%, their lowest-ever level. Financial markets did not expect this low level of interest rates to persist, with the first rise expected nine months later in December 2009. Yet six years on, official UK interest rates remain at 0.5%. The first rise in UK interest rates is still expected around a year hence (Chart 1). Like a bad flight, the take-off time for interest rates has been repeatedly put back.

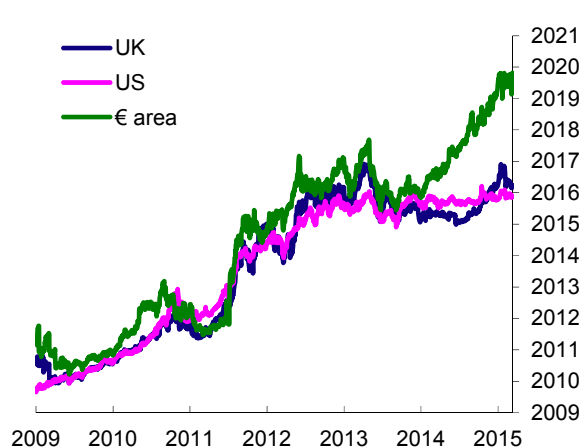
That pattern has been mirrored internationally. In March 2009 US policy rates were in a range of 0–0.25%, their lowest-ever level. Markets expected them to rise within a year. In the euro-area, policy rates were also at all-time lows, but were expected to rise within 18 months or so. Six years on, US policy rates remain between 0–0.25%, while euro-area rates are 150 basis points lower. The first rise in US policy rates is still expected within a year, while the first rise in euro-area rates is now not expected for over four years (Chart 2).

**Chart 1:** Date of first rate rises implied by forward market interest rates



Sources: Bloomberg and Bank calculations. Notes: The y axis shows the date at which the instantaneous forward OIS curve reaches 25bps above Bank Rate.

**Chart 2:** Date of first rate rises implied by forward market interest rates



Sources: Bloomberg and Bank calculations. Notes: The y axis shows the date at which the instantaneous forward OIS curve reaches 25bps above Bank Rate for the UK; the ECB main refinancing rate for the euro area; the top of the FOMC target range for the US.

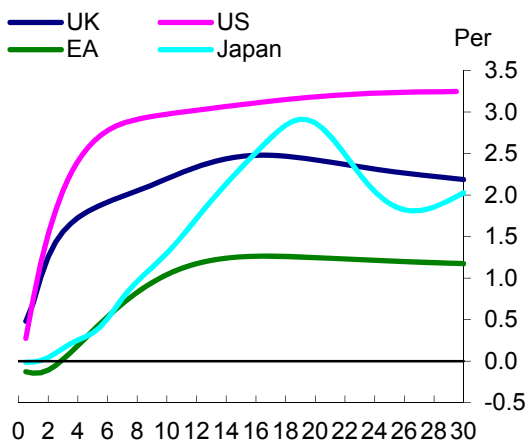
Looking beyond lift-off, the expected pace of interest rate ascent is also remarkably gradual by historical comparison. Chart 3 shows the paths of short-term forward interest rates in the UK, US, euro-area and Japan for the next 30 years. They imply that rates will rise, on

average, by only 10 basis points per year in the US, 7 basis points per year in the UK, 6 basis points per year in Japan and 5 basis points per year in the euro-area. That is the most gradual of interest rate glide-paths.

The eventual cruising altitude for interest rates expected by financial markets is also remarkably low by historical comparison. The level of forward interest rates 30 years hence is around 3% in the US, 2.5% in the UK, 2% in Japan and 1.2% in the euro-area. Up until the crisis, the average level of policy rates in these countries in the post-war period was 3%, 7%, 4% and 3% respectively – for most, roughly double the levels currently expected. Interest rate end-points are also remarkably low.

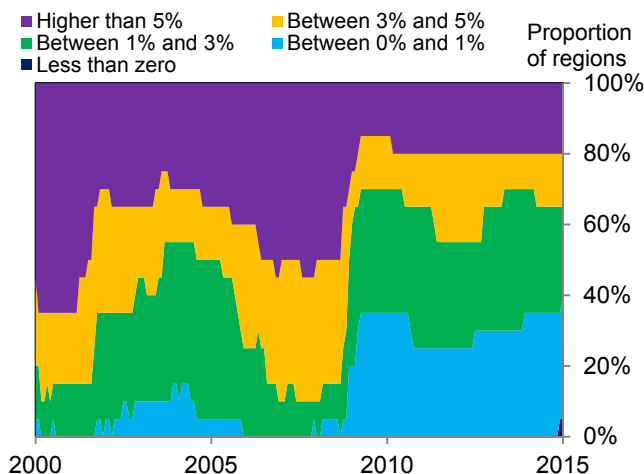
In a growing number of countries, interest rates are not just low but have recently turned negative. At last count, eleven countries had negative shorter-term bond yields, including nine within the euro-area. In part, that reflects the effects of a recent further round of policy loosening by central banks. At present, two-thirds of countries globally have policy rates below 3% (Chart 4).

**Chart 3:** Paths for policy rates implied by forward market interest rates



Sources: Bloomberg and Bank Calculations. Notes: Instantaneous forward rates based on OIS contracts for the UK and euro area and government bonds for the US and Japan.

**Chart 4:** International policy rates over time



Sources: Thomson Reuters Datastream, CEIC and Bank calculations. Notes: Included regions are: Australia, Brazil, Canada, China, Euro area, Hong Kong, India, Indonesia, Malaysia, New Zealand, Norway, Philippines, Singapore, South Korea, Sweden, Switzerland, Taiwan, Thailand, UK and US. Together these countries account for approximately 70% of PPP-weighted world GDP.

Of course, what goes down can also bounce back up. Recently, there has been some upwards movement in UK and US yield curves. But yields elsewhere, especially in Europe, have continued to fall. And the longer-term trend is clear: a persistent ratcheting-down in interest rates across all maturities and virtually all countries, to reach unprecedentedly low levels. As a recent example of that, Chart 5 plots the UK forward curve at monthly intervals over the past 9 months.

What explains this remarkable pattern of global interest rates? And what implications does it carry for monetary policy, in the UK and internationally? I want to offer some reflections on those two questions. To be clear, these views are personal ones, in my capacity as a member of the Bank's Monetary Policy Committee (MPC), rather than necessarily representing the collective view of the MPC.

### The drop

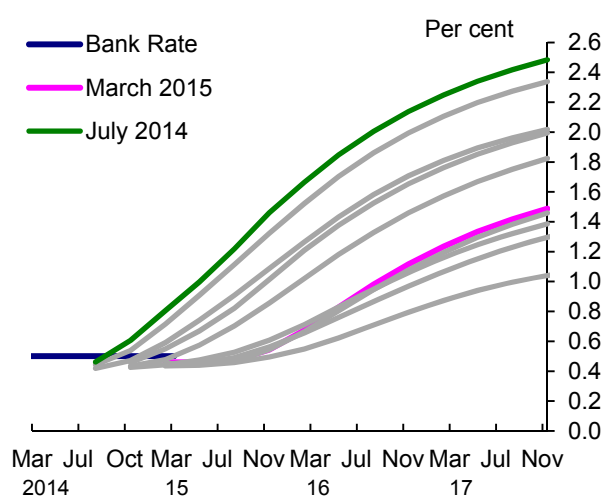
A significant part of the explanation for low interest rates, at least in the years immediately after the crisis, was the weakness of demand. Chart 6 looks at the path for UK output growth expected in the MPC's *Inflation Report* each February since 2009. Up until around 2012, growth significantly and repeatedly disappointed to the downside.

The same was true internationally, with IMF forecasts significantly and repeatedly revised down. With recovery weaker and taking longer than expected, the expected date of interest rate rises was repeatedly put back, and the expected level of future rates was lowered, in the UK (Chart 1) and globally (Chart 2).

Over the past two years, this story has subtly changed. UK growth has, if anything, surprised to the upside over this period. UK growth in 2013 and 2014 averaged over 2%. And the MPC's February *Inflation Report* forecasts the UK growing above its historic trend over the next two years.

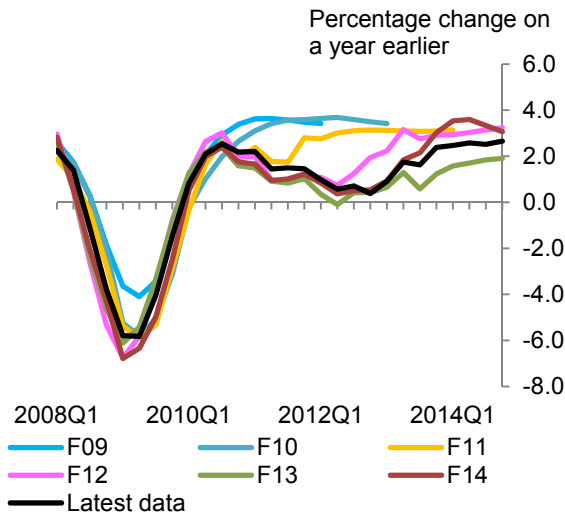
Yet despite this, the expected path of UK interest rates has continued to drift down. That is because macro-economic surprises have continued, but have switched from the real to the nominal side, from stalling growth to falling inflation. Inflation has consistently and significantly undershot the Bank's forecasts since 2012, in particular over the past 12 months (Chart 7).

**Chart 5: Evolution of the UK forward curve**



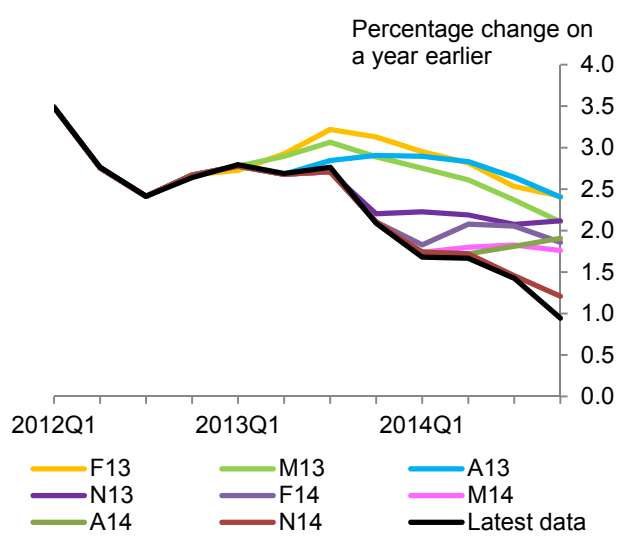
Sources: Bloomberg and Bank Calculations. Notes: Chart shows UK instantaneous forward OIS curves.

**Chart 6: Inflation Report projections of GDP growth**



Sources: ONS and Bank calculations

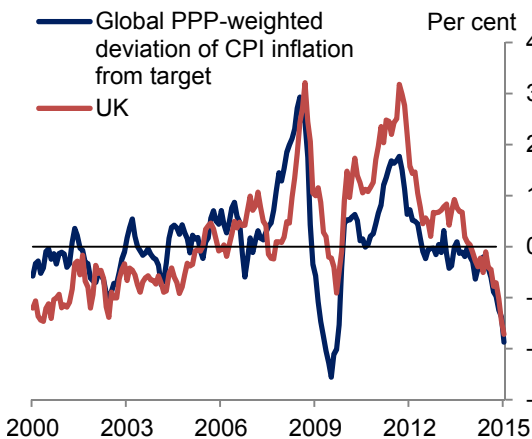
**Chart 7: Inflation Report projections of CPI inflation**



Sources: ONS and Bank calculations

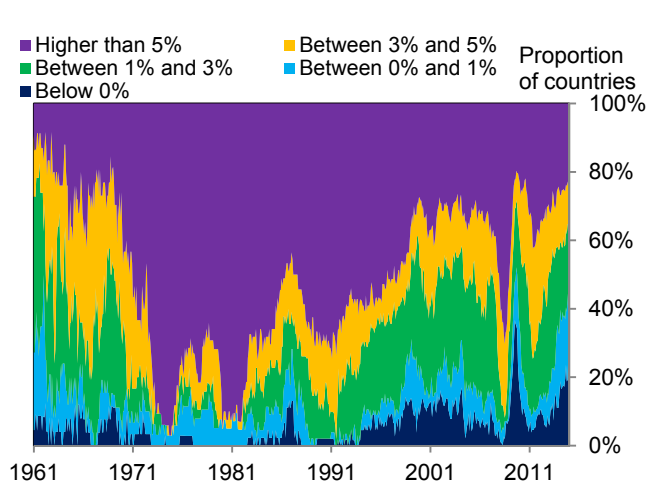
This pattern has been mirrored internationally. Global consumer price index (CPI) inflation, on a PPP-weighted basis, currently stands at 1.2%, having fallen 1.8 percentage points over the past two years (Chart 8). Around 40 countries internationally are currently experiencing deflation (Chart 9). At a global level, inflation was undershooting national inflation targets by almost 2 percentage points in January 2015.<sup>1</sup>

**Chart 8: Global CPI inflation**



Sources: Thomson Reuters Datastream, CEIC and Bank calculations. Notes: Global equates to approximately 70% of world PPP GDP; inflation targets fixed using 2014 targets and PPP-weighted according to share over time.

**Chart 9: International inflation rates over time**



Sources: Datastream and Bank calculations. Notes: Sample varies over time. Average sample sizes are: 30 countries between 1960 and 1980, 55 between 1980 and 2000 and 110 from 2000 onwards.

<sup>1</sup> See Carney (2015).

UK CPI inflation has closely followed global CPI trends since the crisis, with their correlation strikingly high at 0.8 – double its level pre-crisis. UK inflation currently stands at 0.3%, its lowest-ever recorded level. According to the MPC's latest *Inflation Report*, it is more likely than not the UK will join those countries facing temporary deflation this year.

These global disinflationary forces are, in large part, the result of shocks to world prices. Oil prices have fallen by over 50% since the middle of last year. By itself, this would be expected to lower temporarily UK CPI inflation by around  $\frac{3}{4}$  percentage points. Beyond oil, agricultural commodity prices have fallen by 25% in the past two years due to good harvests. Global non-fuel export prices, on a UK trade-weighted basis, have fallen 2%.

These weak external price pressures go a long way towards explaining the fall in global CPI inflation over the past two years. They also account for around two-thirds of the fall in UK CPI inflation over the same period. If these are one-off shocks to the price level, their impact on annual inflation measures should drop out after a year. Such temporary deviations of inflation from target should be “looked through” in setting monetary policy.<sup>2</sup>

This is not, however, the whole inflation story. The weakness of global prices is not wholly the result of one-off shifts in global supply. For example, although supply news is likely to have been the biggest driver of the recent fall in oil prices, a weakening outlook for world demand is also likely to have played a material role.

Moreover, perhaps between a quarter and a third of the fall in inflation, globally and in the UK, is not explained by weak external prices. Another source of “drag” has been at work.<sup>3</sup> Identifying those drag factors is important when accounting for disinflationary trends in the past, but also when assessing whether these trends will be persistent in the future.

## **The drag**

If you consider the traditional determinants of inflation, there are at least three plausible sources of disinflationary “drag”: slack in the economy, a weaker relationship between slack and wages and lower levels of inflation expectations.

These explanations are not mutually exclusive. Higher levels of slack, or a weaker relationship between slack and wages, could lower inflation expectations – for example, if demand is weak today, people may expect lower inflation tomorrow. And lower wage and inflation expectations could themselves depress demand – for example, by raising levels of real interest rates. Nonetheless, it is worth considering these explanations in turn.

### **(a) Slack and the Phillips Curve**

The short-term relationship between unemployment or the output gap and wage growth or inflation – the Phillips curve – is one of the most intensively studied in macro-economics.<sup>4</sup> Despite that, empirical estimates of the Phillips curve have tended to be poorly-identified. That may reflect the effects of structural and behavioural shifts, which have the potential to alter historically-estimated Phillips curve relationships.

For example, changes in the credibility of the monetary policy regime can cause inflation and wage expectations to alter, causing the Phillips curve to shift around over time for a given level of slack. And changes in the competitive structure of labour and product markets can influence the impact of slack on wage and price pressures, causing the Phillips curve to change slope over time.

---

<sup>2</sup> See the Governor's Open Letter to the Chancellor (Bank of England, 2015b).

<sup>3</sup> Bank of England (2015b).

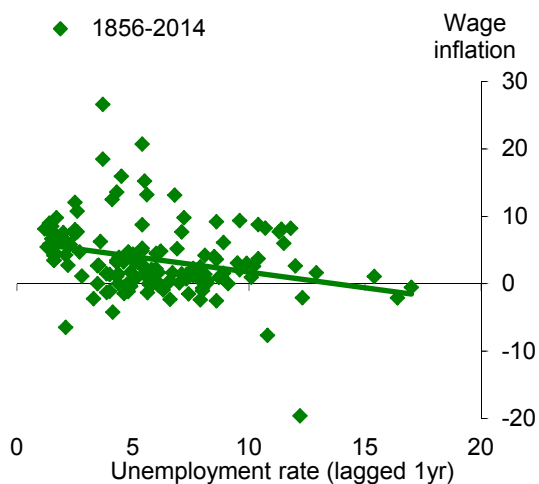
<sup>4</sup> Google Scholar lists more than 3000 citations for Phillips' original article (Phillips (1958)).

Chart 10 plots the historical relationship between wage growth and unemployment in the UK over the period since 1856. Although noisy, it suggests a negative relationship between the two, with an average slope of just under  $\frac{1}{2}$ . In other words, a 1 percentage point increase in the unemployment rate has, on average in the past, lowered wage growth by around half a percentage point.

A somewhat clearer window on this long-run Phillips curve relationship is provided by looking at distinct monetary regimes: exchange rate targeting regimes under the Gold and dollar standards (1856–1970); discretionary monetary policy regimes without central bank independence (1970–1997); and inflation-targeting regimes with independently-set monetary policies (1997 onwards).

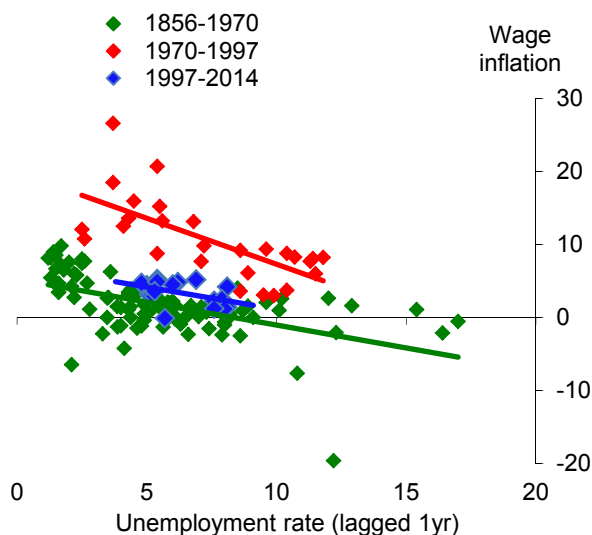
Chart 11 plots the Phillips curve relationship over these windows. The introduction of discretionary monetary policy regimes, without independence, caused an outward shift in the Phillips curve and a shift up in wage and inflation expectations. That is consistent with a loss of monetary credibility. Since 1997, however, inflation expectations having shifted back inwards, restoring the Phillips curve to something closer to its position prior to 1970.<sup>5</sup>

**Chart 10:** A long run estimate of the wage Phillips curve in the UK



Sources: Crafts and Mills (1994), Feinstein (1972) and ONS. Notes: Unemployment is measured here by the claimant count, and is lagged by one year. For more information on the long-run data used to construct this index, see Hills *et al* (2010, 2015).

**Chart 11:** The wage Phillips curve under different policy regimes in the UK



Sources: See footnote to Chart 10.

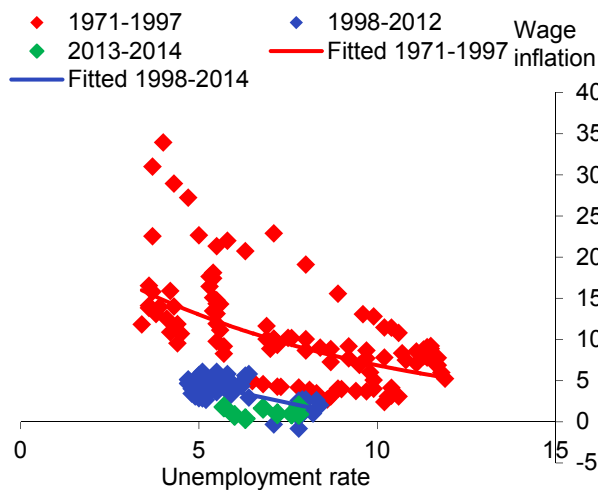
If we look more closely at the most recent period, a second feature stands out (Chart 12). UK wage growth has been puzzlingly weak over the past few years, lying below the Phillips curve estimated since 1997. While UK unemployment has fallen more than 2 percentage points since 2013, wage growth has remained in the range 1–2% per year.

This is, to a degree, a global phenomenon. For example, the US Phillips curve also shifted inward after the Volcker disinflation of the early 1980s (Chart 13). And US wage growth has

<sup>5</sup> This result is also found when wages are adjusted for inflation expectations as discussed in Broadbent (2014).

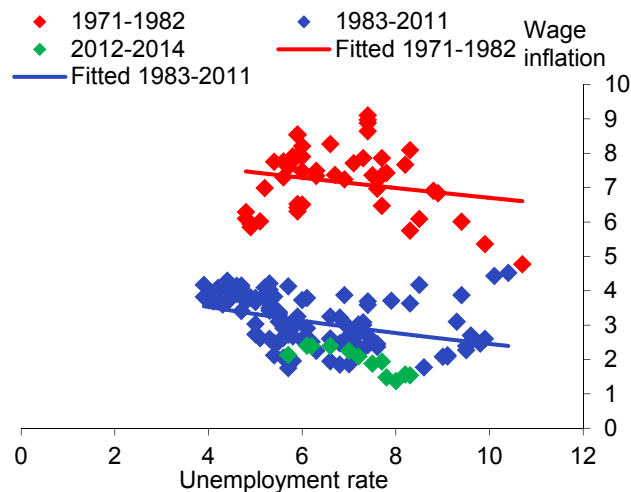
also been puzzlingly weak over the past few years.<sup>6</sup> Despite unemployment falling around 2 percentage points, wage growth has remained around 2%.

**Chart 12: The UK wage Phillips curve**



Sources: ONS and Bank calculations

**Chart 13: The US wage Phillips curve**

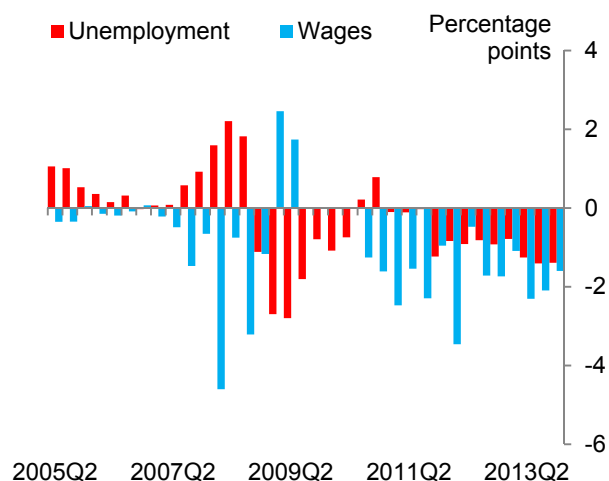


Sources: Thomson Reuters Datastream

These Phillips curve surprises can be clearly seen in the Bank’s own forecast errors for wage growth and unemployment over the past few years (Chart 14). Since 2011, unemployment has come in consistently below the Bank’s expectations. Yet despite this unexpected strength in the labour market, wage growth has come in consistently and significantly lower than the Bank’s forecasts. In part, that reflects weak productivity, which has also been significantly lower than the Bank’s forecasts. But wage growth has been surprisingly weak even allowing for that.

In response to this wage weakness, the MPC has dynamically adjusted its estimates of slack. For example, last year the MPC revised upwards its estimate of the so-called “participation gap” – the wedge between actual and equilibrium levels of participation in the labour force. By increasing the assumed drag from slack, that revision explained away part of the wage puzzle.

**Chart 14: Inflation Report forecast errors on wage growth and unemployment**



Source: ONS and Bank calculations. Notes: Chart shows one year ahead errors. Wage forecasts were for Average Earnings Index until 2010Q2 and Average Weekly Earnings thereafter. The discontinuation of the AEI series in 2010Q2 means it is not possible to calculate wage forecast errors for forecasts made between 2009Q3 and 2010Q2, so those observations are left blank.

<sup>6</sup> See Yellen (2014).

Even after making these adjustments, however, the wage puzzle has persisted. This can be seen by comparing the actual and estimated paths of wages from the Bank’s suite of wage equations, using as inputs the Bank’s estimates of “slack” in the labour market, as well as productivity and other wage determinants.

Wage growth has consistently and significantly undershot its expected path, even after controlling for slack and other shocks. Cumulatively, this undershoot is large, with the level of wages more than 2% below predicted estimates over the past two years. There are a number of possible explanations for this wage puzzle. These have potentially quite different implications for future wage growth and hence policy.

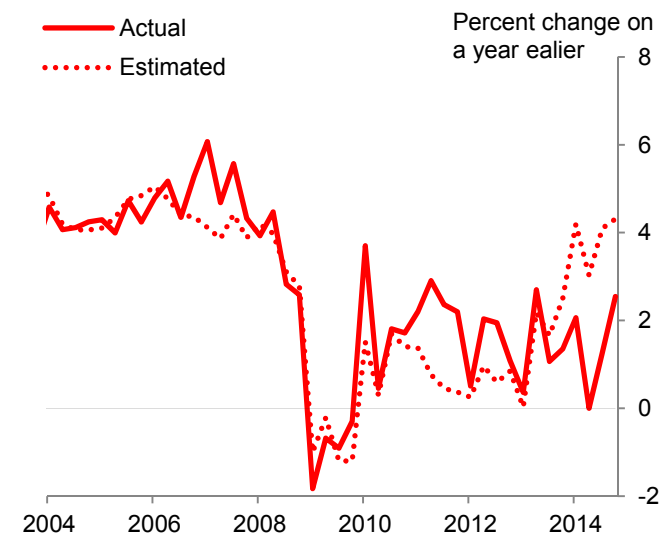
The first is simply that the lags from lower unemployment to wage growth are a little longer than in the past. That might be the case because job-to-job flows in the labour market have been low by historical standards, only recently picking up towards pre-recession levels. If so, we might expect the recent undershoot in wages to course-correct in the period ahead, as labour market activity picks up.

In essence, this is the judgement underpinning the MPC’s central view of wages in the February *Inflation Report*. Wage growth is projected to rise, reaching 3.4% by end-2015. In effect, wages error-correct. There is some tentative evidence of wage growth picking up over the past few months, although yesterday’s wage data were notably weaker. If this pick-up were to continue, the wage puzzle would have been benign. Indeed, with slack eroding, we might then be concerned that wage pressures could overshoot, posing upside risks to the inflation target.<sup>7</sup>

But there are other explanations of the wage puzzle which pose downside inflation risks. One is that the Phillips curve has become less steep than in the past. This would mean that a fall in unemployment might have a lower impact on wage pressures than in the past. This might arise because the pool of workers willing to enter the labour force at the existing wage rate has increased – for example, older workers prepared to work longer than they had planned or workers from overseas moving into the UK labour force.

There is evidence of many of these trends intensifying over the past few years. For example, the unemployment rate among 18-to-24 year olds has fallen by almost 4 percentage points over the past year. The trend in labour force participation rate has picked up significantly among women and older cohorts over the same period. And net migration to the UK was estimated to be almost 300,000 in the year to September 2014, almost double the level two years earlier.

**Chart 15: Actual and estimated UK wage growth**



Sources: ONS and Bank calculations. Notes: Dashed line shows in-sample fitted values from an estimated wage equation.

<sup>7</sup> For example, Weale (2015).



There is evidence, in the UK and internationally, to support the Phillips curve having flattened over time. For example, cross-country evidence from the IMF suggests that the slope of the price Phillips curve has fallen, from around one in the 1970s to 0.1–0.2 today (Chart 16). That could reflect the effects of globalisation, enhancing competition in domestic labour and product markets.<sup>8</sup>

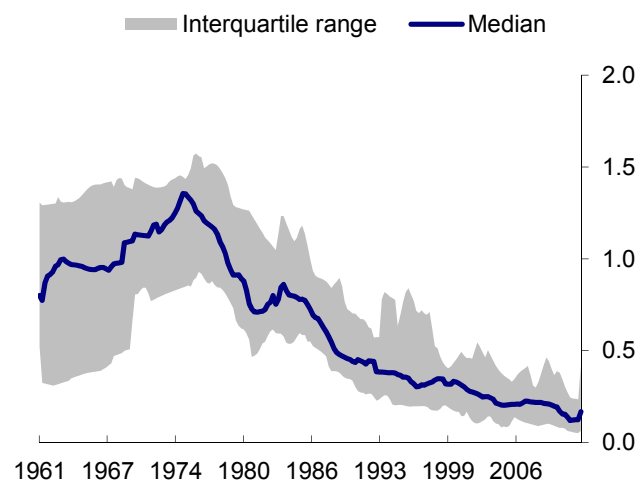
The implications of a flatter Phillips curve for future wage growth and inflation can be assessed by re-running the projections from the MPC’s February *Inflation Report*. Specifically, assume a halving of the Phillips curve slope used in the model of Chart 15, from 1 to 0.5.<sup>9</sup> That slope is still well above the levels in Chart 16.

Chart 17 shows the results from this exercise. Wages and prices are both weaker throughout: at the two-year horizon, wage growth is 0.6 percentage points lower than in the February *Inflation Report*, while inflation is 0.2 percentage points lower. In other words, a flatter Phillips curve would generate a downside risk to the inflation outlook at the policy horizon.

A final explanation for the wage puzzle is that weak wages are signalling that the output or unemployment gap is larger than currently estimated. There are a number of potential sources of such additional slack, including greater spare capacity in firms, a greater willingness among workers to increase their average hours, or a lower long-term rate of unemployment than is currently estimated by the Bank.<sup>10</sup>

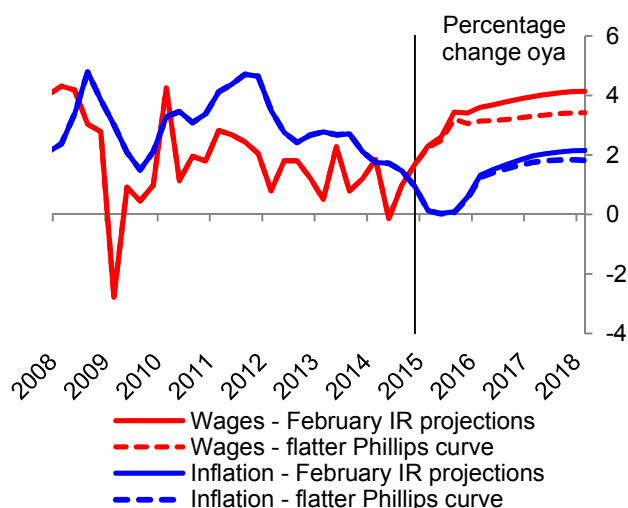
How much additional slack? Imagine you asked yourself how much slack would be needed to resolve the wage puzzle of the past few years. Even with a very conservative estimate of the Phillips curve slope, the implied degree of slack could be somewhere close to 4%, materially above the MPC’s current central view of slack of around ½%.

**Chart 16:** IMF estimates of global price Phillips curve slopes



Sources: IMF (2013).

**Chart 17:** Projection for wage growth and inflation, assuming a flatter Phillips curve



Source: ONS and Bank calculations.

<sup>8</sup> For instance, see Rogoff (2003, 2006), Ball (2006), Bernanke (2006), IMF (2006), Borio and Filardo (2007) and BIS (2014).

<sup>9</sup> The independent variable is the MPC’s estimate of the hours gap.

<sup>10</sup> See Bell and Blanchflower (2011, 2013) for a discussion of the role of underemployment in the UK economy since the crisis.

To give a sense of its implications, imagine the level of slack were currently around 2% and was only gradually eroded over the forecast. Chart 18 shows the resulting path of inflation and wage growth. Inflation and wage growth are both materially weaker: at the two-year horizon, they are around 0.2 percentage points lower than in the MPC's February *Inflation Report*.

Each of these three explanations of the wage puzzle is empirically plausible. If some weight is given to the final two explanations, the risks to future wage growth and inflation would be skewed to the downside, not only in the short-term but at longer horizons too.<sup>11</sup>

### (b) Inflation expectations

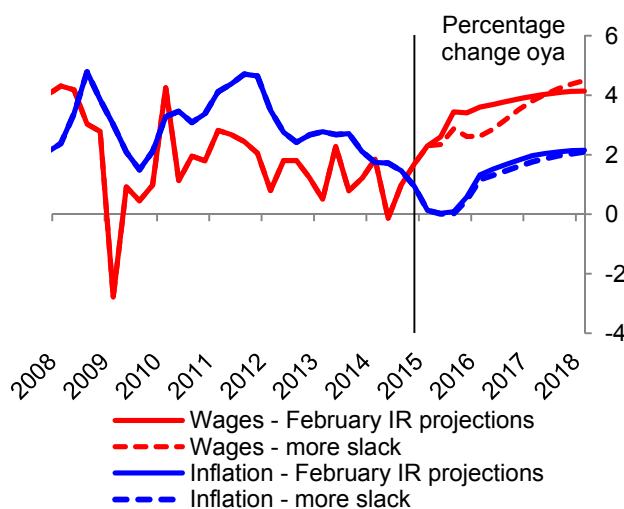
A complementary explanation for the wage puzzle, which goes in the same direction, is that inflation expectations have shifted downwards. To the extent these weaker expectations shape firms' wage-bargaining and price-setting behaviour, this would impart downwards persistence into wage and inflation dynamics.

There is an array of inflation expectations measures covering different sectors – households, companies, financial markets – and horizons – short and longer term. All of these measures have fallen over the course of the past two years, as actual inflation has fallen, though often by differing amounts.

Among households, one-year-ahead inflation expectations, as reported by Citigroup, have fallen by 120bp over the past year. At the five to ten year horizon, they have fallen by around 30bp (Chart 19). Shorter-term expectations are around 1.5 percentage points, and longer-term expectations around 1 percentage point, below their pre-crisis averages. Over the same period, households' inflation expectations from the Bank/NOP survey have fallen by 90bp, 60bp and 50bp respectively at the one, two and five year horizons.

Chart 20 looks at the term structure of expected inflation by households from the Bank/NOP survey, relative to the past and the Bank's forecasts.<sup>12</sup> The term structure of expected inflation is currently lower than at any stage since the crisis. Moreover, household inflation expectations are significantly below 2% at the two-year horizon and, to a lesser extent, thereafter. That means it is unclear, at present, whether household inflation expectations are consistent with the Bank hitting the inflation target.

**Chart 18:** Projection for wage growth and inflation, assuming a starting level of slack of 2%

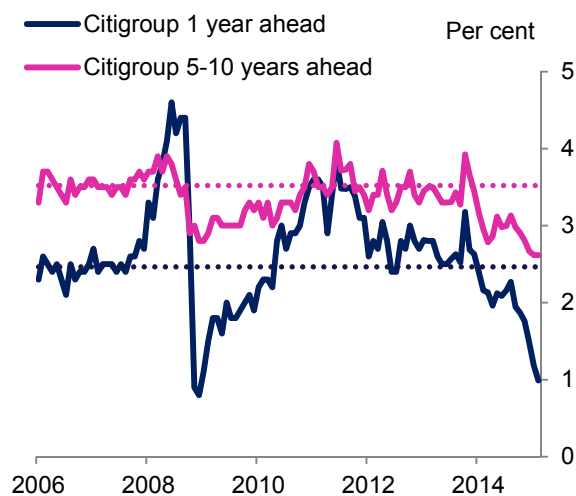


Source: ONS and Bank calculations.

<sup>11</sup> The MPC's February *Inflation Report* included a small downside skew to the inflation fan chart, but this did not extend to two years.

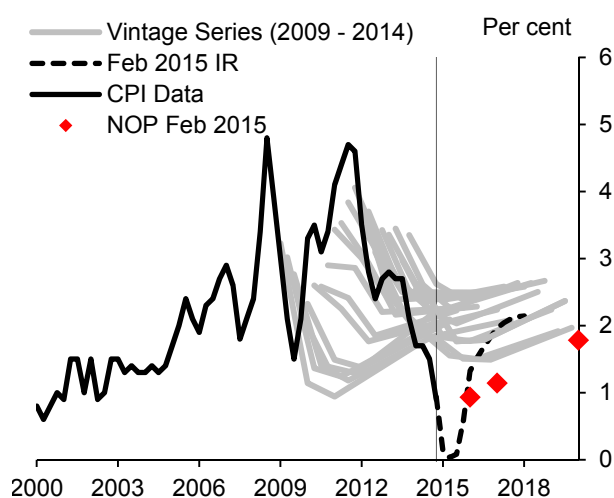
<sup>12</sup> These have been adjusted to take into account the average difference between perceptions of the level of current inflation and actual inflation.

**Chart 19: UK household inflation expectations**



Sources: Citigroup. Dashed lines show series 2005–07 averages.

**Chart 20: Term structure of UK household inflation expectations**

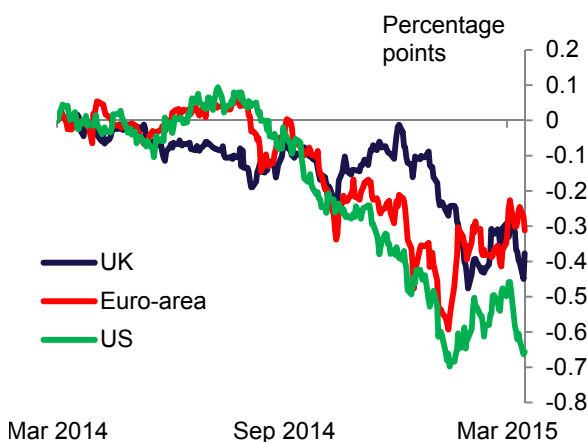


Sources: Bank of England/GfK NOP. Notes: The red dots show the adjusted inflation expectations at the one, two and five year horizons in the February 2015 Bank/GfK NOP household survey; grey lines show adjusted perceptions and expectations from previous vintages of the survey.

Turning to financial market measures of inflation expectations, two-year ahead forward inflation rates have fallen by around 40bp over the past year and 5-year ahead expectations by the same amount. This appears to have been, to a degree, a global phenomenon, with forward inflation rates also falling in the US and euro-area (Chart 21).

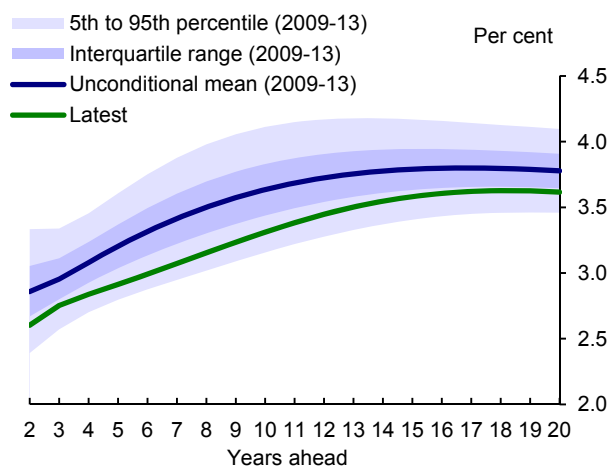
Chart 22 looks at the term structure of RPI inflation implied by inflation swap rates. Inflation is near the bottom of its distribution over the period 2009–2013. Financial markets appear to expect inflation to remain lower for longer than in the recent past. Because the period 2009–2013 was associated with higher than target levels of inflation, financial market inflation expectations may still be broadly consistent with the Bank’s inflation target.

**Chart 21:** Changes in 5-year instantaneous forward inflation swap rates since March 2014



Sources: Bloomberg and Bank Calculations.

**Chart 22:** Term structure of inflation swap forward rates



Sources: Bloomberg and Bank Calculations. Notes: Unconditional distribution from a parametric factor model using data from January 2009 to August 2013. Data from May 2012 to January 2013 are excluded due to uncertainty about proposed changes in RPI methodology, which temporarily affected expectations of the RPI-CPI wedge.

On either measure, inflation expectations have fallen over the past year at all horizons. At longer-term horizons, that is difficult to reconcile with global disinflationary trends having been the result of one-off falls in global prices. Measured expectations suggest that lower inflation is expected to persist. To the extent this affected wage and price-setting, those expectations could become self-fulfilling.

A number of plausible explanations for a shift in longer-horizon inflation expectations are possible. One is greater slack in the economy than is currently assumed in the MPC's central projections. A second is doubt about the ability of monetary policymakers to boost inflation – for example, because of the constraint of the zero lower bound on interest rates.

A third explanation is greater expected persistence in low global price pressures. One factor that could potentially depress global prices on a persistent basis is a shortfall in global demand relative to supply. As Chart 23 shows, the IMF estimates the global output gap currently to be around 2%. It is only forecast to close by 2019. This might be expected to exert global disinflationary pressure for the foreseeable future.<sup>13</sup>

A final factor, with particular relevance to the UK over the past two years, is the exchange rate. Sterling's effective exchange rate has appreciated by around 15% over that period and by around 3% since the start of the year. A mechanical model treatment of the appreciation this year would imply inflation in the UK, at a two year horizon, would be around 0.2 percentage points lower. What explains sterling's appreciation and might it continue?

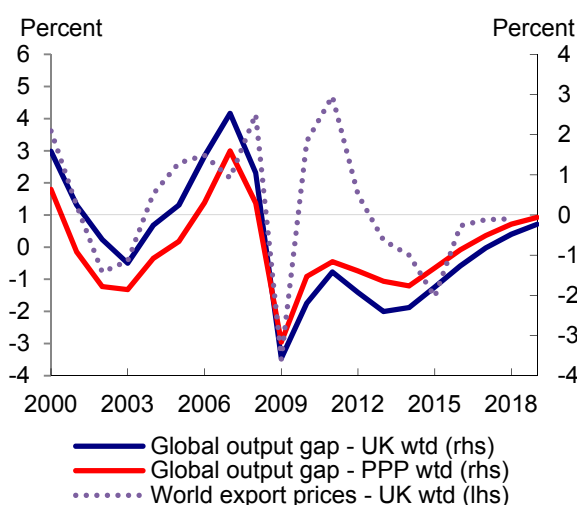
Over the past few years, there has been a positive relationship between countries' effective exchange rates and news about demand relative to overseas competitors (Chart 24). Positive output surprises have increased the attraction of a currency relative to its competitors, including by increasing the chances of a rise in relative interest rates.

<sup>13</sup> I discussed the longer-term global growth outlook in a previous speech (Haldane (2014)).

This is a plausible explanation for the recent appreciation of sterling and the dollar, with positive demand and interest rate surprises in the UK and US relative to the euro-area and Japan. Indeed, those latter countries have in addition embarked on programmes of asset purchase which might have intensified downward pressures on euro and yen assets.

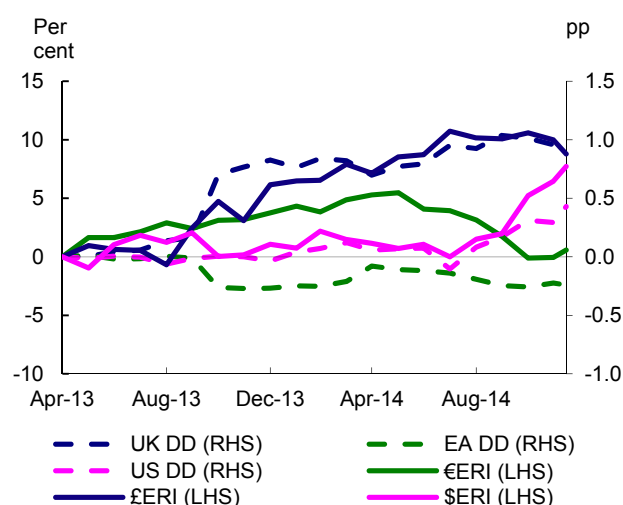
This decoupling of the relative demand and monetary policy positions of the UK and US on the one hand, and the euro-area and Japan on the other, might have on-going implications for exchange rate movements. If these trends continued, they could result in some further appreciation of sterling and the dollar relative to the euro and yen, which would tend to increase disinflationary pressures in the UK and US.

**Chart 23:** IMF output gap estimates and world export prices



Sources: IMF, CEIC, Eurostat, Thomson Reuters Datastream and Bank calculations. Notes: The world export price series shows domestic currency non-oil export prices of goods and services of 49 countries weighted according to their shares in UK imports.

**Chart 24:** Changes in effective exchange rate indices and domestic demand surprises



Sources: Consensus, FRB, ECB, BoE and Bank calculations. Notes: Domestic demand series show revisions to average domestic demand growth relative to main trading partners.

With inflation expectations having adjusted, how might this affect wage and inflation behaviour? Table 1 shows estimates of two estimated Phillips curves, which include the typical wage-determinants, such as productivity, but also include (lagged) measures of inflation expectations for households (at a 2-year horizon) and financial markets (at a 5-year horizon).

Both expectations measures are statistically significant in explaining wage growth. Every one percentage point fall in inflation expectations results in a similarly-sized fall in wage growth the next period. With household expectations having fallen 90bp, and financial market expectations by 40bp over the past year, this implies they would be exerting a significant drag on wage growth at present. That is consistent with survey evidence from the Bank's agents, whose contacts cite falling inflation expectations as the most important factor currently holding back wage settlements.<sup>14</sup>

<sup>14</sup> From the recent Agents' survey on pay and labour costs (Bank of England (2015a)).

**Table 1:** Estimated wage Phillips curves including measures of expected inflation

	Nominal wage growth <sup>(a)</sup>	
	(1)	(2)
Wage growth (t-1) <sup>(a)</sup>	-0.31*** (0.09)	-0.35*** (0.09)
Productivity growth <sup>(a)</sup>	0.36*** (0.11)	0.31*** (0.10)
Unemployment gap	-2.22*** (0.36)	-2.23*** (0.36)
Labour share (t-1)	-0.52*** (0.14)	-0.33** (0.17)
<b>2-year household inflation expectations (t-1)<sup>(b)</sup></b>	<b>1.13*** (0.35)</b>	
<b>5-year breakeven inflation rate (t-1)<sup>(c)</sup></b>		<b>1.02*** (0.28)</b>
Interaction with inflation targeting dummy	-0.14 (0.29)	-0.04 (0.29)
Constant	0.02 (0.02)	0.03* (0.02)
Observations	105	101
R-squared	0.50	0.50

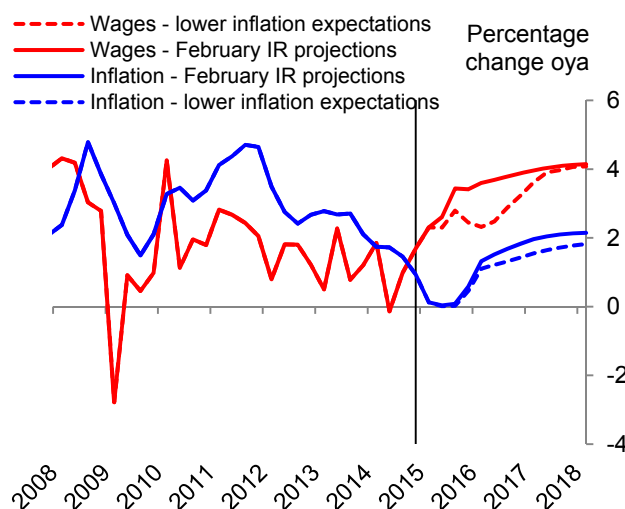
Sources: Barclays Basix; Bloomberg; Bank calculations. Notes: Estimated using quarterly data between 1987 Q1 and 2014 Q4. (a) Annualised quarter-on-quarter growth. (b) Excludes the period between 2012 Q2 and 2013 Q1 due to effects of the CPAC review on RPI-linked financial instruments. (c) Barclays Basix 2-year head household expectations.

It is possible to simulate the effects of lower inflation expectations on the MPC's February *Inflation Report* projections using the estimated wage relationships from Table 1, together with the Bank's general equilibrium forecasting model. Chart 25 shows the effect on wages and inflation. Wage growth ends up around 0.3 percentage points lower at the two-year horizon, while inflation is around 0.4 percentage points lower, than in the MPC's central projections. Taking seriously recent falls in inflation expectations would add to the scale and duration of potential downside risks to UK inflation in the period ahead.

### Monetary policy

If there is evidence that risks to inflation, globally and in the UK, may be skewed to the downside, the obvious next

**Chart 25:** Projection for wage growth and inflation, assuming inflation expectations put downward pressure on wages



Source: ONS and Bank calculations.

question is what, if any, monetary policy response might be appropriate as insurance against those downside risks.

One insurance device comes from the specification of the inflation target itself. Even if the risks to inflation are asymmetric, central banks' inflation targets typically are not. This reduces the risk of monetary policy imparting a "deflationary bias". The MPC's own mandate is crystal clear: deviations above and below the 2% inflation target are to be treated symmetrically. In its Open Letter to the Chancellor earlier this year, the MPC made clear it would act symmetrically to meet the inflation target.<sup>15</sup>

A second insurance policy against downside inflation risk comes from clearly specifying the horizon over which inflation is expected to return to target following a deviation. Provided that horizon is credible, this reduces the risk of inflationary expectations becoming dislodged from the target on a persistent basis.

In the UK, the inflation-targeting regime requires the MPC to specify the horizon over which it expects inflation to return to target if it deviates by more than one percentage point. In its Open Letter earlier this year, the MPC stated that it judged it appropriate to set policy so that inflation would likely return to target within two years. That was intended to provide a clear horizon for the MPC's actions and as an anchor for inflation expectations.<sup>16</sup>

A third potential source of policy insurance comes from making clear that, were it necessary on inflationary grounds at the two-year horizon, monetary policy could be eased further. If monetary policy were perceived to be constrained to the downside – for example, because of the zero lower bound on interest rates – that could affect agents' perceptions of the distribution of inflation risk, which would be skewed to the downside.

At the time of its Open Letter, the MPC stated that it had a variety of tools available to ease policy, should that prove necessary. That included re-starting asset purchases (Quantitative Easing or QE) and cutting interest rates from their current level of 0.5% towards zero. The latter reflected a re-assessment by the MPC of the relative costs and benefits of a rate cut.

Back in 2009, the MPC's judgement was that the benefits of cutting rates below 0.5% were probably outweighed by their costs, in terms of the negative impact on financial sector resilience and lending. With the financial sector now stronger, the MPC judges there may be greater scope to cut rates below 0.5%.

This change in assessment could itself have had some impact in reducing the downside risks to inflation expectations. To see that, consider two inflation fan charts based on simulations from the Bank's macro-economic model.<sup>17</sup> Monetary policy is set according to a policy rule, which weights deviations of inflation from target and output from trend. These rules only differ in their assumed lower interest rate bound.<sup>18</sup>

Chart 26 shows the inflation fan chart assuming an effective lower interest rate bound of 0.5%, whereas Chart 27 shows it with an effective lower interest rate bound of zero. Both these fan charts are negatively skewed. But by reducing the lower bound, this skew is reduced significantly. For example, at a two-year horizon the probability of deflation is reduced from around 20% to around 10%.

---

<sup>15</sup> Bank of England (2015b).

<sup>16</sup> Bank of England (2015b).

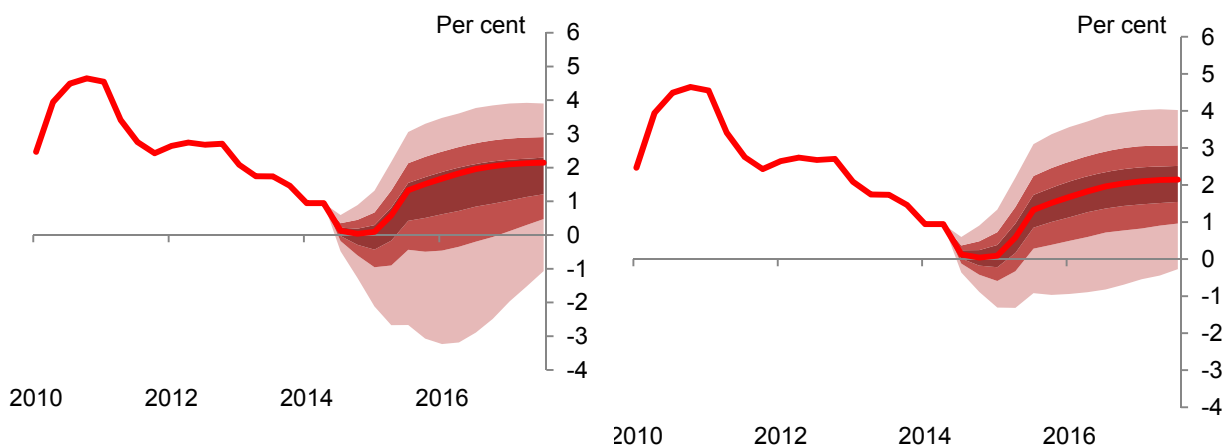
<sup>17</sup> Because these fan charts are based on stochastic simulations, they do not match precisely the fan charts in the *Inflation Report*, which are based on the MPC's best collective judgement of the balance of risks.

<sup>18</sup> To keep things simple, the simulation does not consider the effects of QE, though in principle this could also be used to boost demand and inflation expectations.

Essentially, a lower effective bound gives the central bank more room for manoeuvre when responding to downside inflation news. Indeed, if this cushion gets internalised in expectations, it reduces the probability of disinflationary dynamics taking hold in the first place.

**Chart 26:** Annual CPI inflation with an effective lower bound of 0.5%

**Chart 27:** Annual CPI inflation with an effective lower bound of 0%



Source: Bank calculations.

A final, and the most conservative, insurance policy against disinflationary risks would be to ease monetary policy pre-emptively. Even if the *modal* view of expected inflation is for it to return to target over the planned horizon, *mean* expected inflation will be lower if risks are skewed to the downside. Provided policymakers care about these risks, there is then a case for setting policy in response to mean, rather than modal, inflation expectations.<sup>19</sup>

This option is not a hypothetical one. Already during the course of less than three months this year, more than 25 central banks internationally have eased policy through a combination of lower interest rates, currency adjustments or unconventional methods.

Here in the UK the situation is somewhat different, with activity growing pretty strongly and slack being eroded. The MPC's best collective judgement is that interest rates are more likely than not to rise over the forecast horizon. Recent surveys of professional forecasters suggest they believe, unanimously, that the next rise in UK rates is likely to be upwards.

<sup>19</sup> For example, a simple approximation to the assumption that policymakers care about the risks to the inflation outlook is the use of a "quadratic loss function" to characterise preferences over alternative outcomes. One implication of that approximation is that policymakers should care about the mean path of inflation (see Svensson (2002)). Policymakers who take into account the risks associated with uncertainty over the structure of the economy (such as those discussed earlier in this speech) should care about the entire distribution of inflation (Svensson and Williams (2005)).



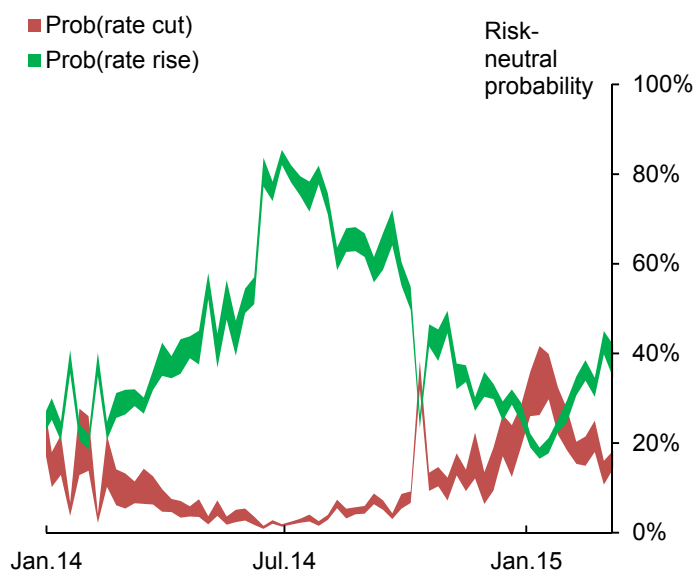
But financial market participants have a more nuanced view. They currently assign a roughly 15% probability to UK interest rates being *cut* over the next 12 months, versus a 40% probability of a rise (Chart 28). The most likely outcome, in their view, is that rates will not change over the next year.

I do not currently see an immediate case for a policy change in either direction. If one were required, given the asymmetry of inflation risks, I think the chances of a rate rise or cut are broadly evenly balanced. In other words, my view would be that policy may need to move off either foot in the immediate period ahead, depending on which way risks break.

As a thought experiment, imagine policy were not set by the MPC but instead by algorithm. Specifically, this algorithm sets rates to minimise deviations of inflation from target and output from trend, using the Bank's forecasting model, COMPASS, to simulate the effect of alternative policy paths.<sup>20</sup> What would it suggest was the optimal policy path given these preferences and the projections in the February *Inflation Report*?

This is shown in Chart 29. With the lower bound set at zero, the optimal path for interest rates would involve them being *cut* in the short-run towards zero for around a year, before then roughly following the market yield curve. This results in inflation and output returning to target sooner than in the February *Inflation Report*, at the cost of a slight over-shoot thereafter. Even without any asymmetry in risks to the inflation outlook, a case can be made for policy easing today.

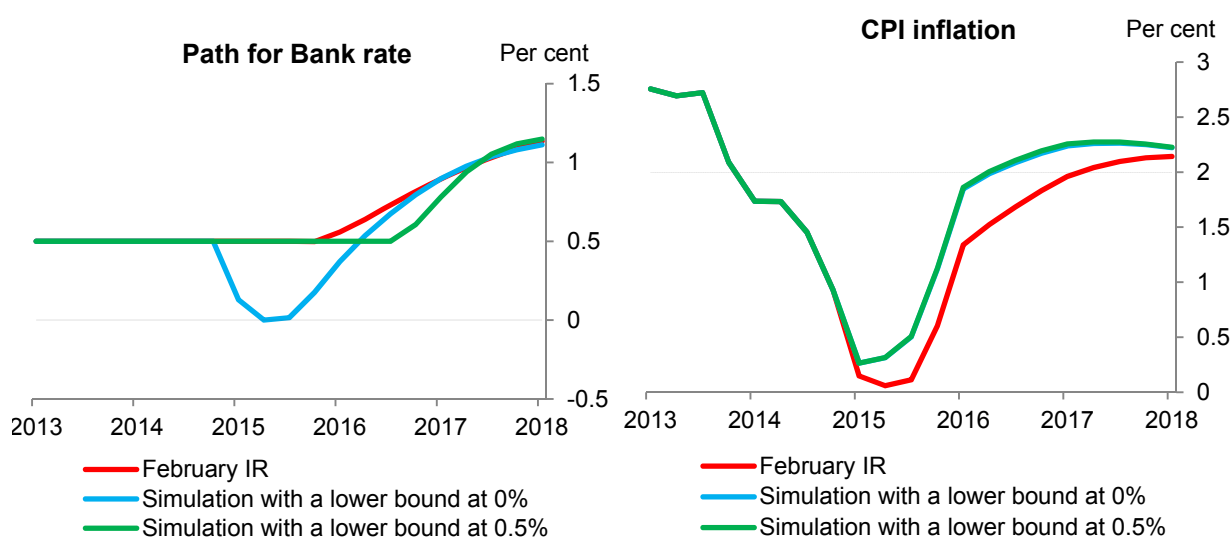
**Chart 28:** Option implied probabilities of a rate rise and rate cut over the next 12 months



Source: Bloomberg; Bank calculations. Notes: The swathes represent alternative assumptions about the evolution of the wedge between SONIA and Bank Rate. They do not account for other sources of uncertainty such as the presence of risk premia in option prices, and should not be treated as a confidence interval. For further details please see Clews *et al* (2000).

<sup>20</sup> The algorithm also puts some weight on smoothing of the interest rate path. For more information on COMPASS, see Burgess *et al* (2013).

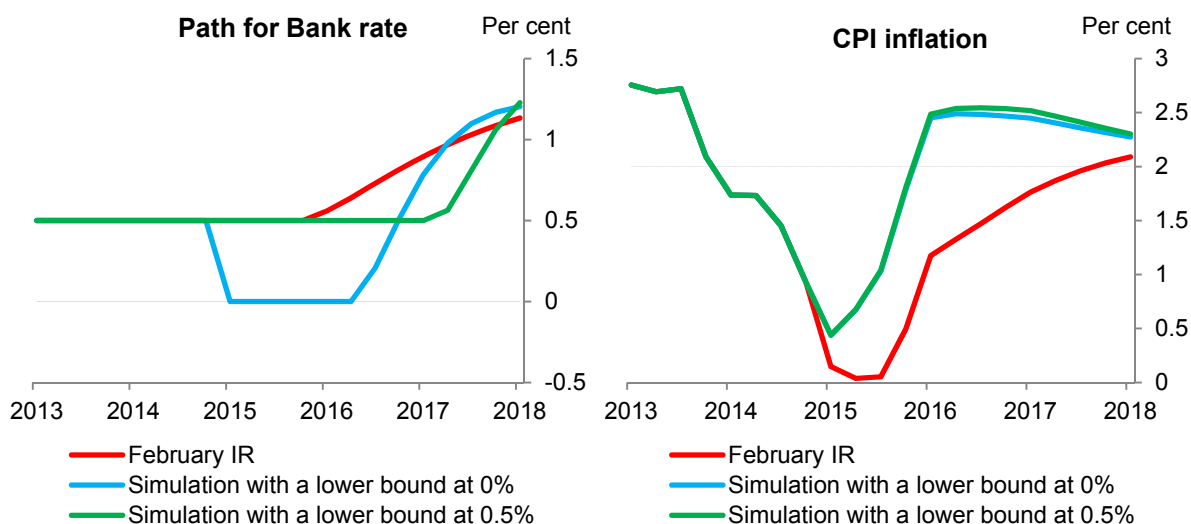
**Chart 29:** Simulation of Bank rate and CPI inflation



Source: ONS and Bank Calculations. Simulations show optimal policy under full commitment.

Were downside risks to inflation to materialise, this case is strengthened. Chart 30 shows the optimal policy paths if we assume the starting level of slack is larger in line with Chart 18. The interest rate path now implies that rates should be cut and held at their lower bound for longer. This alternative policy path returns output and inflation to target sooner, at the cost of a more significant over-shoot.

**Chart 30:** Simulation of Bank rate and CPI inflation, if the starting level of slack is 2%



Source: ONS and Bank Calculations. Simulations show optimal policy under full commitment.

Of course, there are good reasons why monetary policy is not set by algorithm. These simulations ignore a number of important practical uncertainties. For example, they assume that this policy path is fully credible and effective in stimulating demand and inflation expectations. In practice, the effects of a policy easing cannot be known with certainty and

policy credibility cannot be guaranteed. Moreover, there are upside as well as downside risks to the inflation outlook. Nonetheless, these experiments are in my view the right baseline when assessing the appropriate policy stance today.

## Conclusion

Inflation has dropped like a stone over the past year, to close to zero. This largely, but not wholly, reflects external forces. On the MPC's central view, inflation will remain close to zero in the near-term, before rising to reach the inflation target over a two-year horizon. The risks to inflation at that horizon are plainly two-sided. But my personal view is that these risks are skewed to the downside. In my view, that means policy needs to stand ready to move off either foot in the period ahead to meet the symmetric inflation target.

Thank you.

## References

**Ball, L (2006)**, "Has Globalisation Changed Inflation", *NBER Working Paper 12687*.

**Bank of England (2015a)**, "Agents summary of business conditions", February 2015, available at:  
<http://www.bankofengland.co.uk/publications/Documents/agentssummary/2015/feb.pdf>.

**Bank of England (2015b)**, "Letter from the Governor to the Chancellor", available at  
<http://www.bankofengland.co.uk/monetarypolicy/Documents/pdf/cpiletter120215.pdf>.

**Bell, D and Blanchflower, D (2011)**, "Underemployment in the UK in the Great Recession", *National Institute Economic Review No. 215*.

**Bell, D and Blanchflower, D (2013)**, "Underemployment in the UK Revisited", *National Institute Economic Review No. 224*.

**Bernanke, B (2006)**, "Global economic integration: what's new and what's not?", *remarks at the Federal Reserve Bank of Kansas City's Thirtieth Annual Economic Symposium, Jackson Hole*, available at: [www.federalreserve.gov/boarddocs/speeches/2006/20060825/default.htm](http://www.federalreserve.gov/boarddocs/speeches/2006/20060825/default.htm).

**BIS (2014)**, "Inflation: domestic and global drivers", *BIS 84th Annual Report page 49 onwards*.

**Borio, C and Filardo, A (2013)**, "Globalisation and inflation: New cross-country evidence on the global determinants of domestic inflation", *BIS Working paper, No. 227*.

**Broadbent, B (2014)**, "Unemployment and the conduct of monetary policy in the UK", *speech given at the Federal Reserve Bank of Kansas City 28th Economic Symposium, Jackson Hole*, available at:  
<http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech752.pdf>.

**Burgess, S, Fernandez-Corugedo, E, Groth, C, Harrison, R, Monti, F, Theodoridis, K and Waldron, M (2013)**, "The Bank of England's forecasting platform", *Bank of England Working Paper 471*.

**Carney, M (2015)**, "Writing the path back to target", *speech at the University of Sheffield Advanced Manufacturing Research Centre, 12 March 2015*, available at  
<http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech716.pdf>.

**Clews, R, Panigirtzoglou, N and Proudman, J (2000)**, "Recent developments in extracting information from options markets", *Bank of England Quarterly Bulletin*, Spring, pages 50–60.

- Haldane, A (2014)**, “Twin Peaks”, *speech at the Kenilworth Chamber of Trade Business Breakfast, 17 October 2014*, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech716.pdf>.
- Hills, S, Thomas, R and Dimsdale, N (2010)**, “The UK recession in context – what do three centuries of data tell us?”, *Bank of England Quarterly Bulletin 2010 Q4*.
- Hills, S, Thomas, R and Dimsdale, N (2015)**, “Three Centuries of Data – Version 2.1”, available here: <http://www.bankofengland.co.uk/research/Pages/onebank/datasets.aspx>.
- IMF (2006)**, “How Has Globalisation Affected Inflation”, available at: <http://www.imf.org/external/pubs/ft/weo/2006/01/pdf/c3.pdf>.
- IMF (2013)**, “The dog that didn’t bark: Has inflation been muzzled or was it just sleeping?”, *World Economic Outlook*, April 2013.
- Phillips, A (1958)**, “The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861–1957”. *Economica* 25 pp 283–299.
- Rogoff, K (2003)**, “Globalisation and Global Disinflation”, *paper prepared for the Federal Reserve Bank of Kansas City conference on “Monetary Policy and Uncertainty: Adapting to a Changing Economy” at Jackson Hole*.
- Rogoff, K (2006)**, “Impact of Globalisation on Monetary Policy”, available at: [http://scholar.harvard.edu/files/rogoff/files/impact\\_of\\_globalization\\_on\\_monetary\\_policy.pdf](http://scholar.harvard.edu/files/rogoff/files/impact_of_globalization_on_monetary_policy.pdf).
- Svensson, L (2002)**, “The Inflation Forecast and the Loss Function”, *CEPR Discussion Paper* 3365.
- Svensson, L and Williams, N (2005)**, “Monetary Policy with Model Uncertainty: Distribution Forecast Targeting”, *NBER Working Paper No. 11733*.
- Weale, M (2014)**, “Slack and the labour market”, *speech at the Thames Valley Chamber of Commerce, 20 March 2014*, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech716.pdf>.
- Weale, M (2015)**, “Inflation: finely balanced risks”, *speech at City and Islington Sixth Form College, 11 March 2015*, available at <http://www.bankofengland.co.uk/publications/Documents/speeches/2015/speech805.pdf>.
- Yellen, J (2014)**, “Labor Market Dynamics and Monetary Policy”, *speech given at the Federal Reserve Bank of Kansas City Economic Symposium, Jackson Hole*.