



BANK OF ENGLAND

Speech

From asymmetry to symmetry: changing risks to the economic outlook

Speech given by

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Confederation of British Industry, Birmingham

23 March 2018

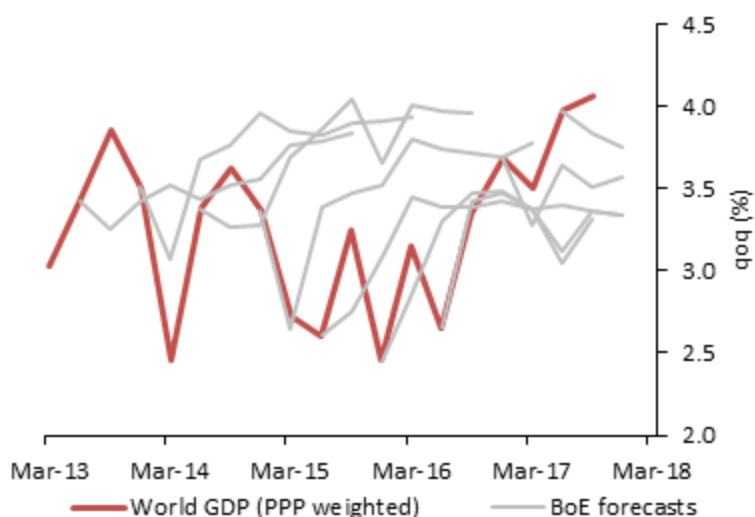
I would like to thank Yad Selvakumar, William Abel, Emil Iordanov, Manveer Sokhi, Rodrigo Guimarães, Clare Macallan, Thomas Belsham, Alex Tuckett, Silvana Tenreiro, Michael Saunders, Ben Broadbent and Ian McCafferty for help and insightful comments.

I will discuss the recent evolution of the economic outlook, and in particular the prospects for growth, inflation and interest rates. I will focus on how the balance of risks has changed, and argue that it has become more symmetric relative to previous years.

Global economy

Developments in the global economy have always been and continue to be an important influence on the UK economy, via a range of trade and financial channels. Over the past year and a half or so, the global economy has picked up significantly. Chart 1 shows that, after many years of surprising persistently to the downside, since mid-2016 global growth has surprised persistently on the upside.¹ The strength of global growth is noteworthy along several dimensions.

Chart 1. World GDP versus Bank of England forecasts



Notes: Grey lines denote BoE forecasts from May and November Inflation Reports in each year.

Source: Bank of England

First, global growth is now more broad-based than in the early years of the post-crisis recovery. In 2011, for example, global growth was also strong, but it was supported by very strong stimulus-driven growth in emerging markets, counterbalanced by weak growth in advanced economies. Now, growth is more evenly balanced across major areas. Importantly for the UK, the growth in the Eurozone has also picked up, and is now close to its strongest since before the financial crisis.

Second, there are signs that growth is becoming increasingly investment based. US capital goods orders have grown at 10% over the past year, and similar rates of growth were seen in Germany. Investment-driven

¹ Chart 1 shows real time QoQ World GDP growth (PPP-weighted) outturns versus Bank forecasts. A similar pattern occurs when comparing growth outturns against IMF forecasts or consensus forecasts. For a detailed discussion of evaluating forecasts, see Vlieghe (2017a).

growth is likely to be more durable, because higher investment not only raises demand initially, but it raises the productive capacity of the economy in the medium term.

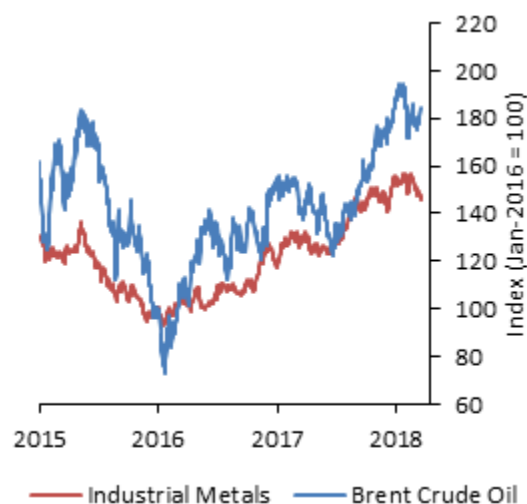
Third, alongside better global growth, we are starting to see higher global inflation, which is a welcome development after several years of weakness (Chart 2). Commodity prices have been rising since early 2016. That is not just a story about oil prices, which are up around 150% since their early 2016 lows. Industrial metal prices are up around 75% over the same period (Chart 3). This rise in commodity prices provides further evidence of the strength of global demand. It also contributed to a pickup in inflation. And the inflationary effect of stronger growth is expected to be persistent: since the low point in early 2016, ten year inflation break-evens in financial markets have risen by 90bp in the US and the UK, 50bp in the Euro Area.² In the UK and the US, inflation break-evens are now close to pre-crisis averages again, while in the Euro Area, they remain some way below their pre-crisis average.

Chart 2. World inflation



Source: Bank of England

Chart 3. Commodity prices



Source: Bank of England

Over the course of 2017 then, we can say that the risks to the UK from global growth and inflation have become more symmetric. We have moved out of the phase of persistently disappointing growth and low inflation, to a period of stronger growth, with inflation moving up, closer to pre-crisis averages.

² It is well known that break-even rates are imperfect measures of inflation expectations, as they also contain inflation risk premia, which compensate investors for bearing inflation risk. See Campbell and Shiller (1996) for a fuller discussion. I use break-evens here for purely descriptive purposes. I use government bond based measures for the US and UK, and a swaps measure for the Euro Area as Euro-Area-wide bonds do not exist.

Brexit

A second major factor influencing the UK growth outlook has been Brexit. When it comes to the economic impact of Brexit, what matters for the country is the cumulative economic impact over many years, but this is not the aspect that is most important for the Monetary Policy Committee. First, much of the longer-run impact is outside the time horizon for which we set monetary policy. Given that interest rate changes today affect growth and inflation over the next couple of years, economic developments beyond that horizon will be a matter for future monetary policy, not today's monetary policy. Second, the long-run impact is likely to manifest itself via long-run changes to the supply potential of the economy, and these are structural changes that monetary policy – which mostly affects demand – can do little about. I will therefore focus my comments only on the aspects of Brexit that do have a material impact on the setting of monetary policy today: how households, business and financial markets change their behaviour *now*, in anticipation of possible changes to the economy's supply side *in the future*.

Before the vote, I thought that a vote to Leave would result, for a period, in slower growth, a weaker exchange rate and higher inflation (Vlieghe, 2016b). That was also the MPC's best collective judgement.³ In the event, the UK did indeed experience slower growth, a weaker exchange rate and higher inflation. Notwithstanding the relatively robust growth in the economy in the first two quarters after the referendum, a slowdown did occur in 2017. Four quarter UK GDP growth in 2017 was 1.4%, slower than the 2.0% growth in 2016, and slower than the 2.5% average growth seen between 2013 and 2016.

We have accumulated more evidence since the referendum about how the economy has responded to the uncertainty about, and anticipated potential changes to, the UK's trading relationship with the rest of the EU. I will first discuss financial markets, then households, then businesses.

On financial markets I will be brief, because most of it has been said many times already, and the picture has changed little. In the days after the referendum sterling dropped 12% on a trade-weighted basis. Since then, sterling has been volatile, but the recent level remains around 9% lower than on the eve of the referendum, and 15% below the local peak reached in late 2015. Foreign exchange markets have judged, rightly or wrongly, that Brexit would be a negative medium-term development for the UK economy. The share prices of UK-focused companies, meaning companies that derive most of their profits from within the UK have underperformed the share indices of our major trading partners by a similar amount.⁴ Equity markets have also judged that Brexit would be a negative medium-term development for the UK economy.

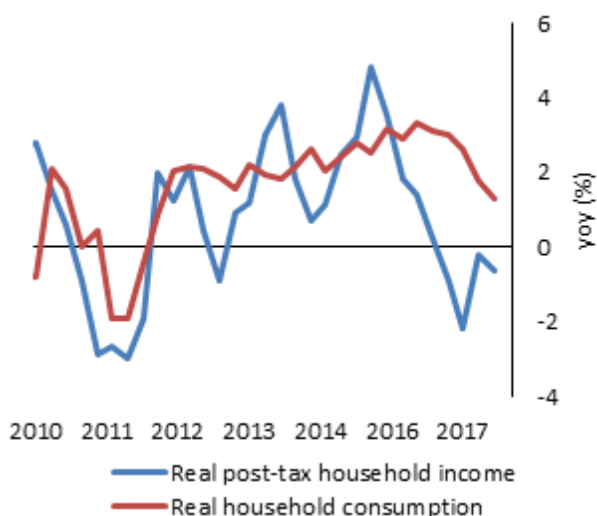
Households, on the other hand, appear to have remained relatively more upbeat. Household real income growth has slowed sharply since the referendum: this was the predictable and predicted consequence of a

³ See paragraph 33 of the May 2016 Minutes: <https://www.bankofengland.co.uk/-/media/boe/files/monetary-policy-summary-and-minutes/2016/may-2016.pdf>

⁴ Index of UK-focused companies includes companies that generate more than 70% revenue in the UK. This index has underperformed the S&P 500 by around 22ppts and the Euro Stoxx by around 15ppts since the result of the EU referendum.

weaker exchange rate, which has pushed up import prices, which in turn has pushed up consumer price inflation by more than wage inflation. Against this backdrop of slowing real income growth, household consumption growth has slowed, but not by as much as real income growth (Chart 4). That is another way of saying that the savings rate has declined. A declining savings rate is typically a sign of confidence, a sign that households, on average, believe that the reduction in real income is temporary. A further indicator of resilient household sentiment has been households expectations of their own financial situation, which has remained little changed and above historical averages over the past 18 months (Chart 5).

Chart 4. Consumption and income growth



Source: Bank of England

Chart 5. GfK consumer confidence



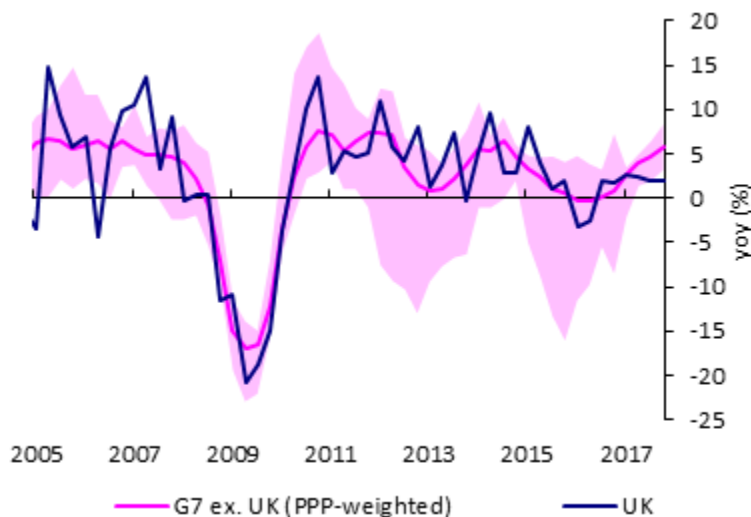
Note: Red line denotes sample mean from 1985 to present
Source: Bank of England

Turning to the response of businesses, here the question the MPC faced, and continues to face, is to what extent uncertainty about and anticipated changes to the future trading relationship with the EU are holding back investment. UK investment growth had slowed significantly ahead of the referendum. But it is not clear to what extent that was *due* to the referendum, since a similar slowdown was seen across the G7, so global factors were likely at play as well. Since the referendum, UK business investment has been growing at around a 2% annual pace, which is weaker than business investment growth in any G7 country, as shown in Chart 6. This more clearly suggests there is something UK-specific that is weighing on business sentiment. More direct evidence on the impact of Brexit on investment is available from the Decision Maker Panel, a new survey.⁵ This allows us to split firms into a group that says Brexit is an important source of uncertainty, and another group that says Brexit is not an important source of uncertainty. We can then ask whether investment spending has been different across those groups. Until recently those who say Brexit is an

⁵ The Decision Maker Panel, launched in August 2016 by the Bank of England and the University of Nottingham, aims to uncover how business conditions are changing in the face of substantial UK and international economic uncertainty. It involves sampling senior executives of 2500 companies across different industries each month, and includes questions on the firm's expectations for the year ahead and any resulting uncertainty about changes in their sales and prices, employment and costs and borrowing and capital expenditure.

important source of uncertainty had reported weaker investment growth relative to the other group. In the most recent survey that gap in reported investment growth has closed. Overall, my current interpretation is that Brexit *is* having some dampening effect on investment, although it remains difficult to judge the magnitude of that effect.

Chart 6. Business Investment Growth



Note: Shaded area represents the swathe of business investment of countries in the G7 ex. UK.

Source: Bank of England

Headwind vs Tailwind

The slowdown in UK growth in 2017 relative to prior years reflects the fact that headwinds from uncertainty about, and anticipation of, Brexit were not fully offset by the increased global tailwinds. Activity indicators throughout 2017 do not show a clear pattern of either acceleration or deceleration. Growth was more or less steady throughout the year. Thinking about how growth will evolve in the coming years, it is useful to consider how the balance between global tailwinds and Brexit headwinds might evolve.

At present, there are few signs that global growth is about to falter. There are always risks, but it seems risks are now more symmetric than before. On the upside, stronger investment growth with still very accommodative financial conditions (low interest rates, high stock market valuations, low corporate bond spreads), fiscal easing in the US and, on average, no further fiscal tightening across advanced economies, could mean that global growth remains “stronger for longer” relative to the MPC forecast of a gradual easing back.⁶ On the downside, some worries are familiar, some are new. Chinese growth continues to be underpinned by strong credit expansion, which is ultimately unsustainable. Global financial conditions might

⁶ The IMF expects, as outlined in its most recent Fiscal Monitor Database (Oct 2017), the fiscal impulse across the G20 Advanced Economies to remain positive until 2021. The fiscal impulse is defined as the change in the Cyclically Adjusted Primary Balance.

not remain as supportive as they are now. A newer risk is the risk of a trade war, should the recent tariff increases lead to an escalation of retaliatory measures.

Turning to Brexit headwinds, there are risks in both directions too. Under the assumption that the government achieves what it sets out to achieve, namely comprehensive trade access to the EU after a transition period, the headwinds could ease over the coming years depending on how favourably the new agreements are viewed by households, businesses and financial markets. Household real income growth is also set to rise this year as the impact of the past depreciation in sterling on inflation gradually fades and wage growth is expected to increase. The question is whether households will spend that additional income, or use it to rebuild savings. On the downside, there is the risk that Brexit negotiations do not go well, and that a desirable outcome is judged less likely by households, businesses and financial markets, which would increase the headwinds.

But, to be clear, for demand growth to continue at its recent pace, it is not necessary for Brexit headwinds to disappear in short order. It is sufficient that the balance between Brexit headwinds and global tailwinds remains close to where it is now.

Inflation

The primary objective of the Monetary Policy Committee is to meet the inflation target of 2% CPI. So what does the outlook of global tailwinds vs Brexit headwinds imply for medium term inflation pressure? Inflation has been close to 3% over the past six months. The fact that it would rise to “around 3%” is something the MPC had been expecting more than a year earlier.⁷ Inflation has risen largely because, following the sterling depreciation after the referendum, imports became more expensive. Eventually, higher import costs get passed on to consumers. This is a process that can take several years, as each firm in the supply chain renegotiates its price, possibly not all in one go, at the time of the next contract renewal.⁸ While there are probably still further import-driven price rises to come, we are at the peak of the *rate* at which those prices rises are coming through. That means that the impact on the *rate* of CPI inflation (as opposed to the impact on the *level* of consumer prices) should ease back over the course of this year.

What matters more for monetary policy is what will drive inflation thereafter, i.e. what are the medium-term underlying inflation pressures that remain once the exchange rate effect has faded?

One important driver of medium-term inflation pressure is domestic cost inflation, of which wage inflation is a large component. To be clear, inflation is not “caused” by wage inflation. Rather, both wage and price

⁷ I discussed this and the potential implications for monetary policy in Vlieghe (2016c). This view was also the best collective judgement of the MPC, as laid out in the November 2016 Inflation Report: <https://www.bankofengland.co.uk/inflation-report/2016/november-2016>

⁸ Atkeson and Burstein (2008) show that the diminished pass-through can, in part, be explained by firms pricing to market. In other words, firms choose to not fully pass through increases in their marginal costs because their optimal mark-up depends on their market share.

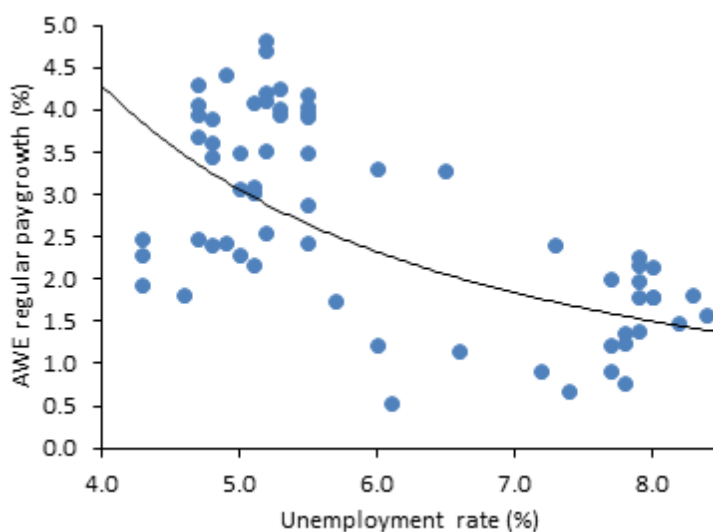
inflation are simultaneously determined by a combination of demand pressure on supply, and the anchoring of medium-term inflation expectations by the promise of credible central bank action. But when inflation is being pushed up or down temporarily by well-understood factors such as import prices, wage inflation can give a useful steer on the underlying inflation pressures that will prevail once the temporary factors wane.

Wages and the Phillips Curve

A useful framework to think about wage inflation is the so-called Phillips curve, named after a New Zealand economist Bill Phillips, working at the London School of Economics, who wrote a famous paper on the subject in 1958. I want to spend some time discussing his framework, how it has evolved, and to what extent it remains useful today.

The original Phillips curve was drawn as a simple (negative) relationship between unemployment and wage growth. It captures the basic forces of demand and supply in the labour market. If demand for labour exceeds the supply of labour, the unemployment rate will fall, and this will put upward pressure on wage inflation. Chart 7 shows that negative relationship between unemployment and wage growth in the UK since 2001.⁹

Chart 7. Phillips Curve for UK data (2001-2017)



Source: Office for National Statistics

Over the past 50 years, macroeconomists have enriched the framework by incorporating inflation expectations¹⁰ and a rate of structural unemployment¹¹ that can both vary over time.¹² Allowance has also

⁹ AWE regular pay data, which excludes bonuses, is available from 2001 onwards. I use a power specification to fit the data, similar to Phillips (1958).

¹⁰ Phelps (1967) discusses why the Phillips (1958) model of wages and unemployment may be unstable, and attributes part of this to inflation expectations. Friedman (1968) also emphasized the role of expectations, as well as introducing the concept of natural rate of

been made for a time-varying rate of productivity growth.¹³ The richer framework proposes that if unemployment falls *relative to its structural rate*, wage growth will rise *relative to inflation expectations and productivity growth*.

Phillips already discussed some of these aspects in his original 1958 paper. He talked about the importance of thinking about wage growth relative to productivity growth and retail price inflation. Much of Phillips's paper is actually taken up by showing how, in various historical episodes, wages deviated significantly from their simple relationship with unemployment, before ultimately returning to it.¹⁴

Despite Phillips's own insistence that, for good economic reasons, the relationship was not expected to hold rigidly at all times, any time there has been a deviation from the typical relationship, as has been the case in recent years, commentators are quick to pronounce the "Death of the Phillips curve".¹⁵

I want to argue today that, in the UK data at least, the Phillips curve is not dead. In particular, I want to present some evidence that the unemployment rate is still an important driver of wages, even if other factors matter as well.¹⁶

Empirical results

Rather than focusing on variations in aggregate wages and unemployment over time, I want to focus on variation of wages and employment across sectors of the economy, as well as over time.¹⁷ The use of time series specifications of aggregate data for estimation of the Philips Curve has been shown in the academic literature to be fraught with insurmountable econometric issues.¹⁸ Using sectoral data rather than aggregate data, we can ask the question "do sectors with lower unemployment tend to experience higher wage growth".¹⁹

unemployment. See Mankiw & Reis (2018) and Hall & Sargent (2018) for a recent discussion of the evolution in macroeconomic thinking following Friedman (1968).

¹¹ Many studies, Blanchard (2018) and Miles et al (2017) being two more recent ones, have focused on the price Phillips curve, namely the relationship between inflation and the unemployment rate. In this speech, I choose to focus on the relationship between wages and unemployment – just as Phillips (1958) did.

¹² See Staiger, Stock and Watson (1997) and Gordon (1997) for a discussion of time-varying NAIRU.

¹³ See Ball and Moffitt (2002).

¹⁴ See Broadbent (2014) for a fuller discussion of the original Phillips (1958) curve.

¹⁵ The "death of the Phillips curve" has been professed before. For example, the Federal Reserve Bank of Boston's 1978 economic conference was entitled "After the Phillips Curve". For a recent summary of several articles that argue the Phillips curve has disappeared, see <http://bruegel.org/2017/11/has-the-phillips-curve-disappeared/>

¹⁶ IMF (2017) estimate a global Phillips curve on a country panel dataset, but also include a trend for productivity growth, and find a significant negative coefficient on unemployment. BIS (2017) perform a similar exercise, and find that the slope of the Phillips curve has become less negative (though still significant).

¹⁷ Sectoral unemployment is defined as the industry within which a worker was working in their most recent job, before they became unemployed.

¹⁸ Mavroeidis, Plagborg-Moller and Stock (2014) discuss the weak identification and instability in the estimation of the New Keynesian Phillips curve, and in particular of the role of expectations. They conclude that the literature has reached a limit on how much can be learned about the New Keynesian Philips curve from aggregate macroeconomic time series. One example of this is the endogeneity of monetary policy to both unemployment and wage inflation, which may result in attenuation bias in estimates of the Phillips curve.

Fitzgerald and Nicolini (2014) use this point as motivation for using regional level data to estimate the price Phillips curve.

¹⁹ Many studies have estimated Phillips curves using more dis-aggregated data. In the US, Leduc and Wilson (2017) use

One advantage of such analysis is that we have more data available even if the time period is short.²⁰

A second advantage of the micro analysis is that it allows us to disentangle the impact of unemployment on wages allowing for lots of other factors that affect all sectors over time, or that affect each sector on average.²¹

I estimate a panel regression where wage growth in a sector depends on the previous year's wage growth that sector, and the previous year's unemployment rate in that sector.²² The regression includes year dummies and sector fixed effects (which allow for factors that affect all sectors over time, and different factors that affect each sector on average). The results, in column 1 of Table 1, show that the sectoral unemployment rate is a highly significant driver of wage growth. A one percentage point increase in the unemployment rate in a sector lowers wage growth in that sector by half a percent in the following year.

Next, it is useful to look at the pattern of the year effects. This captures any changes in the economy that affect all sectors similarly over time. Chart 8 shows that the year effects are becoming more negative over time. This implies that, while unemployment was an important factor in explaining wage variation, there were other forces in the economy that were lowering wages in all sectors simultaneously. And these forces became more negative between 2007 and 2012, before roughly stabilising. We can think of this as forces that shift the Phillips curve down, i.e. they lower wage growth for a given rate of unemployment.

metropolitan-area data and find the slope of the US Phillips Curve has flattened; Smith (2014) and Kiley (2014) use state-level and metropolitan-area data respectively to estimate the effect of long-term and short-term unemployment on wage inflation. For the UK, Tuckett (2018) uses the Labour Force Survey regional data to estimate the wage Phillips curve.

²⁰ Using regional data in the UK is more troublesome than in the US. Due to the lack of cross sectional variation in unemployment and wages across UK regions, the inclusion of year dummies to capture common movements across the regions swamps any cross sectional variation that might be useful in the identification of the model. UK sectoral data, on the other hand, exhibits a larger amount of cross sectional variation allowing for a better identification of the effects of unemployment on wages.

²¹ This fixed effect can be used to tackle, at least partially, issues with unavailable data at the sectoral level, for example inflation expectations. Note that these inflation expectations are not the expectations of the inflation of that sector, but of those working in the sector.

²² I use the SIC07-level 1 industry classification for both unemployment and wage data from the ONS Labour Force Survey between 1997 and 2017. I use lagged unemployment in the panel regression in an attempt to eliminate the bias arising from the endogeneity between wages and unemployment.

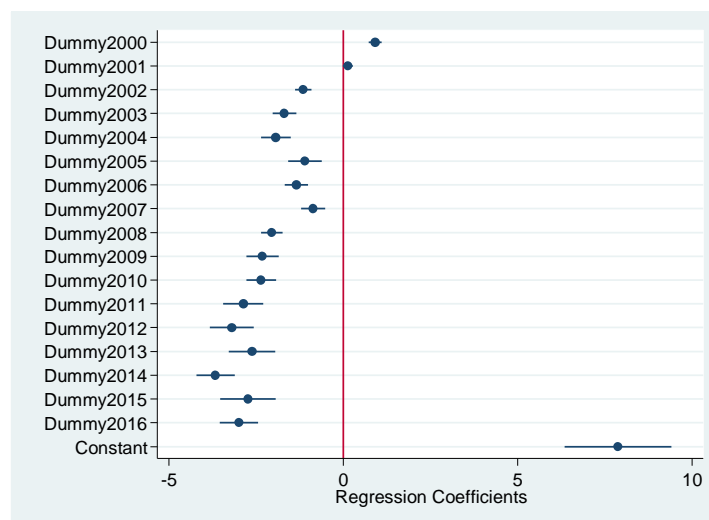
Table 1. Results from sectoral panel regressions

$dW_{i,t}$	(1)	(2)	(3)
Constant	7.88*** (0.726)	5.70*** (0.98)	8.17*** (1.48)
$dW_{i,t-1}$	-0.22* (0.08)	-0.20* (0.09)	-0.18 (0.12)
$u_{i,t-1}$	-0.54*** (0.10)	-	-0.65** (0.22)
Post-crisis dummy* $u_{i,t-1}$	-	-	0.08 (0.15)
Post-crisis dummy* $dW_{i,t-1}$	-	-	-0.09 (0.12)
Dummy _{year}	Yes	No	Yes
Dummy _{year} * $u_{i,t-1}$	No	Yes	No
Sector fixed effects	Yes	Yes	Yes
NT	252	252	252

Notes: Numbers in parentheses are Driscoll and Kraay standard errors. *, ** and *** represent significance at the 95%, 99% and 99.9% significance level respectively.

Source: Office for National Statistics, Bank of England calculations.

Chart 8. Year dummy regression coefficients for specification (1)

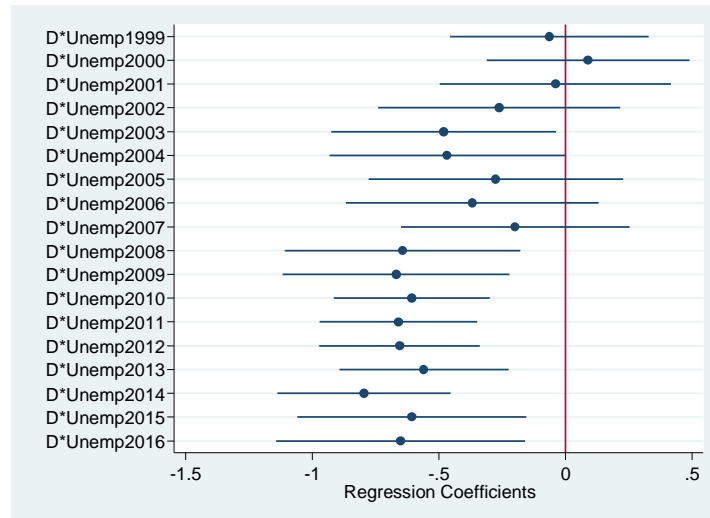


Source: Office for National Statistics, Bank of England calculations

A second useful step in the analysis is to allow the coefficients on the unemployment rate to change over time. This allows us to ask whether the impact of a change in unemployment on wage growth has become,

for example, weaker over time. Chart 9 shows that, if anything, the opposite is true. The coefficient on unemployment appears to have become larger (more negative) over time.

Chart 9. Dummy and unemployment interaction regression coefficients for specification (2)



Source: Office for National Statistics, Bank of England calculations

The third part of the analysis is to check formally whether the apparent change in the impact of unemployment on wage growth is statistically significant. Column 3 of Table 1 shows the results of the same model we used in column 1, but with an added interaction variable that allows the coefficient on unemployment (and lagged wage growth) to shift in the post crisis years. The result shows that the shift has not been significant with this specification. The results here test for a break in 2010, but changing that to a later date leads to similar results.²³

The conclusion from the sectoral analysis can be summarised as follows: there is no evidence that the unemployment rate now has a smaller effect on wage growth than in the past. The Phillips curve has not flattened. Examining the time effects, it does appear that there have been aggregate economic forces that have driven down wage growth for a given unemployment rate, i.e. the Phillips curve has shifted down. That shift largely took place during the crisis and the early years of the recovery, and there is no evidence that it shifted further since then.

What then, explains the fact that wage growth has remained subdued for much of the post-crisis period even though the unemployment rate has fallen from 8.5% to 4.3%. And are those factors likely to persist, or are there signs that some might be fading?

²³ "Post-crisis" is defined as 2010 onwards, in line with the ONS, who define the UK recession as between Q2 2008 and Q3 2009. The results are robust to changing this definition of post-crisis to, say, 2013 onwards when more commentators started pronouncing the "death of the Phillips curve".

Other factors affecting wages

I will look at five different factors that may have been keeping wage growth low despite falling unemployment.

First, a change in the structural unemployment rate. My colleagues on the MPC and I have discussed the reasons for this on several occasions: the UK workforce is ageing and has a higher education attainment now than in the past, which would lead to a lower equilibrium unemployment rate as older and more highly educated workers tend to spend less time out of work.²⁴ Tax and benefit changes might have increased the incentives to find work, which would also lead to less time spent in unemployment. Moreover, there have been changes to work patterns such as increased part-time work and zero hours contracts that may mean that the unemployment rate is a less reliable guide to overall slack in the labour market, because such workers can find themselves underemployed even if they have a job.²⁵

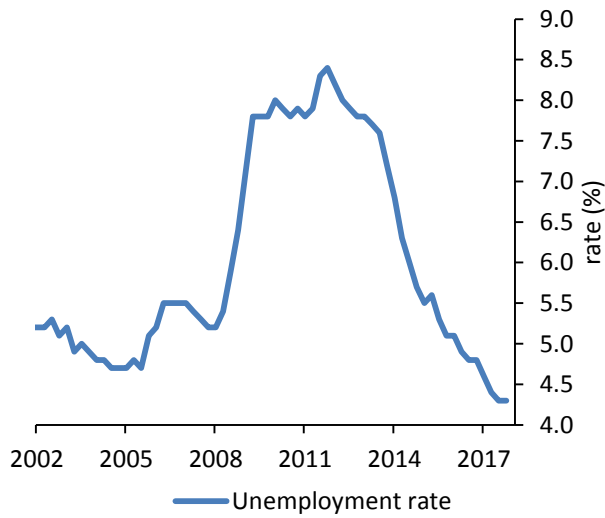
Such considerations mean that the unemployment rate can fall further than it did in the past before pushing up wages. The relevant variable for measuring labour market slack is not the unemployment rate, but the gap between the unemployment rate and the structural unemployment rate. But the MPC has already taken a lot of these changes into account. The MPC's estimate of the equilibrium unemployment rate has been revised down to 4.25%, close to where the actual unemployment rate now is (Chart 10).

And on the issue of underemployment, it seems plausible to me that this was having a significant effect earlier on in the recovery. But measures of underemployment have fallen significantly in recent years. The panel below shows several such measures: the proportion of workers that want to work more hours or are looking for an additional job (Chart 11), the proportion of workers that work part-time but would prefer a full-time job (Chart 12) and the net balance of desired hours per employee (Chart 13). While these measures are still above their pre-crisis levels, unlike the unemployment rate itself, the gap is closing, so the drag on wage growth from underemployment is likely to have lessened. These underemployment effects are also taken into account by the MPC, through estimates that hours per worker are still somewhat below their equilibrium levels.

²⁴ See Saunders (2018), Cunliffe (2017), Carney (2017) for example.

²⁵ See Haldane (2017) for a fuller discussion.

Chart 10. UK Unemployment rate



Source: Office for National Statistics

Chart 11. UK Underemployment rate



Notes: Underemployed workers are defined as those who were looking for an additional job, or looking for a job with longer hours or who want to work longer hours in the reference week.
Source: Office for National Statistics

Chart 12. Share of part-time workers who could not find full-time jobs



Source: Office for National Statistics

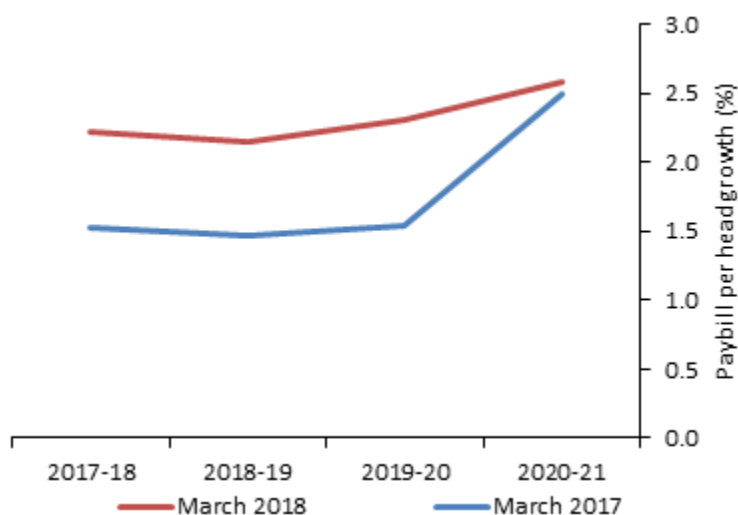
Chart 13. Desired Hours



Notes: Net additional desired hours are calculated as the number of hours employed workers would like to work more minus the number of hours employed workers would like to work fewer normalised by the number of employed workers.
Source: Office for National Statistics

A second factor keeping wage growth low despite falling unemployment might be public sector wage restraint. In the recovery, public sector wage growth has remained generally below private sector wage growth, and public sector employment has contracted. Beyond accounting for roughly 20% of aggregate employment, public sector pay restraint may also affect private wages. For a range of private sector workers, moving to the public sector is an “outside option”, meaning an alternative they might consider when making their employment decision. If the outside option is less easily obtainable and pays less, workers are more likely to accept reduced wage growth in their current job.²⁶ Given the partial lifting of the public sector pay cap in last year’s budget, this factor is likely to become less of a drag on wages in the coming years, compared to the previous years.²⁷ Chart 14 shows that public sector pay growth are now forecast (by the OBR) to be above 2% in 2018 and then close to 2.5% on average over 2019-2021, versus the previous forecast of 1.5% for most of the period until 2020.

Chart 14. OBR Forecasts of public sector wages



Source: Office for Budget Responsibility Fiscal and Economic Outlook 2018, supplementary tables.

A third factor keeping wage growth low despite falling unemployment is the lingering effect of downward nominal wage rigidity. This is the name economists give to the reluctance of firms to cut nominal wage levels outright, or the reluctance of workers to accept such cuts. When the economy suffers a recession, a sufficiently large reduction in labour demand means wages might need to fall outright in nominal terms. But if firms or workers are reluctant to cut nominal wages, the lowest that can be achieved is zero nominal wage growth, so wages do not fall far enough initially. The necessary real wage adjustment takes place more slowly, via inflation that exceeds wage growth, rather than nominal wage cuts. The result is that, when the

²⁶ Alfonso and Gomes (2014) find that public sector wage growth affects private sector wage growth by examining the interactions between wages in the two sectors in OECD countries and within the context of a search and matching model. Holmlund and Linden (1993) discuss the effect of public employment programs on private sector wages and employment levels.

²⁷ “Following the Government’s announcement in September 2017 that the 1 per cent cap on public sector pay rises would be lifted in 2018-19, we assume that general government earnings growth will rise gradually from its lower starting point towards the private sector average over the next three years.” OBR Economic and Fiscal Outlook, March 2018: http://cdn.obr.uk/EFO-MaRch_2018.pdf

economy recovers and labour demand recovers, nominal wages initially do not pick up because the real wage still needs to adjust to the lower equilibrium level.²⁸

Note also that this would imply that the relationship between wage growth and unemployment is not a straight line.²⁹ When unemployment moves higher, wage growth only falls a little due to the unwillingness to cut wages outright. When unemployment falls, wage growth only rises a little initially as real wages still need to achieve a lower equilibrium level. But once those equilibrium levels are reached, if unemployment continues to fall, wage growth can pick up more rapidly. The idea that wage growth rises faster when the unemployment rate falls to very low levels was also noticed by Bill Phillips himself: he did not draw a straight line, he drew a curve. That is why economists call it the “Phillips Curve”, not the “Phillips Line”.

What evidence do we have that this mechanism of downward nominal wage rigidity played a role?³⁰ One informative way to examine the issue is to look at the distribution of pay increases across workers. There will always be some who receive larger increases and some who receive only small increases. But there is usually a spike in the distribution at zero, indicating firms that would have wanted or needed to cut wages, but felt unable to. We can look at the size of that spike over time, i.e. the share of workers that receive precisely no change in their wage, as an indication of the extent to which wages were being prevented from reaching their equilibrium level quickly enough. Chart 15 shows that, in the pre-crisis (non-recession) years, around 1-2% of workers received zero pay change.³¹ During the recession, this rose to 9% for private sector workers and just below 8% for workers more generally, far higher than in previous recessions, strongly suggesting that firms were unable to cut nominal wages fast enough, and that this constraint was much more binding than in previous recessions. In the recovery, this share has fallen back to 4%, only slightly elevated relative to historical experience. This suggests it is becoming less of a constraint now. Several years of inflation outpacing wage and productivity growth have allowed real labour costs to fall far enough so that the labour market may be close to equilibrium again. We might be coming to the end of the “flat” portion of the Phillips curve.

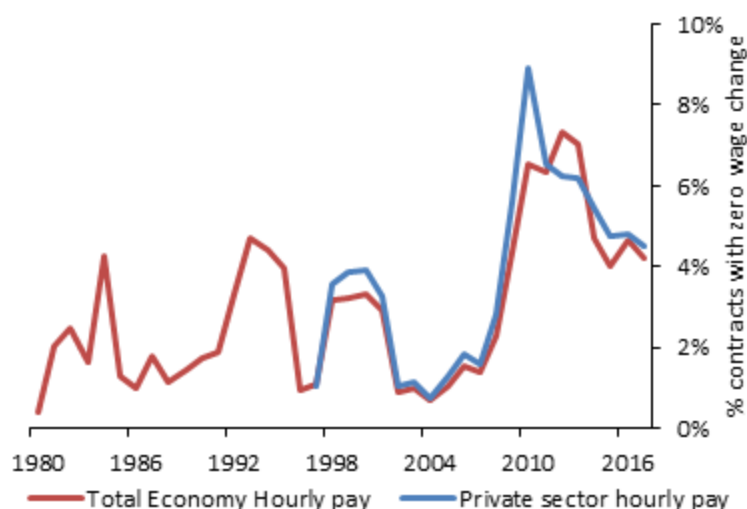
²⁸ Daly and Hobijn (2014) show that a simple model with downward nominal wage rigidity (DNWR) can account for the dynamics of wages and unemployment in the US during the last three recessions. In particular, they show how the Phillips curve will “bend” during the recession and recovery phases because of the increase in importance of the DNWR constraint as the recession hits and the pent up wage deflation that will affect wage dynamics long after employment has started to recover.

²⁹ Benigno and Ricci (2011) show how the slope of the Phillips curve will not only depend on the level of inflation in the presence of DNWR, but also on the volatility of macroeconomic shocks, which can shift the curve. This could explain why the Phillips curve may seem to break down when analysing periods with very different levels of volatility, consistent with the analysis in Broadbent (2014).

³⁰ The empirical significance of DNWR is subject of on-going debate. For example, Elsby et al (2016) discuss wage adjustment in the Great Recession in the UK and US and conclude that DNWR may be less binding than is often supposed. See Benigno and Ricci (2011) for a discussion of the evidence in favour of the importance of DNWR.

³¹ Pay changes are defined as changes on the previous year for those workers who remained in the same job. Naturally, there is a looser definition of “no change” which includes marginal changes around zero. I choose the precise 0% point (as opposed to a range, which would increase the pay freeze claims), to minimise the impact from a possible location or modal shift in the distribution.

Chart 15. Percentage of contracts with zero wage change



Note: This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

Source: Office for National Statistics

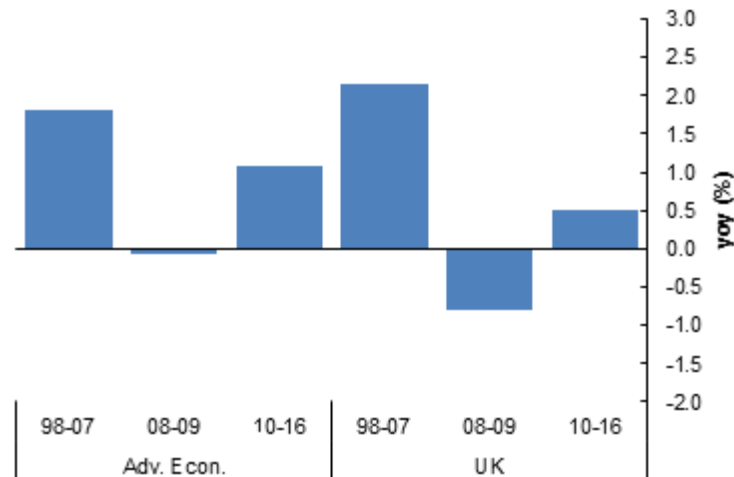
A fourth factor possibly holding wage growth back has been weak inflation expectations. After the recession pushed the unemployment rate to 8.5%, there was significant slack in the economy, the economy was facing deleveraging headwinds,³² and consequently underlying domestic inflation pressure was weak. To prevent medium-term inflation and inflation expectations from falling below target-consistent rates, the economy was in need of substantial monetary stimulus. That is why there were several waves of asset purchases, or QE, over several years, even after Bank Rate had been cut to just 0.5% in the spring of 2009. More recently, from 2014 to 2016, a combination of stronger sterling and falling oil prices lowered inflation well below target, and represented an additional drag on inflation expectations. Weak inflation expectations over that period were seen not just in the UK but across advanced economies. This is likely to have continued to hold down nominal wage demands precisely in a period when they might otherwise have started to pick up due to lower unemployment. However, with inflation now back at 2.7% after the fall in sterling in 2016 and a steady rise in oil prices over the past two years, and rising global growth and inflation, inflation expectations have moved back up. While the direct impact of sterling and oil prices on inflation is likely to fade over the course of this year, we can at least say that the disinflationary effect on wages from the 2014-2016 period has come to an end.

A fifth factor holding wage growth back is productivity growth. When the unemployment rate is at its equilibrium level, and if labour markets are sufficiently competitive, one would expect real wage growth to rise at approximately the rate of real productivity growth. As has been documented and analysed extensively, productivity growth in advanced economies has been unusually weak since the crisis, and even more so in

³² I have discussed this extensively in previous speeches. See Vlieghe (2016a) and Vlieghe (2017b) for further details.

the UK as summarised in Chart 16.³³ Such a persistent slowdown in productivity is likely to be reflected in lower real wage growth as well. We should probably adjust our expectations of what “normal”, full-employment wage growth is likely to be with lower productivity growth. If the previous normal for wage growth was around 4% (2% productivity growth and 2% inflation), the new normal might only be around 3% (1% productivity growth and 2% inflation).³⁴

Chart 16. Productivity growth in Advanced Economies and the UK



Source: IMF, Bank of England calculations

It is important to note that the first four factors keep overall inflationary pressures down for a given unemployment rate, i.e. both wage and price inflation. But the fifth factor, weak productivity growth does not. Weaker productivity growth implies weaker wage growth for the same inflationary pressure. In other words, it lowers the speed limit of wage growth that is consistent with hitting our 2% inflation target.

In summary, I have shown evidence that the Phillips curve is not dead, in the sense that a lower unemployment rate should still be expected to push up on wages and that the effect does not appear to have weakened over time. But other factors have lowered wage growth for a given unemployment rate: lower structural unemployment, public sector wage restraint, downward nominal wage rigidity, weak inflation expectations and weaker productivity growth. I have also argued that several of these wage headwinds are fading now. And weaker productivity growth means that wage inflation that is consistent with our inflation target is lower than it was before the crisis.

Having laid out these slow-moving underlying forces, let’s take a look at the most recent labour market data. The BCC survey of recruitment difficulties in the services sector has been rising steadily, and is now at its

³³ See for example Tenreyro (2018) and Ramsden (2018). There has also been a decline in the labour share of national income across many advanced economies. This is not true in the UK, however, where the labour share has stayed roughly constant since the early 2000s.

³⁴ This is assuming the labour share remains constant in the UK. See Barrow and Faberman (2015) for a clear explanation of the relationship between productivity, inflation, labour share and wages.

cyclical high. The REC measure of the change in availability of staff showed that, in 2017 availability had been falling at a higher rate than in the previous year. Vacancies in 2017 rose at a higher rate than in the previous year. The pay survey conducted by the Bank of England's agents suggests that firms expect pay growth to accelerate to around 3%, which is the highest expectation since the crisis (Chart 17). And finally, actual wage data have been showing some mild acceleration. Growth in private sector regular pay has been rising gradually over the course of 2017 to 2.7% (Chart 18).³⁵ In my speech last September, I mentioned that, at the time, the prior five months had already seen annualised growth rate of regular private sector wages above 3%. That stronger spell of wage growth has persisted. We can now say that, over the past eleven months, annualised growth of wages has been above 3%. While not extraordinary by pre-crisis standards, at least wage growth is now moving in the right direction. And unless productivity growth improves in the coming years, wage growth in the 3-3 ½% range is consistent with full employment and the inflation target.

Chart 17. Agents' pay settlements

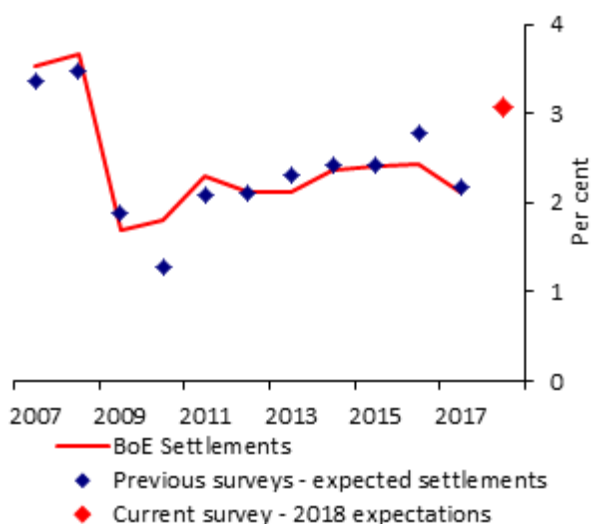
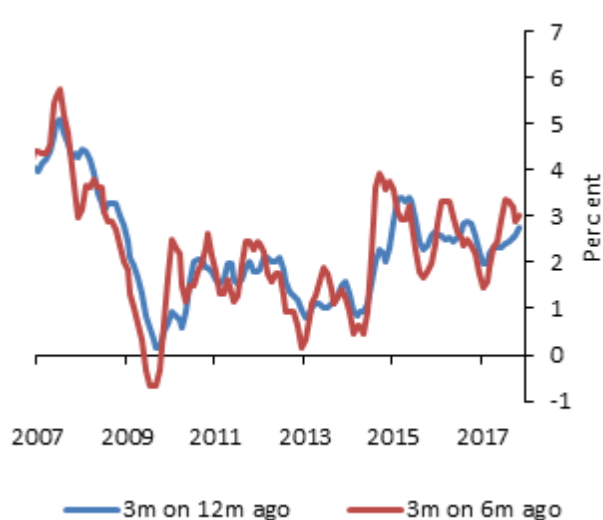


Chart 18. Private sector AWE regular pay



Notes: This is calculated as the 12m and 6m (annualised) growth rate of the rolling 3 months averages of regular pay private sector Average Weekly Earnings.

Source: Office for National Statistics, Bank of England calculations

Source: Bank of England Agents' survey

The combination of survey measures on availability of labour, the Agents' survey on firms' own pay expectations, and the wage data itself, make me more confident now than in previous years that some upward pressure on pay growth is underway.

³⁵ As measured by the growth rate of the 3m average on 12m ago.

Policy implications

What are the implications for monetary policy of the changing risks to growth and inflation?

I have said on a number of occasions that, given that our policy rate is close to its lower bound, policy has less room to respond to downside risk than to upside risk, which means that patience is warranted when tightening policy.³⁶ But by the autumn of 2017, I thought the balance of risks to the outlook had shifted sufficiently to justify a gradually rising path of Bank Rate, starting with a quarter point hike in November. Since then, the data have shifted further in the direction that warrants a continuation of the removal of monetary stimulus over the forecast period.

Provided the balance between global tailwinds and Brexit headwinds remains where it is now, supporting UK growth at or above potential, and provided evidence continues to accumulate that a tight labour market is actually pushing up domestic inflationary pressures, I expect that Bank Rate will need to rise further over the forecast period. The current central outlook is, in my view, consistent with one or two quarter point rate increases per year over the forecast period. Such a path would bring us closer to the neutral policy rate, which I continue to think is likely to be well below the neutral rate that prevailed in the pre-crisis decades.

There is significant uncertainty about the path of rates, and both lower and higher paths are possible, depending on how the economy evolves. While I think it is useful to provide a snapshot of how today's *central* growth and inflation forecast map into my view of the likely *central* path of interest rates, this is a forecast, not a promise. If growth and inflation turn out differently from this central forecast, the path of interest rates will be different too. That should not be seen as a mistake, or a breaking of an earlier promise. It should be seen for what it is, namely an appropriate response to a changed economic outlook. The only promise that all members of the MPC can and do make is to continue to respond to the data to ensure that inflation returns to its 2% target.

³⁶ In Vlieghe (2016a) and Vlieghe (2017a), I discuss the asymmetric risks of monetary policy, given the proximity of the policy rate to the zero lower bound and the headwinds affecting real interest rates.

References

- Atkeson, A., and A. Burstein (2008)**, "Pricing-to-Market, Trade Costs, and International Relative Prices", *American Economic Review*, 98(5): 1998-2031.
- Alfonso, A., and P. Gomes (2014)**, "Interactions between private and public sector wages," *Journal of Macroeconomics*, 39(2014): 97-112.
- Ball, L. and R. Moffitt (2002)**, "Productivity Growth and the Phillips Curve", in A. Krueger. and R. Solow (eds.) *The Roaring Nineties: Can Full Employment Be Sustained?*, Russell Sage Foundation.
- Barrow, L., and J. Faberman (2015)**, "Wage Growth, Inflation and the Labour Share", *Chicago Fed Letter*, No. 347, 2015.
- Benigno, P., and L. Ricci (2011)**, "The Inflation-Output Trade-Off with Downward Wage Rigidities", *American Economic Review*, 101: 1436–66.
- Blanchard, O. (2018)**, "Should We Reject the Natural Rate Hypothesis?", *Journal of Economic Perspectives*, 32(1): 97-120.
- BIS (2017)**, "Exploring the wage Phillips curve", Bank for International Settlements *87th Annual Report*, Box IV.A.
- Broadbent, B. (2014)**, "Unemployment and the conduct of monetary policy in the UK," speech available at: <https://www.bankofengland.co.uk/speech/2014/unemployment-and-the-conduct-of-monetary-policy-in-the-uk>
- Campbell, J., and R. Shiller (1996)**, "A Scorecard for Indexed Government Debt", *NBER Macroeconomics Annual 1996*, 11: 155-208
- Carney, M. (2017)**, "[De]Globalisation and inflation", speech available at: <https://www.bankofengland.co.uk/speech/2017/de-globalisation-and-inflation>
- Cunliffe, J. (2017)**, "The Phillips curve: lower, flatter or in hiding?", speech available at: <https://www.bankofengland.co.uk/speech/2017/jon-cunliffe-speech-at-oxford-economics-society>
- Daly, M. and B. Hobijn (2014)**, "Downward Nominal Wage Rigidities Bend the Phillips Curve", *Journal of Money, Credit and Banking*, Supplement to Vol. 46, No. 2.

Elsby, M., D. Shin and G. Solon (2015), “Wage Adjustment in the Great Recession and the Other Downturns: Evidence from the United States and Great Britain”, *Journal of Labour Economics*, 34(1): 249-291.

Fitzgerald, T. and J. P. Nicolini (2014), “Is There a Stable Relationship between Unemployment and Future Inflation? Evidence from U.S. Cities”, *Federal Reserve Bank of Minneapolis*, Working paper 713.

Friedman, M. (1968), “The role of Monetary Policy”, Presidential address delivered at the Eightieth Meeting of the American Economic Association, *American Economic Review*, 58 (1), 1–17.

Gordon, R. (1997), “The Time-Varying NAIU and Its Implications for Economic Policy”, *Journal of Economic Perspectives*, 11(1): 11-32

Haldane, A. (2017), “Work, Wages and Monetary Policy”, speech available at:
<https://www.bankofengland.co.uk/speech/2017/work-wages-and-monetary-policy>

Hall, R. and T. Sargent (2018), “Short-Run and Long-Run Effects of Milton Friedman’s Presidential Address”, *Journal of Economic Perspectives*, 32 (1): 121-134.

Holmlund, B., and J. Linden (1993), “Job matching, temporary public employment, and equilibrium unemployment”, *Journal of Public Economics*, 51(1993): 329-343.

IMF (2017), “Recent wage dynamics in Advanced Economies: Drivers and Implications”, *World Economic Outlook*, Chapter 2.

Kiley, M. (2014), “An Evaluation of the Inflationary Pressure Associated with Short- and Long-Term Unemployment”, *FEDS Working Paper No. 2014-28*

Leduc, S. and D. Wilson (2017), “Has the Wage Phillips Curve Gone Dormant?”, *FRBSF Economic Letter*, 2017-30.

Mankiw, G. and R. Reis (2018), “Friedman’s Presidential Address in the Evolution of Macroeconomic Thought”, *Journal of Economic Perspectives*, 32 (1): 81-96.

Mavroudis, S., M. Plagborg-Moller and J. Stock (2014), “Empirical Evidence on Inflation Expectations in the New Keynesian Phillips Curve”, *Journal of Economic Literature*, 52(1): 124-188.

Miles, D., U. Panizza, R. Reis and A. Ubide (2017), “And Yet It Moves: Inflation and the Great Recession”, *Geneva Reports on the World Economy* 19.

Phillips, A. (1958), “The Relation Between Unemployment and the Rate of Change of Money Wage in the United Kingdom, 1861-1957”, *Economica*, 100(25): 283-299

Phelps, E. (1967), “Money-Wage Dynamics and Labor-Market Equilibrium”, *Journal of Political Economy*, 76(4): 678-711

Ramsden, D. (2018), “The UK’s productivity growth challenge”, speech available at:
<https://www.bankofengland.co.uk/speech/2018/dave-ramsdend-panel-remarks-cbi-event>

Saunders M. (2018), “The Outlook for Jobs and Pay”, speech available at:
<https://www.bankofengland.co.uk/speech/2018/michael-saunders-launch-of-financial-intermediary-and-broker-association>

Smith, C. (2014), “The Effect of Labour Slack on Wages: Evidence from State-Level Relationships”, *FEDS Notes*.

Staiger, D., J. Stock and M. Watson (1997), “The NAIRU, Unemployment and Monetary Policy”, *Journal of Economic Perspectives*, 11 (1): 33-49.

Tenreyro, S. (2018), “The fall in productivity: causes and implications”, speech available at:
<https://www.bankofengland.co.uk/speech/2018/silvana-tenreyro-2018-peston-lecture>

Tuckett, A. (2018), “Regional data and the Phillips Curve”, *Bank of England Staff Working Paper*, forthcoming.

Vlieghe, G. (2016a), “Debt, Demographics and the Distribution of Income: New challenges for monetary policy”, speech available at: <https://www.bankofengland.co.uk/speech/2016/debt-demographics-and-the-distribution-of-income-new-challenges-for-monetary-policy>

Vlieghe, G. (2016b), “Monetary policy expectations and long term interest rates”, speech available at:
<https://www.bankofengland.co.uk/speech/2016/monetary-policy-expectations-and-long-term-interest-rates>

Vlieghe, G. (2016c), “Umbrellas don't cause rain”, speech available at:
<https://www.bankofengland.co.uk/speech/2016/umbrellas-dont-cause-rain>

Vlieghe, G. (2017a), “Good policy vs accurate forecasts”, speech available at:
<https://www.bankofengland.co.uk/speech/2017/good-policy-vs-accurate-forecasts>

Vlieghe, G. (2017b), “Real interest rates and risk”, speech available at:
<https://www.bankofengland.co.uk/speech/2017/real-interest-rates-and-risk>