



BANK OF ENGLAND

# Speech

---

## **Credit: Can Trees Grow to the Sky?**

Speech given by

Sir Jon Cunliffe, Deputy Governor Financial Stability, Member of the Monetary Policy Committee, Member of the Financial Policy Committee and Member of the Prudential Regulation Authority Board

British Property Federation Annual Residential Investment Conference, London  
Tuesday 9 February 2016

## Evolution of private credit

In 1880, the stock of aggregate bank lending to the private non-financial sector in the British economy was around 16% of GDP.<sup>1</sup>

It grew, gradually, over the next 100 years, except in the periods of the first and second world wars, when it fell sharply. In 1950, the stock of aggregate lending which includes credit provided by non-bank institutions, was 63%. It rose and fell of course but it broadly stayed around that level for the next 30 years. It was 63% in 1980.

The rate of growth changed markedly in the last 20 years of the century which was a period of first liberalisation and then globalisation of the financial sector (**Chart 1**). Credit began to grow consistently faster than the economy. As a result, the stock of credit increased rapidly from 63% of GDP in 1980 to 120% by the early 1990s. It paused for a few years following the recession of the early 1990s, and then resumed its upward path. By 2009 it had reached 177% of GDP – one and three quarter times the annual product of the economy. In aggregate, advanced economies saw a similar upward trend (**Chart 2**).

In the 10 years between 1997 and 2007, the annualised growth rate of real credit was 7%, relative to real GDP growth of 3%. That meant credit grew at more than double the rate of the economy over the period. Had this trend continued the stock of credit would have been 200% of GDP by 2012 and 300% of GDP by 2023.

The great recession that followed the financial crisis saw a sharp correction. Credit went into reverse, shrinking annually by around 2.5% a year in real terms from 2010-2014. By 2014 the stock of credit had dropped from its peak of 177% of GDP to 140% - and remains around that level. To put it in context, we are now back to where we were in 2002. Credit to GDP would have to fall another 25 percentage points to get back to 1997.

Credit, of course, is another way of saying debt. As most of the lending during the long period of pre-crisis credit growth was to UK households, the stock of UK households' debt relative to their income not surprisingly follows a similar path to the stock of credit to GDP. In 1964, it was 54% and remained around this level until 1980; but by 1990 it had exceeded 100%. It surged again from the late 1990s – by 2007 it had grown to 155%. It fell to 135%, its 2004 level, in 2012 and remains around there.

So between the mid-1990s and the financial crisis, the UK experienced a very powerful financial cycle – a long build-up of credit to the private sector followed by a sharp correction that has reversed some but not most of the preceding credit growth. There were of course other important elements such as lending

---

<sup>1</sup> See Schularick and Taylor (2012).

overseas and between banks, and some would argue lending to governments. But I want today to focus on credit to the UK private sector, particularly household credit.

I want to look at what lay behind the upswing of that cycle, the marked rise of credit to GDP since 1997. This is of more than academic interest. We are back to early 2000s levels of credit and debt in the economy. We are now emerging from the post crisis period of credit contraction; in the UK credit slowly began to grow again around 2012. It is now growing at almost the same rate as the economy.

So now is a good time to ask: what lay behind the very rapid expansion of credit from the mid-1990s to the crisis? Should we expect – or want – credit growth to return to its pre-crisis path, growing more than twice as fast as GDP? This is an important question for the Financial Policy Committee of the Bank of England as it assesses the risks to the stability of the UK financial system – where we are in the so-called ‘financial cycle’?

Before I start, however, there are three important points to bear in mind.

The first is that credit or debt is not “bad”. It is an essential part of what makes modern economies grow. It facilitates consumption smoothing, house purchases, investment and risk management. The last eight years have demonstrated what happens to the economy when the credit mechanism is badly damaged.<sup>2</sup>

Nor does the stock of credit to GDP have to be constant; there are good reasons, as I will try to set out, why advanced economies may have been able to sustain and indeed benefit from an increase in the level of credit to GDP.

Our economy and society would be very different, and I suspect much less congenial if the credit to GDP ratio were at its 1880 level of 16%.

The issue rather is what are the financial stability and broader economic risks for the UK if credit consistently grows faster than GDP and as a result debt to income resumes its upward path? That cannot continue indefinitely. Trees cannot grow to the sky.

The second important point to make at the outset is that the great financial crisis of 2007 was not triggered by UK households’ build up of debt. But the debt made our economy much more vulnerable when the shock hit us. And high stocks of household debt – especially when secured on housing assets – have been at the root of many other financial crises in the past. I will say more about this later on.

My third point is that, for every financial debt there is obviously a corresponding financial asset, owned either by domestic residents or foreigners. There is a lender for every borrower. Net indebtedness, in this sense,

---

<sup>2</sup> Although an increase in credit intensity (credit to GDP) is a key part of economic development some studies have found evidence that beyond certain levels of credit to GDP countries experience lower growth. See Cecchetti et al (2011) and Arcand et al (2012).

is zero by definition. What matters, therefore, is how the debt and assets are matched and how the debt is distributed across the population. If debt is concentrated in households with low liquid financial assets, and high marginal propensities to consume, that is a more vulnerable scenario than if debt is more evenly distributed across the population. I'll also return to this issue below.

## Financial cycle

And the idea itself of a 'financial cycle' is perhaps the best place to start.

We are not here talking about the business or economic cycle – that is, the regular 'ups and downs' in economic activity we observe in indicators like employment and GDP. By contrast, financial cycles are the persistent and possibly self-reinforcing build up of leverage, increases in asset prices and loosening of credit conditions over time. They don't always end in tears. But they often do: the peaks of financial cycles tend to be closely associated with financial crises and the possibility of 'serious distress and dislocations'.<sup>3</sup>

And they are long lived – probably on average around 15 years from one peak to the next.<sup>4</sup> In contrast, business cycles are typically relatively short-lived affairs: for instance, the average duration of business cycles in the UK and US economy in the post-war period has been estimated at 5 ½ years.<sup>5</sup>

However, though financial cycles build up much more slowly than business cycles, the amplitude - the swings between the peaks and troughs – is greater. In the UK the peak-to-trough variation in credit has been around 40 percentage points on average for financial cycles, whereas the average peak to trough change in GDP in the business cycle has been around 10 percentage points.

Financial cycles do not always mirror or drive business cycles. To a headline writer, the fact that credit grew twice as fast as GDP for 10 years before 2007 and that household debt rose from levels of around 100% of household income in 1997 to 155% shouts "unsustainable, debt financed growth". But over those 10 years, the economy was not obviously growing at above-normal rates and inflation remained subdued, albeit aided perhaps by the favourable terms of trade shock that followed China's admission to the World Trade Organisation in 2001.<sup>6</sup> While the increase in debt may have had some impact on growth, the UK certainly did not appear to enjoy a credit financed boom.

So one very important lesson in this is that traditional indicators of the business cycle cannot be relied upon to flash warning lights about vulnerabilities building up in the financial system.

---

<sup>3</sup> See Borio (2012).

<sup>4</sup> See Drehmann et al (2012) and Aikman et al (2015). Arguably, if one looks through the pause in the early 1990s, the upswing of the last financial cycle lasted for 30 years.

<sup>5</sup> For the United Kingdom, this estimate is provided by Hills et al (2010). For the United States, the estimate is from the National Bureau of Economic Research's business cycle dating committee. <http://www.nber.org/cycles.html>.

<sup>6</sup> As I observed in a speech in 2015: 'Nor did this increase in lending drive a commensurate increase in economic growth in this particular credit cycle. Over the period 2000-2007 GDP growth averaged little more than its long-run average of around 2.8%. In fact, business investment over the period averaged just 1.3% a year and it appears that most of this was related to commercial real estate.' See Cunliffe (2015).

## **Where did the money go?**

If the total amount of UK private credit in the economy rose sharply in the 10 years before the crisis without much impact on private sector demand or the economy as a whole, where did the money go?

Some went to business – around a third, much of it to commercial real estate. But the bulk, around two-thirds of the credit, was to households (**Chart 3**). Bank lending to households made a particularly large contribution to credit growth in the first half of the 2000s. And while unsecured lending grew strongly over the period, it only comprised about 10-15% of lending to households. The much larger part was, of course, secured lending for housing.

And it is fair to call it a boom. Secured household debt relative to annual household income was stable at around 70% for much of the 1990s, before rising rapidly to over 110% by 2007. The stock of household debt secured on housing went in real terms from around £300 billion to £700 billion. The main driver of course was the increase in house prices relative to earnings over the period – from about 2.5 times climbing to 5 times.

Households have of course a house on their balance sheet – to set against the debt. The debt stock has grown but so has the value of the housing assets it is financing. The total size of the household sector's balance sheet grew over the period. But the debt is fixed while the value of the asset can vary quite widely. And large balance sheets can be vulnerable at times of stress. I will look at some of the risks around this later on.

## **Drivers of the credit boom**

The obvious and tempting conclusion when looking at the upswing of the last financial cycle, growth of credit and of household balance sheets in the UK economy is that this was surely unsustainable.

The reality I think is more complex. As I said at the outset, the growth of credit has been part of the development of the economy for at least the past 120 years.

Credit cannot grow faster than the economy forever. But the level of debt and the rate of growth of credit that the economy can sustain is not fixed. It can and has shifted over time. To learn the lessons of the pre-crisis period, we need to explore whether a shift occurred in the sustainable level of debt during the upswing of the last cycle and what we should expect for the future.

There are many interrelated factors that might influence the sustainable level of debt in the economy. For example, some relatively slow-moving factors such as demographics, tax policy, housing supply and inflation

are likely to play a role. But today I want to highlight two key factors that may have played a particularly important role in shifting the ratio of credit to GDP during the upswing of the last cycle. First, the level of long-run real interest rates and second, credit supply conditions, including credit spreads.

### *Long-term interest rate*

The long-term real interest rate is crucially important both to the level of debt and to the price of the assets it finances. Structural changes in real interest rates are perhaps the most important factor in driving a shift in the sustainable level of debt. The real long-term interest rate is, of course, determined by structural features of the economy, not by central banks.

Enduring changes in the level of real interest rates and in the cost of credit intermediation by lenders alter the sustainable level of debt service of borrowers. And changes in the interest rate also affect the net present value, and hence the price, of housing assets. All else equal, lower rates will increase both the price borrowers can afford to pay and the net present value of houses.

There has been a substantial fall in the long-term real interest rates of around 4.5 percentage points over the past 30 years (**Chart 4**); this trend has occurred across countries. The structural decline in real rates pushed up on house prices in particular given the inelastic supply. It has also made a larger debt stock easier to service.

This fall in real rates was clearly an important factor over the period in driving the high rate of credit growth relative to GDP and the consequent increase in the level of household debt to income.

Looking forward, to the extent that the fall in interest rates was the result of structural factors that are likely to last for a long time, the increase in the level of household debt is more likely to be sustainable. And indeed, recent work in the Bank of England suggests that much of that fall could well be due to persistent structural factors (**Chart 5**).<sup>7</sup>

These factors include a slowing in the underlying global economic growth rate, the rise in saving due to demographic forces, lower desired investment given a lower relative price of capital, changes in the income distribution, excess saving in emerging markets and declining public investment.

However, not all of these factors will support a higher level of debt. In particular a fall in the potential growth rate of the economy will lower the long-term real interest rate. But it will also lower long-term income so the overall impact on house values and debt sustainability is likely to be neutral. On the other hand, some of the

---

<sup>7</sup> Rachel and Smith (2015) attempt to decompose the substantial fall in real rates over the past 30 years. Although acknowledging significant uncertainty, they account for around 400 basis points of that fall, the majority of which they attribute to structural factors. In another piece of Bank of England work, Waldron and Zampolli (2010) calibrate a model of the UK household sector to examine the behaviour of household debt between 1987 and 2006 – their model can explain most of the rise in debt and house prices if households expected lower real interest rates to persist.

factors which affect preferences for desired saving and investment (demographics and the income distribution, for example), are likely to lift the sustainable level of debt and asset prices.

### *Credit spreads and credit supply*

The interest rate charged to borrowers and by which risky assets are valued reflects more than just the risk free rate. It includes the spread above the risk free rate charged by the lender to reflect the costs and risk of lending. If reductions in the spread above the risk free interest rate are long lasting, they too will raise both the sustainable level of debt relative to income and the sustainable level of asset prices.

In the run up to the recent crisis, the spread over the risk free rate fell. For example, lending spreads on new UK mortgage lending fell from around 100bps in around 2000 to a low of around 30bps in 2007.

More generally, shifts in credit supply may occur through increased bank competition over non-price factors (such as increasing the availability of credit to borrowers with high LTIs and LTVs), or because of regulatory and other policy changes that affect banks' ability to lend. These shifts in credit supply may appear as direct increases in the credit to GDP ratio but show up less obviously in lending rates. Such shifts may show up as increases in deposit rates rather than falls in lending rates if they affect competition for retail and wholesale funds.

Bank analysis suggests that such reductions in the spread over the risk-free rate played an important role in raising credit growth relative to GDP during both of the surges in the credit to GDP ratio since 1980.<sup>8</sup> The spread over the risk free rate appears to have fallen due to three main factors – improvements in 'intermediation technology', greater risk appetite by banks, and greater access by banks to wholesale funding.<sup>9</sup>

How long should we expect these factors to exert downward pressure on the spread over the risk-free rate?

Reductions in the business cost of intermediation pushed down on rates and up on credit growth relative to GDP during the financial liberalisation of the 1980s. They continued to have an effect, though to a lesser extent, during the 2000s. Such reductions will almost certainly be long lasting. The underlying drivers such as technological innovation in information gathering and rising competition are unlikely to go into reverse. Indeed, we might expect technology and competition to drive intermediation costs down further.

The other factors that pushed down the spread over the risk-free rate in the upswing have proved to be much less sustainable. The increase in banks' willingness to take risks and in investors' willingness to provide wholesale funding both unwound sharply in the crisis. This is likely to have been one factor behind the fall in

---

<sup>8</sup> See Mcleay and Thomas (2016 forthcoming).

<sup>9</sup> Changes in capital regulation may also have had an impact on mortgage lending spreads.

credit to GDP. Following the post-crisis repair phase, banks' risk taking and lending spreads now appear to be at a more standard level. Regulation has been put in place to curtail banks' ability to take excessive risk and to rely on short-term wholesale funding.

### *Debt servicing*

Another lens through which we can look at the sustainability of the increases in debt and asset prices during the upswing of the last financial cycle is the debt servicing ratio or 'income gearing'.

The aggregate household debt service ratio in the UK rose to 13% in 2007 but is now at its 2001 level of around 8% (**Chart 6**).<sup>10</sup> That is a little below its historic average since 1988.

But while the ratio is back at 2001 levels, its composition is now very different. In 2001, the debt stock was around £800 billion and the interest rate was 6.7%. Today it is over £1.6 trillion and the rate has fallen to 3.6%.

These debt service numbers do not include consumer finance which add to the household debt stock. The stock is small relative to secured lending, at around 10-15% of the stock of secured lending. But it is growing quickly at around 9% per year. High levels of consumer finance tend to be associated with households that have high overall debt service levels. The Government has given the Financial Policy Committee the power to implement limits on the flow of lending at certain debt-to-income limits in respect of new owner-occupied residential mortgages. This gives the FPC a tool to target overall household indebtedness should it consider that it posed a risk to financial stability.

### *What does the last financial cycle tell us about sustainability?*

Putting all of this together, it seems reasonable to conclude that since the 1980s there have indeed been long lasting forces that pushed down on both the risk-free interest rate and the spread that lenders charge. This lowered the rates charged to borrowers and raised the price of houses. It will also have raised the sustainable level of debt.

But it is not at all clear that in future these forces will raise the level of sustainability further. There is much uncertainty and discussion now about further downward shifts in the real interest rate as a result of secular stagnation and lower potential economic growth. But though such effects, if they occur, may continue to push down the risk free interest rate, they will as I have said, also push down income and are therefore unlikely to improve sustainability.

---

<sup>10</sup> Debt service ratio is defined here as mortgage interest payments plus mortgage principal repayments as a proportion of total household income.



Judgments about sustainability are difficult. The household debt to income ratio has come down materially since the crisis – back to its 2004 level of 135%.

The debt service ratio shows a similar picture. It is back to 2001 levels. And, crucially, within this, we've seen a fall in the proportion of heavily-indebted households and the share of households spending a high proportion of their income on debt repayments (**Chart 7**).<sup>11</sup>

But the position is sensitive to upward shifts in interest rates without a similar increase in incomes, especially if some of the powerful forces that have pushed rates down since the 1980s begin to unwind. And it is very vulnerable to a resumption of the rise, in credit relative to GDP driven by housing that we have seen for most of the last 40 years and that we saw particularly in the upswing of the last financial cycle.

*How much do such risks matter?*

The growth of credit and household debt relative to GDP and income in the UK did not, as some commentators have pointed out, trigger the financial crisis in the UK. The proximate cause was the overseas exposures of UK banks to very risky assets and the extreme fragility of their capital, funding and liquidity positions. But risky UK mortgage assets, along with UK commercial property, certainly damaged a number of UK institutions.

One risk from an increase in household balance sheets due to house purchases being financed by ever increasing amounts of debt is that homeowners can't repay the mortgage in times of stress. We saw this in the UK in the 1990s. But the main damage in the last crisis from high levels of UK households' secured debt however did not come so much through bank losses or through the huge falls in house prices seen in other countries.

Cushioned by the cuts in interest rates to effectively zero, QE, and stronger-than-expected employment levels<sup>12</sup>, UK households were largely able to maintain servicing their debt even though their real income was declining.

Indeed they paid debt down to reduce the size of their balance sheets. But to do so, they cut back their consumption markedly, thus deepening and prolonging the recession. Real household consumption fell by 6% between end 2007 and 2009.

---

<sup>11</sup> The share of households with very high mortgage debt to income ratios (above 5), for instance, has fallen back significantly since 2012 and is now back to levels seen in the 1990s. The share of households with moderately high mortgage debt to income ratios (between 3 and 5) has also fallen. The proportion of households with debt-service ratios between 30% and 40% is now much smaller than it was in 2008.

<sup>12</sup> The pre-crisis Okun's Law relationship between output growth and unemployment would have suggested that the unemployment rate would rise to around 12% given the change in output, rather than peaking at around 8½%.

This is an important if less well known risk from large household balance sheets. Even if they pay their mortgages households cut back consumption when house prices fall and uncertainty about future income increases. This was especially true in the last recession for the more highly indebted households who cut spending substantially than did less indebted households. That is, the distribution of debt also matters.

Similar effects were seen in other countries. And there is considerable evidence that recessions that follow debt financed housing booms are worse. The IMF estimate that for each additional 10 percentage point rise in household debt prior to the global financial crisis, the consumption loss (as a percent of pre-crisis trend) was larger by 2.6 percentage points. Other studies have come to similar conclusions.<sup>13</sup>

## **Conclusion**

Since the 1980s the UK has seen a sharp and very material increase in the credit to GDP ratio and in the stock of household debt relative to income. This was particularly pronounced in the 10 year upswing of the last financial cycle when credit grew over twice as fast as GDP.

This surge in credit did not finance an economic boom. Indeed, it showed little in the conventional indicators of economic activity. It comprised in the main secured lending to households for housing, driven by house prices rising consistently faster than earnings.

The rise in secured debt and the increase in house prices reflected in part structural reductions in interest rates. Many of the forces that pushed down on rates over the period are long lasting and are unlikely to be reversed. To that extent, they have probably raised the sustainable level of credit to GDP. However, it would, in my view, be unwise to bet on further upward structural shifts in the level of sustainability.

The high level of debt to income made the UK vulnerable to shocks as we saw in the post crisis recession. There was a major correction following the crisis that has improved sustainability. We are now back to early 2000s levels of debt to income and income gearing. Household balance sheets, however, remain large by historic standards. The position is sensitive to the unwinding, were it to occur, of some of the forces that pushed rates down over the past 40 years. And of course we remain vulnerable to the resumption of the rates of credit growth, driven by the housing market, seen in the 10 year upswing of the last cycle. Trees cannot in the end grow to the sky.

The debt stock of course tends to change relatively slowly. Credit is growing broadly in line with GDP. If it were to resume growing more than twice as fast as GDP, it could take a number of years for debt to income

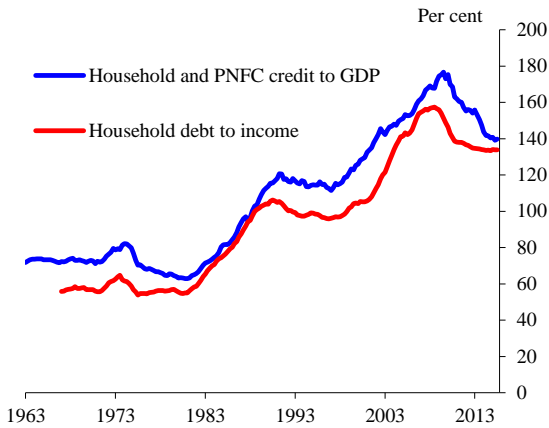
---

<sup>13</sup> Jorda et al (2015) find that credit expansions associated with housing bubbles are more likely to end in a severe recession than expansions not associated with build ups in credit. Mian et al (2015) find that a rise in the household debt to GDP ratio predicts lower output growth and higher unemployment over the medium-run. Crowe et al (2011) find that more than two thirds of the 46 systemic banking crises (for which house price data are available) were preceded by housing boom-bust cycles. These effects are typically not present in equity bubbles (Aikman et al 2015).

to retain its pre-crisis peak. But just as financial cycles build up over a number of years, the risks they pose are perhaps best managed over time. Given the vulnerability that already exists and the powerful drivers in the UK, particularly the housing market, if credit began again to grow faster than GDP, I would want to think about action to manage the financial stability risks sooner rather than later.

## Charts

**Chart 1: Credit to GDP<sup>(a)</sup> and Household debt to income<sup>(b)</sup> ratios**

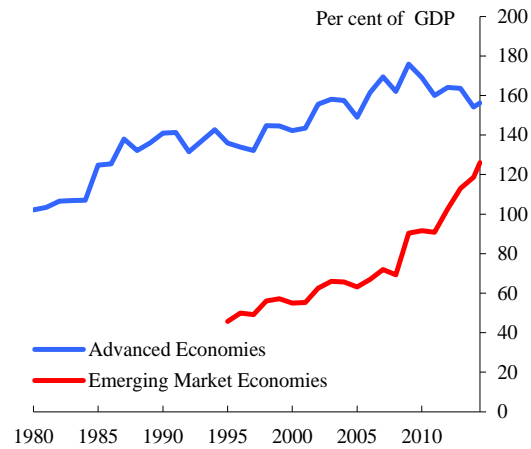


Sources: ONS and Bank calculations.

(a) Credit is defined as debt claims on the UK private non-financial sector. This includes household liabilities and loans and debt securities of the private non-financial corporation (PNFC) sector.

(b) Gross household debt as a percentage of a four-quarter moving sum of disposable income.

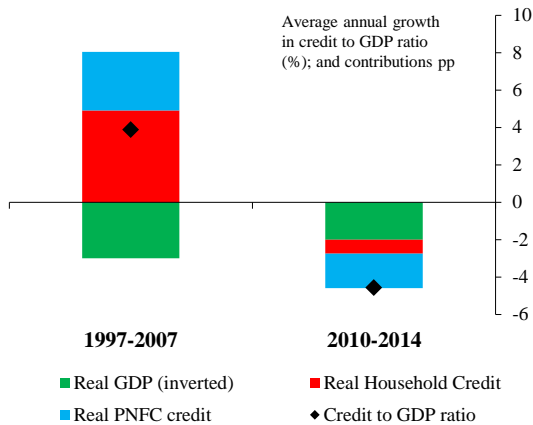
**Chart 2: International private non-financial sector debt to GDP ratios<sup>(a)</sup>**



Sources: BIS and Bank calculations.

(a) Credit from all lenders. Aggregate credit over aggregate GDP for each group. Advanced economy sample is 25 countries; Emerging Market Economies sample is 14 countries.

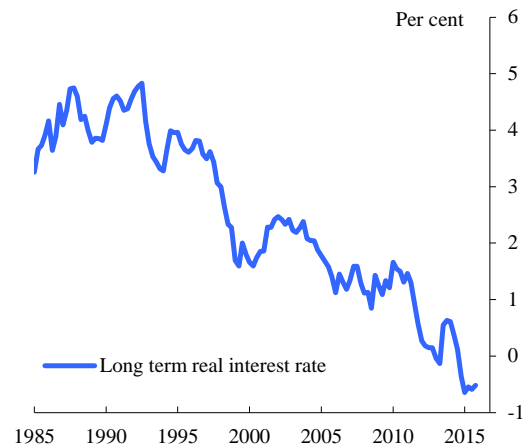
**Chart 3: Decomposition of average annual growth in credit-to-GDP ratio<sup>(a)</sup>**



Sources: ONS and Bank calculations.

(a) Credit is defined as debt claims on the UK private non-financial sector, as in Chart 1. PNFC credit includes debt securities. Credit series are deflated by the GDP deflator to be put in real terms.

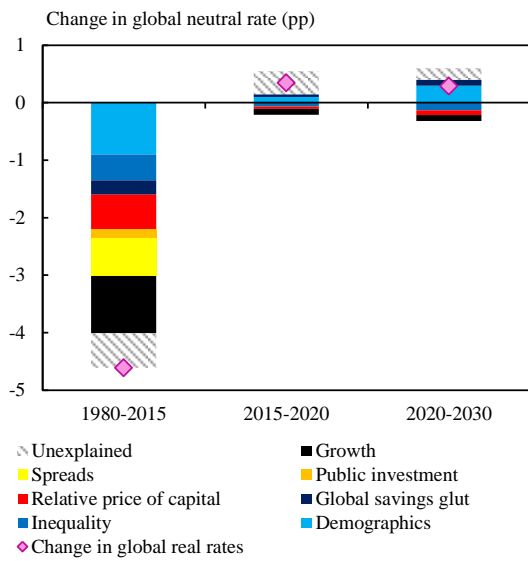
**Chart 4: Long-term real interest rate<sup>(a)</sup>**



Sources: Bloomberg and Bank calculations.

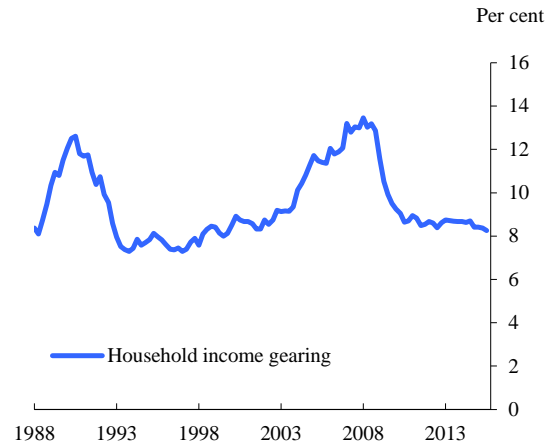
(a) Five-year real interest rates five years forward, derived from the Bank's index-linked government liabilities curve.

**Chart 5: Secular drivers of global real interest rates**



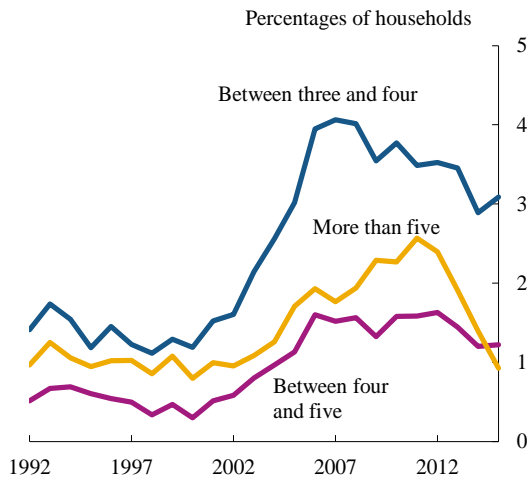
Source: [Rachel and Smith \(2015\)](#).

**Chart 6: Household income gearing<sup>(a)</sup>**



Sources: ONS and Bank calculations.  
 (a) Calculated as mortgage interest payments plus mortgage principal repayments as a proportion of total household income. Household income has been adjusted to take into account the effects of Financial Intermediation Services Indirectly Measured.

**Chart 7: Proportion of households with high mortgage debt to gross income ratios<sup>(a)</sup>**



Sources: Living Costs and Food (LCF) survey, NMG Consulting and Bank calculations.  
 (a) Data up to 2013 are based on responses to the LCF Survey. Data for 2014 and 2015 are based on responses to the NMG Consulting survey and have been spliced onto the earlier LCF Survey data series.

## References

- Aikman, D., Haldane, A. G. and Nelson, B. D.** (2015), Curbing the Credit Cycle. *The Economic Journal*, 125: 1072–1109. doi: 10.1111/eoj.12113
- Arcand, J-L, Berkes, E and Panizza, U** (2012), 'Too much finance?', *IMF Working Paper No. 12/161*.
- Borio, C** (2012), 'The financial cycle and macroeconomics: What have we learnt?', BIS Working Paper No 395, December.
- Cecchetti, S, G, Mohanty, M, S, Zampolli, F** (2011), 'The real effects of debt', BIS Working Paper No 352, September.
- Crowe, C., Dell’Ariccia, G., Igan, D., and Rabanal, P.,** (2011) 'How to Deal with Real Estate Booms: Lessons from Country Experiences', IMF Working Paper, WP/11/91.
- Cunliffe, J,** (2015) 'Macroprudential policy: from Tiberius to Crockett and beyond', Bank of England, speech given at TheCityUK, London.
- Drehmann, M, Borio, C and Tsatsaronis, K** (2012), 'Characterising the financial cycle: don't lose sight of the medium term', BIS Working Paper No 380, June.
- 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, Q4.
- Jorda, Ò, Schularick, M., and Taylor, A, M.,** (2015) 'Leveraged bubbles', Federal Reserve Bank of San Francisco Working Paper Series, 2015-10.
- Mcleay, M, and Thomas, R,** (2016) 'UK broad money growth in the long expansion 1992-2007: what can it tell us about the role of money?', forthcoming in: in Chadha, J, Chrystal, A, Pearlman, J, Smith, P, and Wright S (2016) eds., *The Long Expansion in the UK: causes and consequences*”, Cambridge University Press.
- Mian, A, R., Sufi, A., and Verner, E.,** (2015) 'Household debt and business cycles worldwide', NBER Working Paper No.21581.
- Rachel, L, and Smith, T, D,** (2015) 'Secular drivers of the global real interest rate', Bank of England Staff Working Paper No.571, December.
- Schularick, M and Taylor, A, M.** (2012), 'Credit booms gone bust: Monetary policy, Leverage Cycles, and Financial Cycles, 1870-2008', *American Economic Review* 102(2): 1029-1061.
- Waldron, M, and Zampolli, F** (2010), 'Household debt, house prices and consumption in the United Kingdom: a quantitative theoretical analysis', Bank of England Working Paper No 379.