THE ECONOMIC JOURNAL

The Economic Journal, **126** (*May*), 507–522. Doi: 10.1111/ecoj.12370 © 2016 Royal Economic Society. Published by John Wiley & Sons, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

LIVING WITH LOW FOR LONG*

Charles Bean

I review the causes and some of the consequences of the recent decline in global real interest rates. Causes include: a higher propensity to save associated with a rise in the population share of the high-saving middle-aged; a weaker propensity to invest since the 2007–8 financial crisis; and portfolio shifts towards safer assets. Consequences include: an increased likelihood that policy rates are constrained by the zero lower bound, necessitating greater reliance on unconventional monetary policies; and an increased risk of financial instability as investors seek to generate higher yields.

The past 15 years have witnessed extraordinary falls in both short and long-term nominal interest rates. When I joined the Bank of England's Monetary Policy Committee (MPC) in October 2000, the Bank's policy rate stood at 6%, while the nominal yield on 10-year UK gilts was 5.1%. In April 2015, just a few months after I returned to academia, Bank Rate stood at 0.5%, while the nominal 10-year gilt rate was just 1.8%.

Figure 1 puts these movements into historical context by showing the full history for the Bank's policy rate since it was founded in 1694.[1] The Figure also shows the nominal yield on 2½% consols, the only government security for which a long run is available. Recent yields do not quite match the previous historic lows seen after World War II and before that in the late nineteenth century, shortly after the founding of the Royal Economic Society. But they are still pretty low compared to historical experience.

Of course this low level of nominal interest rates is not peculiar to the UK. Policy rates have been at, or close to, their floor in many other advanced economies (AE). Indeed, in the euro area, Denmark, Sweden and Switzerland, commercial banks have even been paying to leave funds on deposit at the central bank. Long-term nominal interest rates have also fallen to unusually low levels: US Treasury 10-year yields reached a 220-year low in July 2012, while the yields on some debt of several euro-area sovereigns have even fallen into negative territory.

Were this fall in nominal interest rates merely to reflect a decline in expected inflation, it might not seem so remarkable. But break-even inflation rates[2] have been pretty stable over this period, suggesting that inflation expectations have been well-anchored, reflecting the successful and widespread establishment of credible monetary frameworks such as flexible inflation targeting. Instead, the decline in nominal yields appears mainly to reflect a decline in real interest rates.

* Corresponding author: Charles Bean, Department of Economics, London School of Economics, Houghton Street, London WC2A 2AE, UK. Email: c.r.bean@lse.ac.uk.

This RES Presidential Lecture draws on joint work with Christian Broda, Takatoshi Ito and Randy Kroszner (Bean *et al.*, 2015).

[1] The Bank's operating procedures have changed over time but, broadly speaking, this series represents the rate paid on short-term lending to, or borrowing from, the commercial banks. Fuller details and the data are available at http://www.bankofengland.co.uk/research/Pages/onebank/datasets.aspx#4.

[2] The difference between the nominal yield on a fixed-rate investment and the real yield on an inflation-linked investment of similar maturity and credit quality. If the marginal investor was risk-neutral, break-even inflation would therefore provide a measure of average expected inflation over the lifetime of the security.

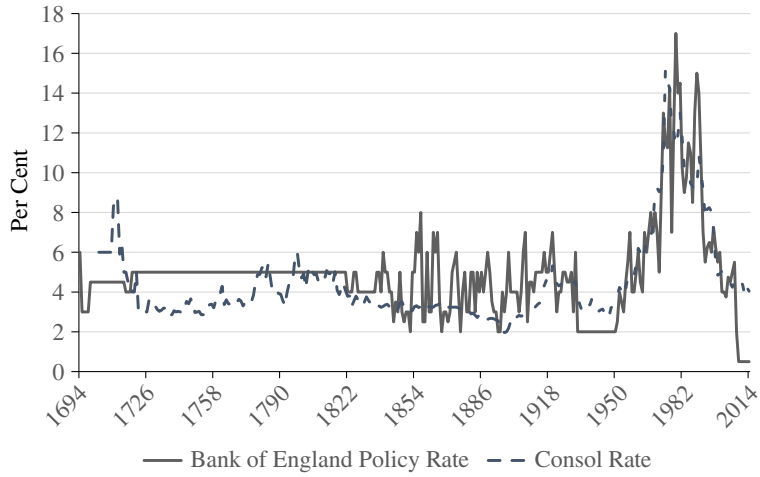

Fig. 1. *320 Years of UK Interest Rates*
Source. Bank of England Historical Database (http://www.bankofengland.co.uk/research/Pages/onebank/database.aspx#4).

Figure 2 shows a measure of the 'world' 10-year risk-free real interest rate, derived from the inflation-indexed sovereign bonds of the G7 countries (excluding Italy) by King and Low (2014). This has fallen steadily from around 4% in the late 1990s to around zero today. Virtually all of the decline in advanced-economy long-term nominal interest rates since the late 1990s can be attributed to these lower real yields. Moreover, the decline in real rates is emphatically not just a reflection of the extraordinary policies pursued by central banks during the Great Recession that followed the 2007–8 financial crisis, which registers as little more than a blip. More persistent and deep-rooted forces have clearly been at work.

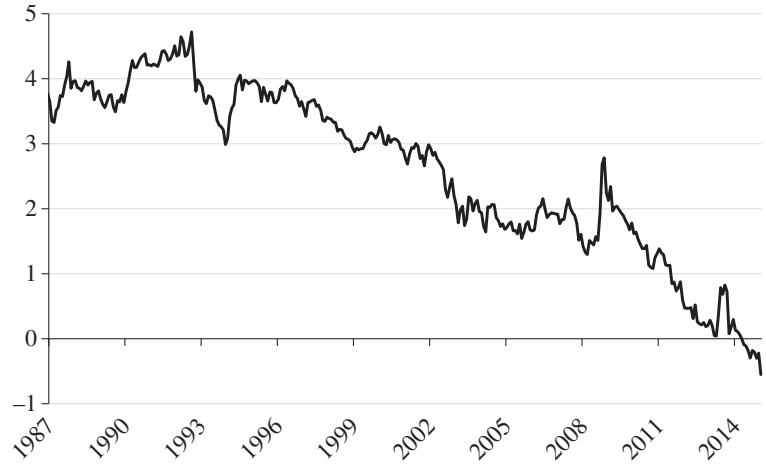

Fig. 2. *'World' 10-year Risk-free Real Interest Rate*
Source. King and Low (2014) Updated by the author.

How unusual are these developments from a historical perspective? Consistent series for longer-term real yields are available for only a few countries but Reinhart and Sbrancia (2015) present data on real Treasury bill rates for a relatively large number of countries over the post-war period. They find that during the decade after World War II, and again during the 1970s, real interest rates were even lower than today. These periods were, however, atypical. During the former, market interest rates were subject to regulatory caps and segmented capital markets ensured a captive domestic audience for government debt, so that observed rates of return were below the level that could have been expected to obtain in an unrestricted environment (so-called 'financial repression'). And the latter period was characterised by unexpectedly high inflation. So it was not at all like the world of liberalised financial markets and low and stable inflation of the past two decades.

Going even further back, Hamilton *et al.* (2015) have employed data stretching back into the early nineteenth century to derive short-term (expected) real interest rates for 17 countries. From simple time-series regressions, they then obtain estimates of the time-varying steady-state real interest rate for each country, which can be thought of as an underlying real long-term rate, while the average across countries provides a series for the 'world' underlying long-run interest rate. In line with Reinhart and Sbrancia, their estimates suggest that the only analogue to recent experience is the abnormal period around and immediately after World War II.

1. Causes

What has generated this downward trend in longer-term interest rates since the late 1990s? As the puzzle relates to the behaviour of the real interest rate, rather than inflation, the primary focus needs to be on the factors determining the equilibrium real rate of interest, rather than central banks' monetary policy decisions. Although the main proximate determinant of long-term nominal interest rates is the expected path of future nominal short-term interest rates, if inflation is at target and there are no cost shocks, the central bank's policy rate should be consistent with achieving the equilibrium level of employment and output; the associated real rate of interest is commonly referred to as the natural (or Wicksellian) interest rate. Were the central bank to choose a lower (higher) rate, it would generate excess demand (supply) and inflation above (below) the target. And if the central bank were to continue to do that, it could be expected to lead inflation to spiral upwards or downwards. If inflation expectations are not at the right level or there are cost shocks that the central bank wishes to look through, then it may decide to set a different rate but this deviation should only be temporary. Or, to put it another way, the central bank can affect neither the real interest rate[3] nor the growth rate of the economy in the long run, only the inflation rate (and with it the long-run nominal interest rate).

To begin with, I frame my discussion of the determination of the natural real interest rate in terms of the supply of funds from savers and the corresponding demand for funds to invest – what used to be referred to as the market for loanable funds – shown

[3] For the present, I am ignoring unconventional monetary policies (quantitative easing) whereby changes in the size and composition of the central bank's balance sheet are used to alter term and risk premia.

in Figure 3.[4] The Figure is drawn making the conventional assumption that substitution effects dominate income effects, so that saving (SS) is increasing in 'the' real interest rate, while investment (II) is a decreasing function. Saving and investment are both likely to be affected by current and future output and initially I assume that output is at potential. The Figure then suggests that the observed fall in real interest rates is potentially attributable either to an exogenous fall in the propensity to invest (i.e. a leftward shift in the II schedule) or an exogenous increase in the propensity to save (i.e. a rightward shift in the SS schedule) or to some combination.

This simple conceptual framework suffices for the decade or so leading up to the financial crisis. During that period, inflation was low and stable, cost shocks were small, unemployment was low and nominal interest rates were well above zero. So interest rates were likely to be close to their natural level. But matters became more complex after 2008. Since then, many advanced-economy central banks have operated with policy rates at, or close to, their near-zero effective lower bound.

How does this affect the framework? Suppose first that other policies – for instance, fiscal policy or unconventional monetary policies – are successfully deployed to maintain full employment. This corresponds to the generation of endogenous movements in the SS and II schedules so as to bring the natural rate of interest up the level consistent with policy rates being at their lower bound.

In practice, although fiscal policy turned highly expansionary in 2009–10 and central banks became increasingly aggressive in their use of unconventional monetary tools, full employment was not maintained, leaving output well below potential. As far as the Figure is concerned, that shortfall below potential is likely to be associated with a lower volume of savings (shifting SS to the left) and possibly lower investment too (also shifting II to the left). In this case, it is activity, rather than the interest rate, which

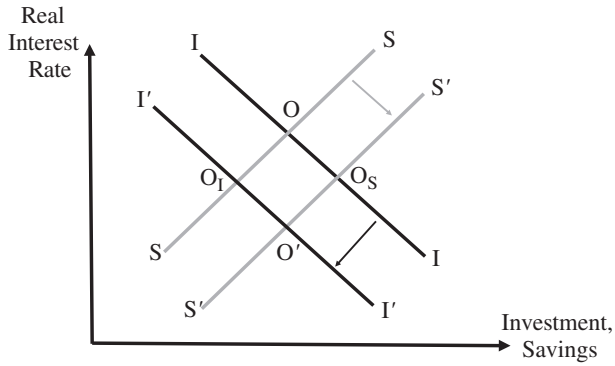

Fig. 3. *Global Market for Loanable Funds*

[4] Some commentators frame their discussion within the Euler equation for a representative consumer (implicitly assuming complete markets), so tying the decline in the real interest rate to lower expected consumption (and therewith output) growth. However, while growth was very weak immediately after the financial crisis, over the period as a whole there appears to have been relatively little variation in expected growth rates, suggesting that this is not a particularly fruitful apparatus for evaluating the forces behind the trend decline in real interest rates.

adjusts to keep the demand and supply of funds in line with each other. Since 2009, the (unobserved) natural interest rate is likely to have been even lower than the unusually low rate observed in the financial markets.

1.1. *A Higher Savings Propensity*?

So is the decline in the natural real rate of interest over the past two decades due to a higher propensity to save or a lower propensity to invest? Ahead of the crisis and shortly before he became Chairman of the US Federal Reserve, Bernanke (2005) put the blame on a 'savings glut' in the emerging economies, especially China. More recently, Cowen (2011), Gordon (2012, 2014) and Summers (2013, 2014) have pointed instead to a weak propensity to invest, in the process reviving the 'secular stagnation' thesis of Hansen (1939). Such investment weakness is in turn attributed to slower total factor productivity growth associated with dwindling opportunities for innovation and a slowing in the growth of the working population.

What does the evidence suggest? Figure 3 suggests that one way to discriminate between the two hypotheses is to look at what happened to the quantity of global savings/investment. Figure 4 shows the savings/investment share for the world, together with the savings and investment shares for the AEs and the emerging/developing economies (EME) separately. In each case, the gap between savings and investment corresponds to the region's external surplus or deficit. Somewhat unhelpfully, the global savings/investment share has been strikingly stable over this period, displaying only a hint of an upward trend, with just a noticeable dip during the Great Recession.

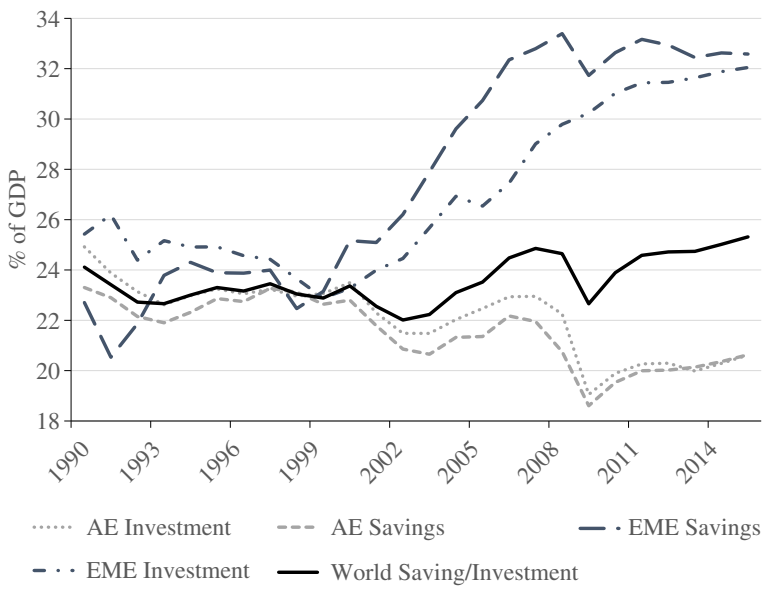

Fig. 4. *Savings and Investment Shares (% of GDP)*

Source. IMF WEO databases.

Now it is possible that the propensity to save has risen at the same time as the propensity to invest has fallen in just such a way as to keep the aggregate savings/investment share broadly constant (i.e. taking the world economy from O to O′ in Figure 3). But that seems a bit too much of a coincidence, and it seems more plausible that either savings or investment (or both) is relatively interest-inelastic. Given the hint of an upward trend over the whole period, plus the dip during the Great Recession when investment collapsed, the latter seems more likely.

In any case, it forces us to rely more on timing for identification. In this regard, Figure 4 is quite striking in showing a sharp increase in savings and investment shares in the emerging and developing economies beginning in the late 1990s, at precisely the time the natural real rate started falling. Moreover, savings runs ahead of investment, reflecting in particular the Chinese trade surplus. That is the opposite of what one might expect: a fast developing economy ought to be importing capital, rather than exporting it to richer nations. That is consistent with Bernanke's savings glut hypothesis.

To shed a bit more light on this, it is helpful to dig a little deeper. Why might the propensity to save have risen? Demographic forces seem likely to have been one factor. To begin with, longevity has been increasing and not matched by an equi-proportionate rise in retirement ages. As a consequence, the average expected length of retirement in the OECD countries has risen from 13.5 years in 1971 to 18.5 years in 2010 and, on present policies, is expected to exceed 20 years by the middle of the century (OECD, 2011). That should tend to raise the savings rates of those who are working. This effect is well recognised (Baldwin and Teulings, 2014).

Perhaps less remarked upon is the implications of the changing age composition of the population. Not only are people living longer but, following a post-war bulge in births, fertility has declined, in some cases – in China, in particular – as a deliberate policy choice. The implications of the evolving age structure for aggregate savings are complex but we can see the basic principles at work if we split an adult's life into three stages: young, characterised by relatively low income; middle-aged, corresponding to the peak earning years; and old, corresponding to retirement. A lack of collateral means the young are likely to have only limited ability to borrow against their future income to finance consumption; we can think of this group as consuming what they earn. But as they move through into the high-earning middle period of their lives, they start saving with a view to building up enough wealth to support themselves in retirement. Then, after retiring, they gradually run down their accumulated assets. Consequently, the difference in the population shares of the middle and old-aged cohorts is central to determining aggregate savings propensities.

Figure 5 shows the past and prospective evolution of the population shares of the middle-aged (40–64 years of age) and old (65 years and older) for the world excluding China and for China, where the demographic structure has been changing especially rapidly. The Figure also shows the difference between the two cohort shares as, together with their respective income profiles, this is what really matters for aggregate savings. This difference has been rising steadily for the past couple of decades, has just peaked and is projected to fall quite sharply over the next three decades. The coincidence of the timing of the upward leg of the difference in population shares with the trend downwards in real interest rates is highly suggestive. The particularly

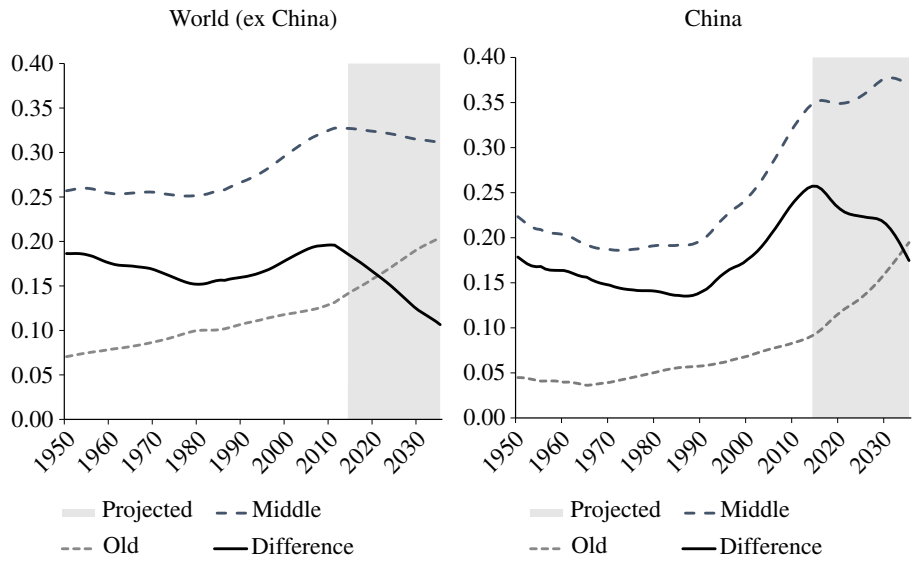

Fig. 5. *Past and Projected Population Shares*

Source. United Nations.

pronounced movements in China, together with the underdeveloped household safety net there, are also consistent with the regional differences evident in Figure 4.[5]

Demographics are unlikely to be the only factor at play on the savings side. The capital outflows from China (and some other emerging economies) during the first half of the period in question reflected a desire on the part of the official sector to raise their ability to self-insure following the uncomfortable experience of IMF programme countries following the 1997–8 Asia crisis. And the widespread trend to greater inequality seen in many economies over the past 30 years may also have raised savings if the rich have a higher propensity to save than the poor. Finally, the financial crisis prompted many highly indebted households to cut back on spending in order to reduce their debts.

1.2. *A Lower Investment Propensity?*

What about a decline in the propensity to invest? That is clearly likely to have been a factor in the second half of the period, as the financial crisis and the subsequent recession and slow recovery are likely to have weighed on investment, which remains well below pre-crisis levels in many of the AEs.

I find the argument that there has been a secular fall-off in investment whose origins predate the crisis rather less persuasive. Gordon, for instance, has argued that the rapid

[5] Other recent-related contributions include: Song *et al.* (2015), who explore the role of demographics and pension arrangements in China; and Coeurdacier *et al.* (2015) who point to the part played by the interaction of growth differentials and credit constraints in generating both the observed international pattern of savings and capital flows and the downward pressure on world real interest rates.

growth of the past 250 years was on the back of three great general-purpose innovations: the steam engine and the railways; electricity and the internal combustion engine; and the digital revolution. He argues that the main gains associated with the last of these have now been realised and that the rate of total factor productivity growth is consequently returning to the slower rates experienced before the Industrial Revolution.

Productivity growth has indeed been weak over the past few years, on both sides of the Atlantic. But much of that appears to be a legacy of the financial crisis and should prove temporary rather than secular. Moreover, Brynjolfsson and McAfee (2011) argue that the benefits of the digital revolution still have a long way to run, while Mokyr (2013) points to other recent scientific advances, such as genetic engineering, that offer tantalising future possibilities. That is compounded by the potential inadequacies of official estimates of output, which record the shift from market to home production made possible by the internet as a decline in GDP and which are likely to fail to capture properly phenomena such as the sharing (e.g. Airbnb) and 'gig' economies. Finally it is worth remembering that even experts in a field have often underestimated the scope for future advancement.[6]

There are other reasons why the demand for funds to invest might have fallen off. Slower growth in the working population would mean less additional capital is needed to maintain the capital–labour ratio. And the persistent fall in the relative price of capital goods would generate a falling nominal demand for new capital (though an increase in real investment) if the elasticity of substitution is sufficiently low. But both these forces have been at work since the 1970s, so seemingly cannot explain a decline in real interest rates that only began in the 1990s.

1.3. *Portfolio Effects*

Moreover, an explanation couched in terms of a fall in the propensity to invest is somewhat at odds with the relative stability of the return on capital and the corresponding rise in the spread over the safe real rate, shown for the UK and the US in Figure 6. The return on capital is proxied by the inverted price to earnings ratio on stocks adjusted for leverage and provides a measure of what the yield on stocks would be if firms were entirely equity financed.

To integrate this feature into the analysis, we need to extend the elementary loanable funds apparatus to accommodate multiple interest rates. Making the heroic simplifying assumption that the only safe asset is sovereign debt, we can write two loanable funds equilibrium conditions:

$$\text{Risk assets:} \qquad \underset{(+)}{f(\rho)}\underset{(+)}{S_{Private}}\underset{(+)}{(r, r+\rho; \ldots)} = \underset{(-)}{I(r+\rho; \ldots)}, \tag{1}$$

$$\text{Safe assets:} \qquad [1 - f(\rho)]S_{Private}(r, r+\rho; \ldots) + S_{public} = 0, \tag{2}$$

[6] Sala-i-Martin provides some choice examples at http://salaimartin.com/about-xsm/nostalgia/74-other/165-have-you-had-a-paper-rejected-recently.html.

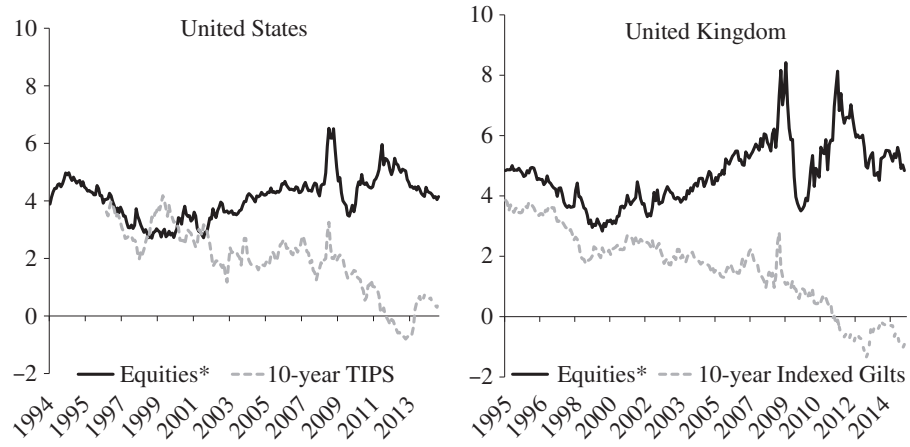

Fig. 6. *Safe Sovereign and Equity Yields*
Note. *Leverage-adjusted inverted Price-earnings ratio.
Source. Bank of England, following Broadbent (2014).

where: r is the real yield on safe assets; ρ is the spread of the expected return on risky capital assets over the return on the safe asset; and the share of funds allocated to risky assets, $f(\rho)$, is increasing in that spread ($f' > 0$). For simplicity, assume that the public primary deficit, $-S_{Public}$, is independent of the level of interest rates. Adding these two equations together gives the usual loanable funds relationship:

$$\text{Loanable funds:} \qquad S_{Private}(r, r+\rho; \ldots) + S_{Public} = I(r+\rho; \ldots), \tag{3}$$

while taking their ratio gives a funds allocation relationship that determines the spread:

$$\text{Funds allocation:} \qquad \varphi(\rho) \equiv f(\rho)/[1-f(\rho)] = -I(r+\rho; \ldots)/S_{Public}. \tag{4}$$

Figure 7 shows the equilibrium of this system in $\{r, \rho\}$ space. IS plots the risk-free real interest rate and spread pairs that are consistent with equilibrium in the overall market for loanable funds. It slopes down but the slope is greater than unity in absolute magnitude. Exogenous increases in saving or decreases in investment shift the IS schedule to the left.

FF plots the risk-free real interest rates and spreads consistent with the allocation of funds. It too slopes down but the absolute value of the slope is less than unity. It is unaffected by exogenous changes in private saving but an exogenous reduction in investment shifts it to the left, while a shift in the allocation of funds towards safe assets shifts it to the right.

An exogenous increase in private savings thus takes the economy from O to O′: it is therefore consistent with a fall in the risk-free real rate and an increase in the spread. By contrast, an exogenous reduction in investment takes the economy from O to O″ and a bit of algebra establishes that the spread in this case falls – as one would intuitively expect. Finally, a shift in the allocation of funds towards safe assets would in

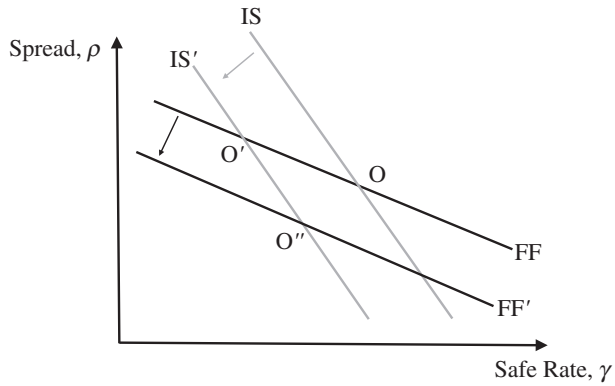

Fig. 7. *Equilibrium with Safe and Risky Assets*

effect shift the economy from O″ to O′, depressing the safe rate and raising the spread. This analysis suggests that explanations attributing the fall in the risk-free real interest rate to shifts in savings behaviour and in the composition of portfolio flows are more consistent with the facts than those focusing on investment weakness.

There are several reasons why such portfolio shifts may have been important. First, reserve accumulation by the official sector in China and other emerging economies was concentrated in safe assets, especially US Treasuries. Second, during and after the financial crisis, there was a flight to safe assets by investors. Heightened appreciation of low probability adverse tail risks in particular can have a significant effect in raising risk premia (Barro, 2006); Broadbent (2014) and Miles (2014) argue that this was an important factor depressing risk-free real interest rates. Third, since the financial crisis, several central banks, including the Bank of England, have been major purchasers of relatively safe assets. In addition, partly in response to tightened regulation, commercial banks have also increased their holdings of liquid assets. Finally, Caballero and Farhi (2014) have argued that, as a result of the financial crisis, investors have realised that some mortgage-backed securities and sovereign debt previously thought safe were anything but, resulting in a large fall in the supply of safe assets and a simultaneous rise in the supply of risky assets, although that will have been at least partially rectified by the subsequent considerable emission of highly rated sovereign debt.

1.4. *Prospects*

Will the downward pressure on the natural real interest rate be maintained or will it revert to historical norms? Figure 5 suggests that the demographic influences pushing up savings should soon begin to reverse as the present bulge of high-saving middle-aged households moves through into retirement. In addition, the headwinds associated with the crisis should continue to ease as the recovery proceeds: firms are likely to become less cautious about investing; and balance-sheet repair will be less pressing for households. And the portfolio shift towards safe assets should also unwind somewhat: China is no longer accumulating reserves; and the safe-haven demand for

safe assets should moderate as conditions improve. Consequently, it seems plausible that at least some reversion will occur but, probably, only slowly; historically low natural real rates are likely to be with us for some time yet.

2. Consequences

2.1. *Monetary Policy Implications: The Zero Lower Bound*

What are the policy implications of a low natural real rate? From a central banker's perspective, the most obvious is that, for a given average inflation rate, the so-called zero lower bound (ZLB) is more likely to constrain the choice of policy rate. With several continental European central banks already charging banks to hold reserves, it is clear that zero cannot be the true floor. The source of the constraint lies in the unrestricted convertibility into cash of reserve accounts at the central bank. In practice, however, banks do not immediately cash in their reserve balances as soon as they are charged for holding them because carrying large volumes of cash represents a security risk. So a bank needs to be able to provide secure storage space for the cash too, which is costly. Illustrative calculations carried out by Bank of England staff suggest that the true lower bound is probably around −0.5% (Bank of England, 2013).

Moreover, the effective floor may well be met before this point. For instance, during 2009, the MPC decided not to lower Bank Rate below +0.5%, which reflected specific nominal rigidities in UK financial markets. In particular, many mortgages were contractually linked to Bank Rate, while UK banks and building societies usually do not charge for current account services. Consequently, a lower Bank Rate squeezed profit margins once deposit rates reached zero. Not only would further decreases have jeopardised the existence of some institutions, it also threatened their ability to extend new credit, thus raising the possibility of a perverse effect on aggregate demand. Of course, these should all be transitory impediments that would disappear once conventions about the terms of deposit accounts change and the mortgage book is repriced. But such frictional considerations can nevertheless be of practical importance at particular times.

Around the turn of the millennium, following Japan's first 'lost decade' but before the trend decline in global real interest rates was properly appreciated, several authors undertook assessments of the impact of the ZLB on the conduct of monetary policy. For instance, in 2000, using the Federal Reserve Board's macroeconomic model, Reifschneider and Williams (2000) found that with a natural real rate of interest of 2½% and mean inflation of 2%, a central bank following a standard Taylor Rule would find the ZLB binding about 5% of the time. Moreover, such episodes would be short-lived and their impact modest.

The downward trend in the long-run real interest rate since then would alone have pointed to an equivalent downward trend in policy rates. But on top of that, the collapse in aggregate demand during the Great Recession meant that an even lower value for policy rates was necessary to keep demand in line with supply. For example, around the trough of the recession, Rudebusch (2009) estimated that a Federal Funds rate of almost −5% would be warranted on the basis of a standard Taylor rule. And one gets broadly similar figures if the same methodology is applied to the UK. Moreover,

policy rates have been at, or close to, their effective lower bound for six years, which is hardly short-lived! So the ZLB cannot just be treated as a curiosum.

Central banks are not, however, completely out of ammunition once the ZLB is reached. In particular, they can still affect the level of demand by influencing agents' expectations of the future path of policy rates through forward guidance. And they can alter term premia and asset prices through large-scale asset purchases – the so-called quantitative easing. Finally, suitably targeted lending policies can also raise the supply of credit.

Academic analyses of the ZLB by Woodford (2012) and others have highlighted the potential value of a central bank being able to commit to a 'low for long' path for its policy rate over the future when there are intertemporal linkages from expected future policy rates and inflation onto demand and supply today (as is the case in the workhorse New Keynesian macroeconomic model). If the central bank announces its intention to generate a future boom by keeping its policy rate at the ZLB way into the future, the combination of lower future interest rates and higher (and above-target) future inflation together feed back into the present, thus boosting the activity for today.

This policy is, however, time-inconsistent: once the emergency is over, the central bank has no incentive to deliver on the past promise to generate an inflationary boom. And it is difficult to see how such a commitment can be implemented in practice. Policy makers cannot tie the hands of their successors, so promises are only likely to be credible for a short period ahead. Woodford and others have suggested that the path under commitment could be approximated by instructing the central bank to pursue a target for the level of nominal income rather than inflation; this is because a nominal income target introduces the necessary history dependence into policy that is absent under an inflation target (bygones are no longer bygones). But all this does is relocate the time-inconsistency problem from the central bank to the government and so fails to provide a convincing solution. In any case, central banks' forward guidance in practice seem to have been more directed to better communication of their reaction function – what is sometimes referred to as 'Delphic' guidance – rather than an 'Odyssean' attempt to implement a time-inconsistent policy path (Moessner *et al.*, 2015).

Turning to quantitative easing, all four of the major central banks have, or are, engaged in large-scale asset purchases. In the UK, the MPC acquired some £375 billion of gilts financed by an expansion in bank reserves. The transmission mechanism of such purchases potentially operates through three channels: a bank-liquidity channel, whereby an increase in bank reserves prompts an expansion in credit supply; a portfolio-rebalancing channel, whereby the reinvestment of the proceeds from the asset sales into substitute assets results in a generalised rise in asset prices; and a signalling channel, whereby asset purchases reinforce expectations that policy will remain accommodative. In light of the Japanese experience, the first channel was expected to be rather weak, something that appears to have been borne out in practice. That left the portfolio-rebalancing and signalling channels as the main transmission routes.

Now there are theoretical reasons why asset purchases could have proved ineffective. In particular, Eggertsson and Woodford (2003) argued that once the ZLB has been

reached and the value of extra liquidity has fallen to zero, central bank open-market purchases should be neutral in their effect, as private agents can exactly offset the consequences of any change in the central bank's balance sheet for the subsequent path of the public finances.

Be that as it may, event studies on both sides of the Atlantic suggest that central bank asset purchases have been effective at lowering longer term interest rates and raising asset prices. For instance, research by Bank of England staff found that the first £200 billion of asset purchases over the year from March 2009 lowered long-term bond yields by around a percentage point (Joyce *et al.*, 2011). Studies of the Federal Reserve's purchases find similar effects from what, relative to size of the economy, was a similar quantum of purchases (Gagnon *et al.*, 2010; Krishnamurthy and Vissing-Jorgensen, 2011).

That said, there are reasons for thinking that the efficacy of asset purchases is likely to be lower when markets are functioning normally than when they are dysfunctional, as was the case after the collapse of Lehman Brothers. We also have considerably more confidence in the efficacy of changes in the short-term policy rate. Finally, routine purchases of government debt invite agents to believe that they are taking place at the behest of government rather than for monetary policy purposes, i.e. the equilibrium is one of fiscal, rather than monetary, dominance. These are all reasons for wanting to get away from relying on large-scale asset purchases as a means to stimulate aggregate demand.

If the natural real interest rate is likely to remain historically low for some time, it therefore makes sense to ask whether there are ways of restoring the efficacy of conventional monetary policy, or at least reducing the zone in which the ZLB binds. One seemingly obvious way to do this is to follow the suggestion of Blanchard *et al.* (2010) and raise central bank inflation targets from their current levels of around 2% to, say, 4%, providing an extra two percentage points room for manoeuvre.

There are, though, several counter arguments. First, 2% inflation is close enough to price stability that households and businesses can for many purposes effectively ignore it. That is not really so at 4% inflation, even though the two percentage point rise might appear rather modest. Moreover, given the positive association between levels and variability of inflation, the regime would probably not anchor expectations so effectively. Second, even if it might have been helpful if inflation targets – and therefore also nominal interest rates – had been higher going into the crisis, raising them at a time when central banks are struggling even to meet their current targets is hardly a recipe for maintaining credibility. Finally, an increase in the inflation target could also engender expectations that fiscally challenged governments might be tempted to press for even higher inflation in order to inflate away the real value of nominally denominated debt, so generating an unhelpful rise in the inflation risk premium.

In principle, one can also attack things from the other side by tackling the ZLB problem directly. One way is to outlaw cash, so making it impossible for banks to avoid charges on their reserve holdings by substitution. An alternative is to charge interest on cash, an old idea due to Gesell (1916). This could be done by requiring notes to be periodically stamped (at a charge) in order to remain valid, or else by declaring that notes with a serial number ending in a randomly chosen digit had ceased to become legal tender. Finally, Buiter (2009) has exhumed a suggestion of Eisler (1932) that the

numéraire be decoupled from the medium of exchange with a variable rate of exchange between them. Neither of the first two options is likely to be publicly acceptable, though the last is possibly more practicable as a similar outcome could be achieved by instituting a variable exchange rate between cash and reserves.

2.2. *Financial Stability Implications*

In any case, finding a way to loosen the constraint imposed by the ZLB is arguably not the most important policy challenge if the present low interest rate environment persists. In particular, it is likely to have consequences for financial market behaviour that increase the likelihood of financial instability – a point also made by Summers (2014).

First, a low real rate of return on safe assets makes it more expensive to accumulate the savings necessary to provide for retirement. As a result, households will be tempted to look for other ways to build savings than investing in bond-heavy pension funds. If the funds flow into the stock market, lowering the cost of capital and boosting productive investment, that would not matter. But past experience suggests that the funds may well head into real estate. And, if mortgage rates remain low, it will be tempting to try to lever up returns by increasing borrowing. An expansion in buy-to-let property investment and further upward pressure on house prices reflecting the relative attractiveness of property as an investment asset therefore seems an entirely plausible outcome.

In addition, fund managers, hedge funds and similar financial institutions are often judged on their performance relative to benchmarks that are likely to adjust only slowly. That will also encourage the use of leverage to try to maintain returns. And investors are likely to be unwilling to pay significant fees for nugatory returns (many hedge funds have been accustomed to charging 2% of the sum invested and 20% of the returns). Consequently, some business models will no longer be viable unless returns can somehow be levered up.

All of this makes a leveraged 'search for yield' of the sort that marked the prelude to the crisis more likely. And that in turn potentially raises the likelihood of future financial instability. Now the conventional wisdom in central banks post-crisis is that such financial stability risks should in the first instance be managed through the use of prudential policies. This includes systemic changes to make the financial sector more resilient, such as enhanced bank-capital standards that deliver greater capacity to absorb losses, and selective macro-prudential interventions that seek to discourage risky or excessive credit expansion. Only if such policies prove ineffective should monetary policy be diverted from its primary objective of stabilising inflation towards heading off these risks instead.

Such prioritisations make sense – indeed one is now formally embodied in the Chancellor of the Exchequer's remit to the MPC. But we should be careful not to expect too much from the new regime. Central banks have relatively little experience in deploying macro-prudential tools and they may prove to have only limited traction. In addition, because they often impinge on identifiable sections of the population, they may be subject to political resistance. Finally, institutions are likely to have a financial incentive to look for ways around such interventions.

The bottom line is that monetary policy seems less well suited to the task of keeping aggregate demand in line with potential in an environment where long-term real interest rates hover near zero than was the case during the 1990s when they were around 4%. Not only are monetary policy options more likely to be constrained by the ZLB resulting in a need to resort to unconventional policies but a world of persistently low interest rates also raises the risks of financial instability. Macro-prudential policies may be able to mitigate these risks but we cannot be sure. In essence, the risk-return trade-off for monetary policy looks less favourable than it used to. At a minimum, central banks need to be wary about pushing asset prices or credit to levels that might prove unsustainable.

That in turn points the need to return to a more active use of fiscal policies than has been the norm in recent years. But policies that simply end up transferring private indebtedness to the public sector are probably not the right answer if indebtedness is too high to begin with. If the fundamental problem is really too much saving by some households and businesses or in some countries then – at least from the financial stability perspective – it is probably better to look for policies that lower that saving rather than encouraging more borrowing.

Moreover, even if the decline in the natural real interest rate largely reflects a higher aggregate propensity to save, it probably makes more sense to look for ways to encourage more productive investment to absorb that saving. Well-designed tax policies can support innovation and encourage capital formation. And, in some parts of the developing world, better protection of property rights would make businesses much more willing to invest. Such investment-friendly policies are desirable in their own right. But they look all the more attractive when interest rates are likely to stay 'low for long'.

London School of Economics and CEPR

References

Baldwin, R.E. and Teulings, C.N. (2014). 'Introduction' in (C.N. Teulings and R.E. Baldwin, eds.), *Secular Stagnation: Facts, Causes and Cures*. VoxEU eBook, pp. 1–23, London: CEPR Press. Available at http://www.voxeu.org/content/secular-stagnation-facts-causes-and-cures (last accessed: 3 November 2015).

Bank of England. (2013). Letter to Andrew Tyrie, Chairman of Treasury Committee, 16 May. Available at: http://www.parliament.uk/documents/commons-committees/treasury/130516-C.pdf (last accessed: 3 November 2015).

Barro, R.J. (2006). 'Rare disasters and asset markets in the twentieth century', *Quarterly Journal of Economics*, vol. 121(3), pp. 823–66.

Bean, C.R., Broda, C., Ito, T. and Kroszner, R.S. (2015). *Low for Long? Causes and Consequences of Persistently Low Interest Rates*, Geneva Report 17, International Centre for Money and Banking, Geneva, and Centre for Economic Policy Research, London.

Bernanke, B.S. (2005). 'The global saving glut and the US current account deficit', Sandridge Lecture, Virginia Association of Economists, 14 April.

Blanchard, O.J., Dell'Ariccia, G. and Mauro, P. (2010). 'Rethinking macroeconomic policy', *Journal of Money, Credit and Banking*, vol. 42(s1), pp. 199–215.

Broadbent, B.R. (2014). 'Monetary policy, asset prices and distribution', speech to the Society of Business Economists, 23 October.

Brynjolfsson, E. and McAfee, A. (2011). *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, Digital Frontier Press.

Buiter, W.H. (2009). 'Negative nominal interest rates: three ways to overcome the zero lower bound', NBER Working Paper No. 15118, Cambridge, MA.

Caballero, R.J. and Farhi, E. (2014). 'On the role of safe asset shortages in secular stagnation' in (C.N. Teulings and R.E. Baldwin, eds.), *Secular Stagnation: Facts, Causes and Cures*. VoxEU eBook, pp. 111–22, London: CEPR Press. Available at: http://www.voxeu.org/content/secular-stagnation-facts-causes-and-cures (last accessed: 3 November 2015).
Coeurdacier, N., Guibaud, S. and Jin, K. (2015). 'Credit constraints and growth in a global economy', *American Economic Review*, vol. 105(9), pp. 2838–81.
Cowen, T. (2011). *The Great Stagnation: How America Ate All The Low-Hanging Fruit of Modern History, Got Sick, and Will (Eventually) Feel Better*, New York: Dutton Press.
Eggertsson, G.B. and Woodford, M.D. (2003). 'The zero bound on interest rates and optimal monetary policy', *Brookings Papers on Economic Activity*, vol. 1, pp. 139–211.
Eisler, R. (1932). *Stable Money: The Remedy for the Economic World Crisis: A Programme of Financial Reconstruction for the International Conference 1933*, London: Search Publishing.
Gagnon, J.E., Raskin, M., Remache, J. and Sack, B.P. (2010). 'Large-scale asset purchases by the Federal Reserve: did they work?' Federal Reserve Bank of New York Staff Report No. 441.
Gesell, S. (1916). *Die Natürliche Wirtschaftsordnung, Rudolf Zitzman Verlag*, available in English as *The Natural Economic Order*, London: Peter Owen Ltd.
Gordon, R.J. (2012). 'Is US economic growth over? Faltering innovation confronts the six headwinds', NBER Working Paper No. 18315, Cambridge, MA.
Gordon, R.J. (2014). 'The demise of US economic growth: restatement, rebuttal and reflections', NBER Working Paper No. 19895, Cambridge, MA.
Hamilton, J., Harris, E., Hatzius, J. and West, K.D. (2015). 'The equilibrium real funds rate: past, present and future', NBER Working Paper No. 21476, Cambridge, MA.
Hansen, A.H. (1939). 'Economic progress and declining population growth', *American Economic Review*, vol. 29(1), pp. 1–15.
Joyce, M.A.S., Lasaosa, A., Stevens, I. and Tong, M.R. (2011). 'The financial market impact of quantitative easing', *International Journal of Central Banking*, vol. 7(3), pp. 113–61.
King, M.A. and Low, D. (2014). 'Measuring the 'world' real interest rate', NBER Working Paper No. 19887, Cambridge, MA.
Krishnamurthy, A. and Vissing-Jorgensen, A. (2011). 'The effects of quantitative easing on interest rates: channels and implications for policy', *Brooking Papers on Economic Activity*, vol. 43(2), pp. 215–87.
Miles, D.K. (2014), 'The transition to a new normal for monetary policy', Speech given at Mile End Group, Queen Mary College, London, 27 February.
Moessner, R., Janssen, D.-J. and de Haan, J. (2015). 'Communication about future policy rates in theory and practice: a survey', DNB working paper No. 475, Amsterdam.
Mokyr, J. (2013). 'Is technological progress a thing of the past?', VoxEU.org, 8 September.
OECD. (2011). *Pensionable Age and Life Expectancy, 1950–2050', in Pensions at a Glance 2011: Retirement Income Systems in OECD and G20 Countries*, Paris: OECD Publishing.
Reifschneider, D. and Williams, J.C. (2000). 'Three lessons for monetary policy in a low inflation era', *Journal of Money, Credit and Banking*, vol. 32(4), pp. 936–66.
Reinhart, C.M. and Sbrancia, M.B. (2015). 'The liquidation of government debt', IMF Working Paper 15/7, Washington, DC.
Rudebusch, G.D. (2009). 'The Fed's monetary policy response to the current crisis', Federal Reserve Bank of San Francisco Economic Letter No. 2009–17.
Song, Z.M., Storesletten, K., Wang, Y. and Zilibotti, F. (2015). 'Sharing high growth across generations: pensions and demographic transition in China', *American Economic Journal: Macroeconomics*, vol. 7(2), pp. 1–39.
Summers, L.H. (2013). Remarks at the IMF Fourteenth Annual Research Conference, 8 November.
Summers, L.H. (2014). 'US economic prospects: secular stagnation, hysteresis, and the zero lower bound', *Business Economics*, vol. 49(2), pp. 65–73.
Woodford, M.D. (2012). 'Methods of policy accommodation at the interest-rate lower bound', in *The Changing Policy Landscape*, pp. 185–228, Kansas City: Federal Reserve Bank of Kansas City.