The cyclical and structural determinants of the low interest rate environment

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Introduction

In recent years, interest rates have dropped to historically low levels throughout the world. That is largely due to a series of (non-)standard measures adopted by central banks in the context of the great recession. However, if we take a longer-term view, it seems that the current low level of interest rates is perhaps not attributable solely to central bank monetary policy or to other cyclical factors since the crisis. By way of illustration, long-term sovereign bond yields in the advanced economies have displayed a downward trend which clearly began many years before the crisis erupted, and that trend applied in both nominal terms (decline since the early 1980s) and real terms (fall since the early 1990s; see chart 1). From that point of view, the expansionary monetary policy conducted in many countries since the crisis is in line with the downward trend in interest rates which had already been apparent previously.

These findings indicate that, apart from cyclical factors, global structural factors have certainly been contributing to the decline in interest rates for several decades. In theory, those structural factors would have influenced the supply of savings and demand for investment in such a way as to lower the equilibrium level of interest rates. Examples of those structural factors might include socio-economic and financial developments in the broad sense, such as demographic trends (e.g. population ageing) and the slower pace of potential growth. Obviously, monetary policy has very little influence on these structural factors. Nevertheless, they could have significant implications for future interest rate levels in general and hence for monetary policy. In particular, a low interest rate environment could become the "new normal" if structural socio-economic factors continue to depress interest rates.

The article is divided into four sections. Section 1 presents the structural factors which may have contributed to the downward trend in real interest rates over the past 25 years. It focuses on analysing the factors which have had an influence on the supply of savings and on the demand for investment. It also examines more specific factors concerning demand for, and supply of, secure assets (such as certain sovereign bonds).

Section 2 looks at the interest rate picture since the crisis, and highlights some cyclical factors which have encouraged the downward trend in interest rates. In particular, it discusses the role of monetary policy in a low interest rate environment.

A low interest rate environment poses various challenges which are illustrated in section 3. In regard to monetary policy, this concerns in particular the effective lower bound of nominal interest rates as well as risks to financial stability, and hence the need for (macro)prudential policy.

The fourth and final section puts forward some ideas for addressing the challenges of a new low real equilibrium interest rate. This section examines the advantages and disadvantages of raising the central banks' inflation target, the advisability of price level targeting, and various types of structural reforms that could counteract or offset the impact of the structural factors currently depressing real interest rates.

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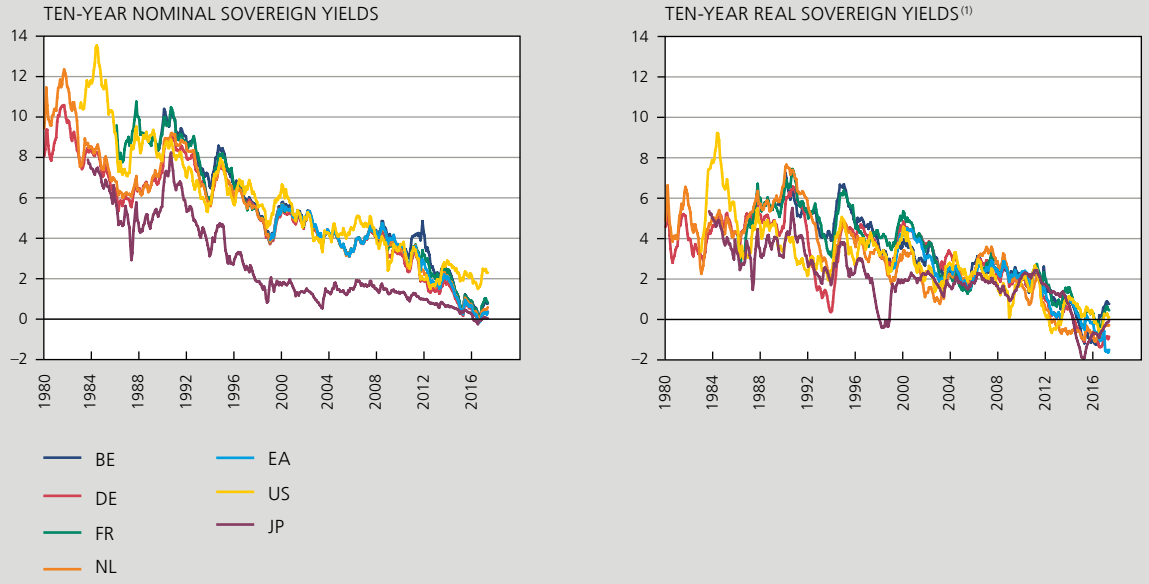
CHART 1 GENERAL DECLINE IN LONG-TERM REAL AND NOMINAL INTEREST RATES IN THE ADVANCED ECONOMIES

(in %, monthly averages up to May 2017)



Sources: OECD, Thomson Reuters.

(1) Differences between nominal interest rates and inflation smoothed over one year.

1. Structural developments related to the decline in interest rates

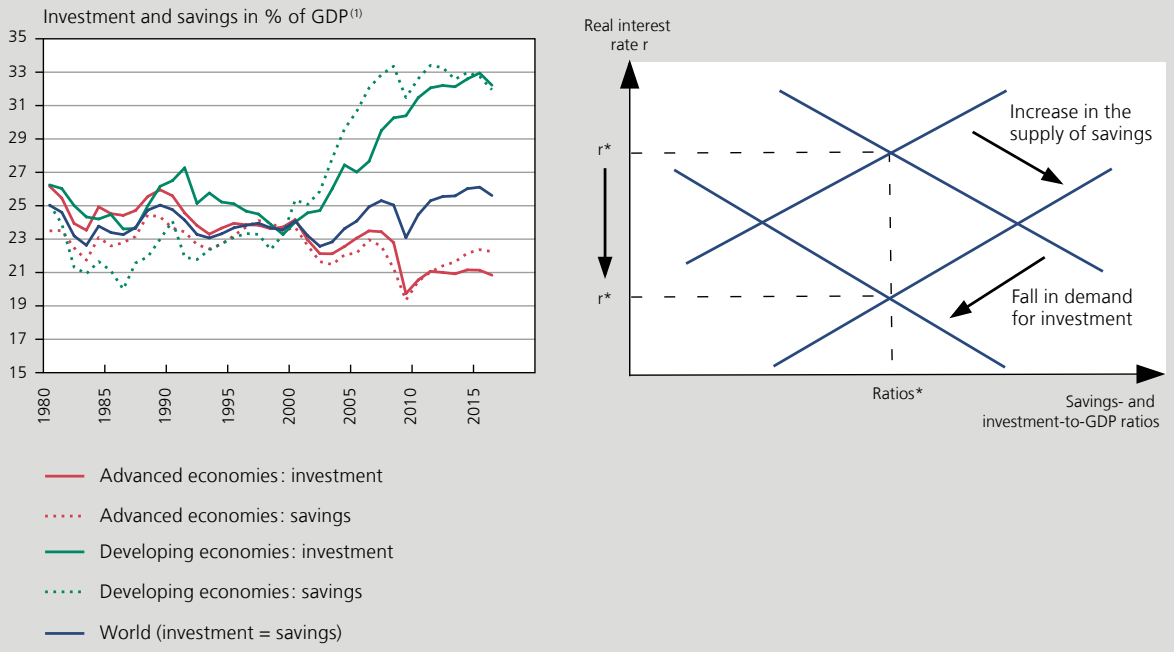
This article examines the causes of the decline in interest rates on the basis of a schematic representation of macroeconomic equilibrium. Conceptually, the point where the savings supply and investment demand curves intersect indicates an equilibrium characterised by an interest rate that creates a balance between the available savings and the level of investment in a closed economy. That interest rate, often called "r", is generally expressed in real terms, i.e. after accounting for inflation. It is assumed that there is a real equilibrium interest rate – or "natural" interest rate – called "r^*", which reflects the long-term equilibrium between the supply of savings and investment demand. If that interest rate applies, the demand for borrowing is in balance with the supply of funds: the economy grows in accordance with its potential and inflation is stable.

This approach is particularly suited to analysis at global level: the world is a closed economy in which savings equal investment. At global level, savings and investment have proved relatively stable in relation to GDP since 1990. Together with the decline in interest rates, that points to a simultaneous movement in the supply of savings and demand for investment (see chart 2). On the one hand, the supply of savings would have increased, which has tended to drive down the natural real interest rate r^* and support the savings/GDP ratio. On the other hand, investment demand would have fallen, causing an even steeper decline in r^* while depressing the investment/GDP ratio. Finally, the simultaneous movement in the two curves would have contributed to the fall in r^* but would not have caused any (major) change in the ratios of saving and investment to GDP.

In the case of the advanced and developing economies, international capital flows complicate the analysis of movements in supply and demand regarding loanable funds. That said, the slight downward trend in savings and investment ratios in the advanced economies suggests that the fall in demand for investment has probably been a bit more pronounced than the movement in the supply of savings. Conversely, in the emerging economies, the increase in the ratios since the late 1990s indicates a relatively sharp rise in the supply of savings.

The rest of this section gives a number of examples of structural factors which may have contributed to the movements in the supply of savings and demand for investment. It outlines the main structural factors without examining the more subtle, possibly secondary, mechanisms and without judging the factors' relative importance (see Rachel and Smith, 2015, for an attempt to quantify the specific

CHART 2 GLOBAL SAVINGS AND INVESTMENT VOLUMES ILLUSTRATE THE INTERSECTION BETWEEN SUPPLY AND DEMAND



Source: IMF.

(1) Investment and gross savings concern both the public sector and the private sector. Averages of investment and savings ratios at the global level (excluding measurement errors).

effects). This section also analyses factors specific to demand for and supply of risk-free assets.

1.1 Various structural determinants have contributed to the fall in the natural real interest rate r^* by increasing the supply of savings

Demographic changes

Longer life expectancy after retirement is a first factor that has certainly contributed to the increased supply of savings (see chart 3). Longer life expectancy is a global phenomenon, seen both in Europe and in the United States, but also in Japan and China (EC, 2015). It is largely due to medical progress, the rise in the standard of living (especially in developing economies), and public health campaigns (e.g. the reduction in the number of smokers).

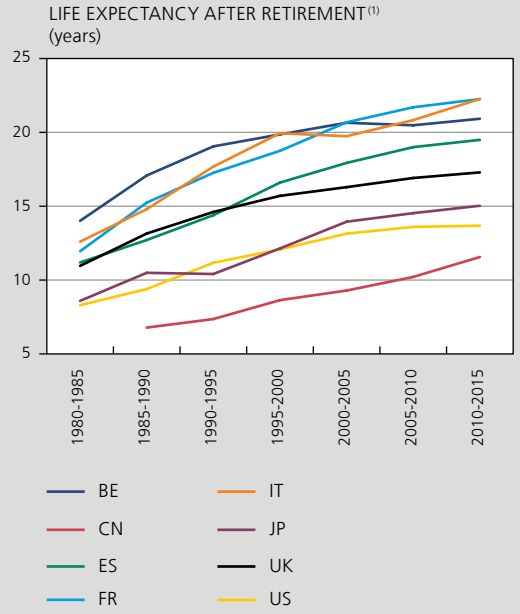
In view of the increasing life expectancy and the relatively stable retirement age, it is reasonable to assume that workers need to set aside more savings for their old age. The Household Finance and Consumption Survey reveals that "provision for retirement" is the second most important motive for saving in the euro area (and notably in Belgium), after "building up a contingency reserve", which could also relate to unexpected events following retirement(1).

Apart from the longer life expectancy, two other factors may have contributed to the increase in the supply of savings, since they have changed the demographic structure of the advanced economies: the post-war baby boom and the subsequent slowing pace of population growth (fall in the fertility ratio) (see Carvalho *et al.*, 2016; Goodhart and Pradhan, 2017). Together, those factors led to an increase in the relative size of the population of working age (the "baby boom" generation) and consequently a rise in the support ratio (expressed, for example, as the size of the 15-64 age group relative to the rest of the population).

According to the life cycle hypothesis, the increase in the support ratio may have boosted the supply of savings. That theory suggests that consumption remains fairly constant throughout the life cycle, whereas incomes follow a hump-shaped curve. This means that persons of working

(1) This survey indicates that roughly 60 % of households polled save in order to build up a contingency reserve, and around 40 % save to provide for their retirement. See Du Caju (2016) for a detailed analysis of the findings of the Household Finance and Consumption Survey.

CHART 3 THE INCREASE IN LIFE EXPECTANCY AND THE STABLE RETIREMENT AGE ENCOURAGE MORE SAVING FOR OLD AGE



Sources: OECD, United Nations.

(1) Difference between life expectancy at birth and actual retirement age (averages for both genders during the periods indicated).

age generally save the most, and that the size of that group influences the supply of savings.

Growing inequality

An increase in inequality expands the supply of savings if the savings ratio of wealthier households exceeds that of people on lower incomes.

Measures of inequality based on the distribution of national income or on the Gini coefficient generally show that inequality is increasing within countries (see Piketty, 2014; Solt, 2016). For example, in the United States, those in the top 10 % of earners accounted for over 50 % of gross national income in 2015, compared to just over 30 % in 1980 (1). Similar increases are seen in Germany, China, the United Kingdom and other countries. The reasons for the growing inequality are the subject of debate. It may be due to technological developments, particularly in the information and communications sector, leading to automation of the tasks of low-skilled workers. The highly-skilled may also have benefited from technological progress, enabling them to increase their productivity (and their wages).

Besides, measures of the savings ratio by income class show that the wealthiest households save proportionately more than the rest of the population; that supports the hypothesis that growing inequality is associated with an increase in the supply of savings. On the basis of the data from the Survey of Consumer Finances in the United States, Dynan *et al.* (2004) show, for example, that between 1983 and 1989, households in the lowest income quintile saved barely more than 1 % of their income, compared to an average of almost 25 % for those in the highest income quintile.

Increased supply of savings from the developing economies

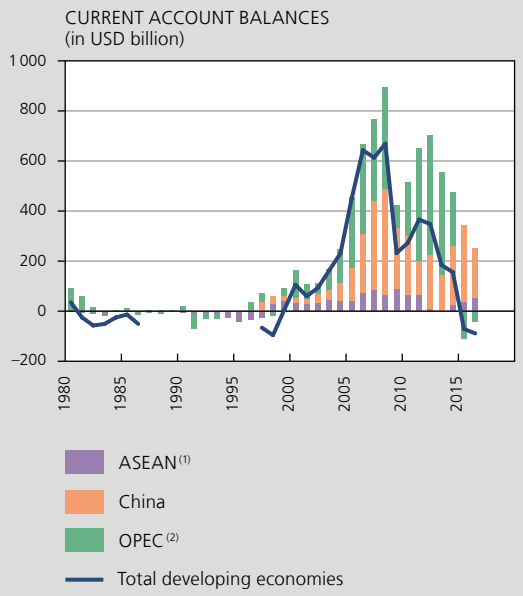
The growth of the supply of savings in the developing economies has been particularly marked since the late 1990s, and has led to a positive current account balance for the developing economies (see chart 4), implying a negative balance for the advanced economies. The increase in the current accounts therefore essentially represents a substantial flow of capital from the emerging economies to the advanced economies. According to Bernanke (2005, 2015), this is the clearest sign of excess saving at global level (global saving glut).

Three key factors may explain the sharp rise in the emerging economies' current account balances. First, the start of that rise in the late 1990s coincided with financial crises in the developing economies. More specifically, the Asian financial crisis of 1997-1998 seems to have prompted South-East Asian countries, in particular, to revise their strategy for managing their foreign exchange reserves. As a result of that crisis, some countries began to build up large stocks of foreign exchange reserves in order to prevent (sometimes sudden) capital outflows and the associated downward pressure on their currencies. Next, some countries such as the members of the Organisation of the Petroleum Exporting Countries (OPEC) gained enormously from the increase in oil prices. Finally, China's current account balance has risen steeply, partly because of the country's integration into the global economy, and demographic factors (such as the one child policy).

Following the latest financial crisis, however, net saving in the developing economies went into reverse in 2015 (the current account balance became negative), largely on account of the fall in oil prices. However, that reversal was offset by the current account surplus which began to appear in the euro area, and which seems to be mainly a reflection of cyclical factors (economic uncertainty in the euro

(1) Data from the World Wealth & Income Database, which are available at http://wid.world/.

CHART 4 INCREASE IN THE SUPPLY OF SAVINGS IN DEVELOPING ECONOMIES



Source: IMF.

(1) Association of South-East Asian Nations (except Singapore), including Hong Kong.

(2) The members of the Organisation of the Petroleum Exporting Countries are Algeria, Angola, Ecuador, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela.

area, the tendency towards debt reduction). Overall, the global saving glut still seems to be present, even though the role of the developing economies has diminished.

1.2 Various structural determinants have depressed demand for investment

Slackening pace of innovation

Several economists take the view that potential growth in advanced countries has already been in decline for decades, and that those economies may be experiencing "secular stagnation" (see Summers, 2013; Draghi, 2016a,c; Eggertsson *et al.*, 2016; Praet, 2016). By secular stagnation these economists mean a prolonged period of economic equilibrium accompanied by relatively low growth and interest rates. Generally speaking, the downward trend in potential growth has probably depressed the growth outlook and therefore caused investment to fall owing to the low actual and expected returns on investment.

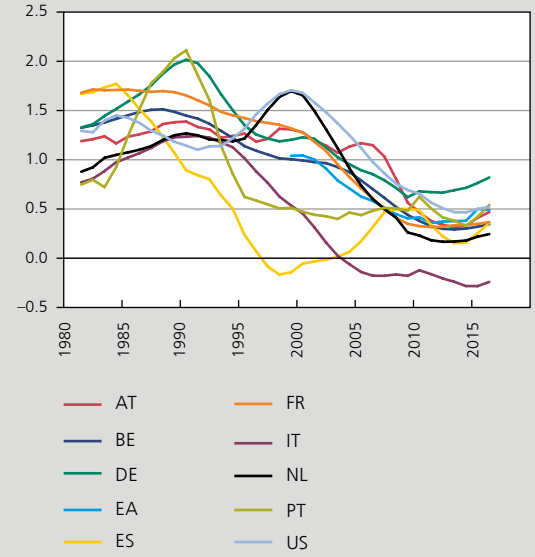
The European Commission estimates that the slowdown in potential growth is due mainly to the fact that, in most euro area countries and in the United States, the contribution of total factor productivity (TFP) has fallen sharply (see chart 5). According to Gordon (2014), the decline in the TFP contribution is attributable partly to a stagnation of the level of education (educational plateau), which can be estimated on the basis of the slower growth in the number of years of education per worker. Rachel and Smith (2015) state that between 1950 and 1990 the number of years of education per worker in the United States increased by 0.8 years per decade, whereas since 1990 it has risen by only 0.3 years per decade; this implies a decline in the contribution of human capital to TFP. Furthermore, Bergeaud *et al.* (2014) detected breaks in the TFP trend in a number of countries. Depending on the case, they were caused by factors such as wars, global financial crises, global supply shocks (e.g. those concerning oil prices) and changes in economic policy.

Decline in the relative price of capital goods

According to the empirical literature, the relative price of capital goods has fallen in recent decades in advanced economies (IMF, 2014; Eichengreen, 2015). And for a given *volume* of investment, a fall in the relative price of capital goods reduces the *nominal* investment expenditure (and therefore the nominal demand for investment). Besides, if capital and labour are not readily

CHART 5 THE SLACKENING PACE OF INNOVATION HAS CONTRIBUTED TO THE DECLINE IN POTENTIAL GROWTH (AND GROWTH PROSPECTS)

(in %, contribution of TFP to annual potential growth)



Source: EC.

interchangeable in the production function, the *volume* of investment will not increase even if capital goods become relatively less expensive. According to the IMF (2014), the volume of investment in the advanced economies has indeed failed to increase since 1990, indicating that the fall in the relative price of capital goods has driven down demand for investment.

Growing importance of services in advanced economies' value added

Services account for an ever-growing share of value added in advanced economies. In 1995, services in the United States and the euro area represented 73 % and 68 % of value added respectively, whereas in 2014 they represented 78 % and 79 % [1]. Assuming that services are less capital-intensive, an increase in the importance of services in advanced economies will tend to depress demand for investment. The OECD (2015) estimates that the growing importance of services has a negative impact on the domestic investment ratio (in % of GDP).

Decline in public investment

The fall in public investment may also have contributed to the decline in interest rates. According to the IMF (2014), public investment has displayed a downward trend as a percentage of GDP in advanced economies since 1970. That decline should be considered partly against the backdrop of pressure on public finances. It could also be due to a certain polarisation of political ideas, hampering public investment in large-scale projects.

1.3 Specific supply and demand factors concerning long-term risk-free assets

Long-term sovereign bond yields were used to illustrate the fall in the real equilibrium interest rate r^* because they often serve as the benchmark for other types of interest rate, and they are available as series of sufficient length and high quality to assess the historical downward trend. Nonetheless, specific factors may have contributed to the fall in sovereign yields, since sovereign bonds are "risk-free" and "long-term". If that is the case, then the sovereign yields will have fallen more sharply than the yields on riskier assets.

Caballero *et al.* (2017) consider, for example, that returns on capital – in contrast to the risk-free long-term interest rates – have been fairly stable since 1980, indicating that the equity risk premium has risen. However, Williams (2017a) comments that the estimated return on equities is based on (theoretical) models. He uses the survey of professional forecasters conducted by the Federal Reserve Bank of Philadelphia to show that the predicted yields on equities (and bonds) have been declining since the early 1990s. He concludes that the reduction in interest rates is not confined to risk-free assets and that it consequently reflects a fall in the natural real equilibrium interest rate r^*.

The estimates of the IMF (2014) and Rachel and Smith (2015) show in a more nuanced way that, on average, returns on capital have fallen throughout the world, albeit less sharply than long-term sovereign bond yields. The reason for this difference could be that the equity market risk premium has generally risen since the early 2000s. These estimates therefore indicate that preferences may have shifted from risky assets to long-term risk-free assets.

In all, various factors may have caused the yields on long-term risk-free sovereign bonds to have fallen more sharply than the real equilibrium interest rate r^* (see also Bernanke, 2013). Those factors include structural developments such as the aforesaid formation of currency reserves in the developing economies, particularly following the Asian financial crisis at the end of the 1990s (those reserves consist mainly of American government paper), certain changes in financial intermediation (such as the growth of insurance companies and pension funds, that generally invest in low-risk long-term assets) and new prudential regulations (risk weighting for the calculation of the capital requirements of financial institutions). Recently, cyclical factors have driven up demand for long-term risk-free assets, such as the purchases of sovereign bonds by central banks implementing quantitative easing programmes. Examples of cyclical factors on the supply side are the trend towards consolidation of public finances since the last financial crisis (contraction of the supply of sovereign bonds) and the loss of "risk-free" status for many structured or government-issued assets (such as certain financial products linked to American mortgage loans).

2. What is the role of monetary policy?

In the light of the foregoing, what is the role of monetary policy in the current low interest rate environment? This section discusses why the real equilibrium interest rate r^* is important for the monetary policy stance. Next, we present estimates showing that r^* is currently at a historically low level, and we establish the link with the low real interest rates actually observed.

(1) Ratios based on European Commission figures (AMECO).

2.1 Estimates of r^* indicate a historical low point

The lower r^* is important for the monetary policy-makers: they endeavour to steer the real interest rate around the equilibrium interest rate which corresponds to an equilibrium between saving and investment with a closed output gap and stable inflation. If inflation is below the target and the output gap is negative, then monetary policy will try to bring the real interest rate below the equilibrium interest rate. The monetary policy stance is then expansionary because it stimulates demand by making saving less attractive and by encouraging investment. In the opposite situation, where inflation exceeds the target and the output gap is positive, restrictive monetary policy will aim to restrain demand by taking the real interest rate above r^* (Draghi, 2016c).

To measure the monetary policy stance, it is not only the level of r but the difference between r and r^* that matters. Lower real interest rates may therefore be seen when monetary policy aims to be neutral in the context of a lower level of r^*. In those circumstances, lower interest rates are necessary to stabilise growth and inflation, because failing to reduce interest rates when r^* falls would cause the economy to drop below its potential and would drive inflation down below its target. That principle is also seen in the Taylor (1993) rule, which prescribes the recommended real interest rate on the basis of the output gap and the inflation rate's deviation from its target. That rule usually adopts an r^* of 2 %, but if account is taken of a lower r^* in recent years, the recommended real interest rate also falls (Yellen, 2017)[1].

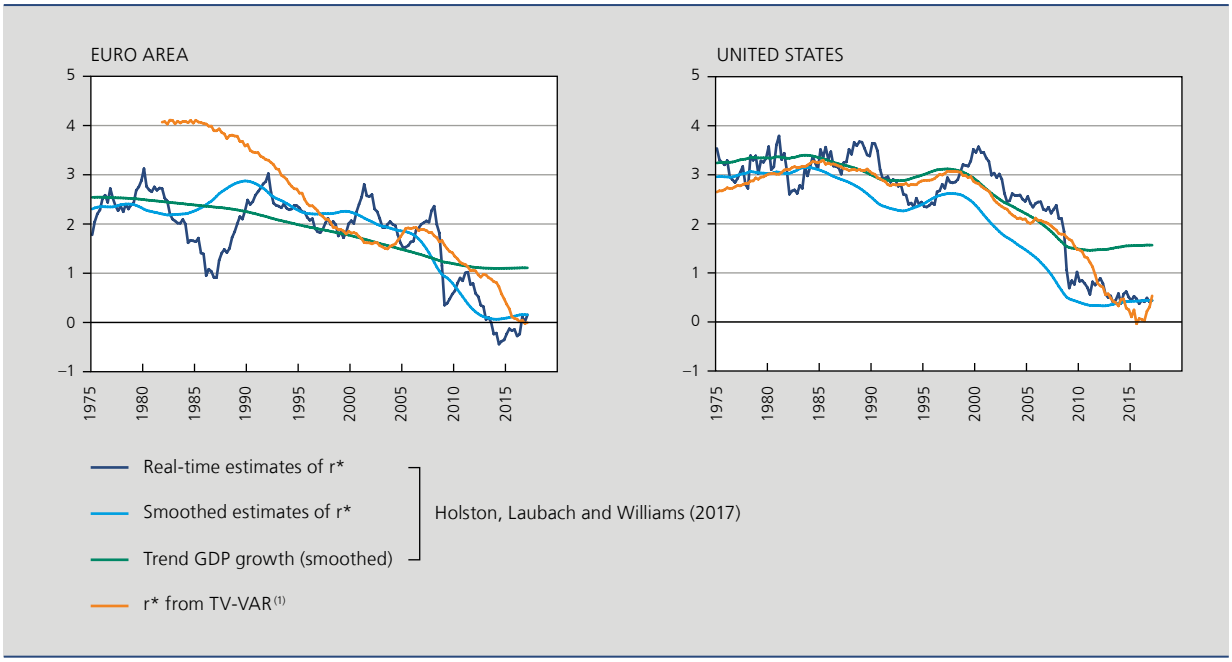
However, the real equilibrium interest rate is a theoretical concept that cannot be observed. Holston *et al.* (2017) use an econometric model to estimate r^* empirically for various regions, such as the United States and the euro area. Their model assumes that r^* is the interest rate corresponding to a closed output gap and stable core inflation once the temporary shocks affecting the economy have dissipated. The intuition of that model is discussed in box 1.

The real-time estimates of r^* according to the model of Holston *et al.* (2017) show two periods of declining r^* values (see chart 6). During the first phase, from 1990 to 2007, r^* displays a moderate fall in both regions.

(1) The original Taylor rule predicts that the nominal policy interest rate i_t depends on inflation (π_t) and the output gap ($\widetilde{y}_t$) : $i_t = \pi_t + r^* + 0{,}5\,(\pi_t - 2\,\%) + 0{,}5\,\widetilde{y}_t$ (Taylor, 1993). In equilibrium, the real interest rate is therefore equal to r^* (which Taylor assumed to be 2 %). It follows from this rule that – for a given inflation rate and output gap – a lower r^* implies a lower recommended policy interest rate.

CHART 6 ESTIMATES OF THE EQUILIBRIUM INTEREST RATE INDICATE A HISTORICAL LOW POINT

(in %, up to 2017Q1)



Source: NBB.

(1) The estimate of the time-varying parameter vector autoregression (TV-VAR) is based on Lubik and Matthes (2015).

During the second phase, which began in 2007 with the financial crisis, the r^* values fall more steeply and reach historical low points. The smoothed r^* estimates from this model and a vector autoregressive model with time-varying parameters show similar tendencies[1]. According to the estimates, r^* in the euro area is currently close to zero and lower than in the United States (where r^* is positive).

According to the model of Holston *et al.* (2017), r^* is equal to the sum of two components: potential growth of real GDP and a variable that represents the time preference of consumers. The estimated potential growth falls systematically in both the euro area and the United States, and the r^* estimates follow that trend. However, in addition to that lower potential growth, there is also a shift in consumers' time preference, as the equilibrium interest rate has fallen more sharply than potential growth. That means that cyclical factors are reinforcing the structural driving forces which are separate from potential growth (see previous section). The propensity to save has increased, e.g. in order to reduce debt levels or as a precaution against the risk of unemployment. And investment demand has fallen further, e.g. in response to a climate of great uncertainty, difficult access to bank credit for businesses, and lower public investment as a result of public expenditure cuts.

(1) The real time estimates indicate for each time period t the estimate based on the data up to that moment. However, the smoothed estimates use data from the complete time series (and therefore also data from after time t), which makes those estimates generally less volatile.

Box 1 – How is r^* defined and estimated?

This box examines in more detail how the real equilibrium interest rate r^* is defined and estimated in the academic literature. It also explains the intuition behind the model of Holston *et al.* (2017) (whose estimation results are discussed in the text).

It was Knut Wicksell who, in 1898, introduced the concept of the natural equilibrium interest rate as the loan interest rate which neither increases nor reduces commodity prices (Wicksell, 1936, translation of the 1898 text, p. 102). That concept is found in several variants in today's academic literature (Beyer and Wieland, 2017). For instance, the new-Keynesian macroeconomic models include a *short-term* equilibrium interest rate which reflects the interest rate in a (hypothetical) economy where prices can always be adjusted flexibly and the economic allocation is therefore not distorted by price rigidities. However, in this article, we follow Laubach and Williams (2003) and define r^* as the interest rate consistent with an equilibrium in which real GDP equals its potential level and inflation is stable. That definition takes a long-term view and indicates the expected real interest rate in, say, five to ten years when demand and supply shocks have dissipated and the economy grows at its potential rate (Williams, 2003).

The figures in the text show estimates of r^* based on the model of Holston *et al.* (2017). This semi-structural model, which is based largely on Laubach and Williams (2003), is explained in more detail here. We estimate several indicators on the basis of data relating to real GDP, core inflation and a measure of the real interest rate r (the 3-month interest rate less the moving average of inflation over four quarters). The model breaks down real GDP into a potential level and an output gap; it derives a measure of trend growth from GDP and also indicates an equilibrium interest rate r^* corresponding to a closed output gap and stable core inflation.

The first component is an "IS equation" for aggregate demand:

$$\tilde{y}_t = a_{y,1}\tilde{y}_{t-1} + a_{y,2}\tilde{y}_{t-2} + \frac{a_r}{2}\sum_{j=1}^{2}(r_{t-j} - r^*_{t-j}) + \varepsilon_{\tilde{y},t}$$

in which the output gap $\tilde{y}_t$ – the percentage difference between real GDP and its potential level – is a function of earlier values for the output gap, deviations between the real interest rate and the equilibrium interest rate r^*, and a residual $\varepsilon_{\tilde{y},t}$.

The second component is a Phillips curve equation that links activity and inflation π_t:

$$\pi_t = b_\pi \pi_{t-1} + (1 - b_\pi) \pi_{t-2,4} + b_y \tilde{y}_{t-1} + \varepsilon_{\pi,t}$$

in which $\pi_{t-2,4}$ represents the average inflation between two and four quarters ago.

Together, these equations display the following dynamics: if the real interest rate is higher than r^*, the output gap is subject to negative pressure (IS equation). A negative output gap will in turn drive down core inflation (Phillips curve equation). Conversely, if $r < r^*$, there will be upward pressure on the output gap and on inflation.

It follows that, in the absence of shocks and if $r = r^*$, the model ultimately converges to an equilibrium with a closed output gap and stable core inflation. This shows that r^* is a long-term concept in this model, and that the sign of $r–r^*$ indicates whether monetary policy is exerting upward or downward pressure on inflation.

Finally, there are some unobserved components. The model uses the Euler equation derived from theoretical models to determine r^* as the sum of two time-varying parameters:

$$r_t^* = g_t + z_t$$

The parameters are the potential growth g_t of real GDP and the time preference z_t of consumers. The latter declines if consumers are more willing to postpone their consumption, implying a higher propensity to save. Finally, g_t indicates the trend growth of potential real GDP y_t^*, and both g_t and z_t are modelled as random walks[1]:

$$y_t^* = y_{t-1}^* + g_{t-1} + \varepsilon_{y^*,t}$$

$$g_t = g_{t-1} + \varepsilon_{g,t}$$

$$z_t = z_{t-1} + \varepsilon_{z,t}$$

The parameters and unobservable variables are estimated on the basis of Kalman filter techniques (Holston *et al.*, 2017). The estimates in the text are based on the *r* code of the original study with updated data.

For comparison, chart 6 also presents estimates of r^* based on a time-varying parameter vector autoregression (TV-VAR), based on Lubik and Matthes (2015). The TV-VAR describes how GDP growth, core inflation and the real interest rate depend on their earlier values and random shocks, and flexibly allows for non-linearities in their underlying equations. In the TV-VAR, the equilibrium interest rate r^* was calculated as the real interest rate prevailing once all temporary shocks have dissipated.

(1) The output gap is defined as $\tilde{y}_t = 100\,(y_t - y_t^*)$, in which y_t and y_t^* respectively represent the natural logarithm of real and potential GDP. Therefore, $y_t^* - y_{t-1}^*$ can be regarded as the growth rate of potential GDP.

2.2 Monetary policy has lowered the real interest rate via (non-)standard policy

During the financial crisis, monetary policy in the euro area tried to encourage demand by means of expansionary measures that reduced r below r^*. Initially this was done via conventional measures, namely by cutting the key interest rates, even taking them into negative territory. However, the effective lower bound to the key interest rate made it difficult to reduce r much below r^*. It was therefore decided to adopt (additional) non-standard measures such as asset purchases, the issuance of long-term loans, and forward guidance on policy intentions. The central bank thus attempted to reduce the real interest rates for various maturities on several markets[1].

(1) See Cordemans *et al.* (2016) for an overview of (non) standard monetary policy in the euro area.

The recommendation on reducing r below r^* – and especially the estimates presented here – should be interpreted in qualitative rather than in strictly quantitative terms. Indeed, model estimates of r^* are generally associated with great statistical uncertainty (Holston *et al.*, 2017; Beyer and Wieland, 2017), which must be taken into account in monetary policy decisions. Nevertheless, the assumption that r^* has fallen is borne out by various models, both for the euro area (Constâncio, 2016) and for other regions of the world (Holston *et al.*, 2017).

In short, the role of monetary policy in the current low interest rate environment was to implement necessary expansionary measures in order to reduce r below r^*, with the latter having decreased since the crisis.

3. Challenges posed by low interest rates

This section discusses some challenges confronting the euro area policy-makers as a result of the low r^*, namely: i) can the real interest rate fall sufficiently? ii) is the low real interest rate appropriate to all countries? and iii) what does the low interest rate imply for macroprudential stability?

3.1 The low r^* and the "effective lower bound" hamper monetary policy

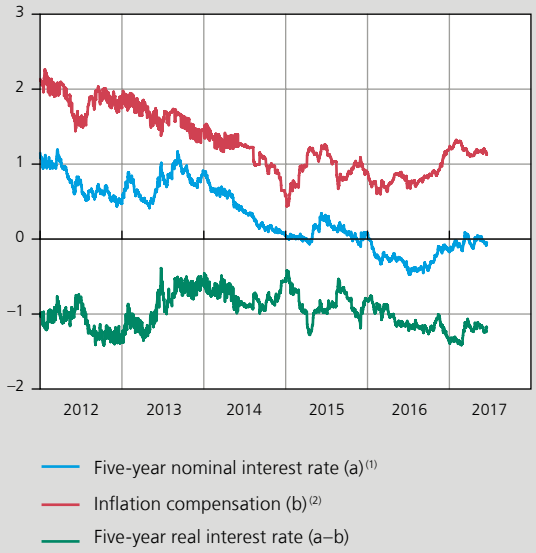
Owing to the low r^* in the euro area, if monetary policy is to be expansionary it has to take the real interest rates to historically low levels. Since the real interest rate is equal to the nominal interest rate minus expected inflation, this means that policymakers have to aim at a low nominal interest rate and/or high inflation.

However, in the current context, there is little scope for the real interest rate to fall. A reduction in the nominal interest rate is impeded by the effective lower bound, because if the nominal interest rate is decidedly negative it is advantageous to convert deposits into cash. The existence of paper money as a non-interest-bearing resource prevents monetary policy from implementing a very negative interest rate.

Chart 7 illustrates developments in the five-year real interest rate in the euro area defined as the difference between the five-year nominal interest rate and the inflation compensation at five years on the financial markets. In principle, the real interest rate could fall to –2 % if the nominal interest rate is zero and inflation expectations are anchored in accordance with the ECB's target. However, in recent years, the real interest rate has been more or less stable at around –1 %. That is due to the downward trend in inflation compensation, which has negated the fall in the nominal interest rate.

CHART 7 THE LOW r^* AND THE "EFFECTIVE LOWER BOUND" HAMPER MONETARY POLICY IN THE EURO AREA

(in %, data up to 16 June 2017)



Source: Thomson Reuters.
(1) Five-year OIS in the euro area
(2) Five-year inflation swap for the euro area.

Monetary policy is therefore approaching its limits, whereas the economic situation still requires stimulus. Although non-standard policy has reduced r, it is also desirable to increase r^* to make the current policy more accommodative. A growth-friendly fiscal stance – in so far as that is possible – could help here, as could (growth-friendly) structural measures aimed at driving r^* back up. We shall return to this in the next section.

3.2 Is the low monetary policy interest rate appropriate to all euro area countries?

While the low r^* makes it difficult to give monetary stimulus for the euro area as a whole, the question is whether the expansionary policy is appropriate to all countries in the currency area. The ECB Governing Council determines the monetary policy for the euro area as a whole and therefore steers a "euro area r" in relation to a "euro area r^*". The unified monetary policy may therefore differ from a policy tailored to the individual Member States.

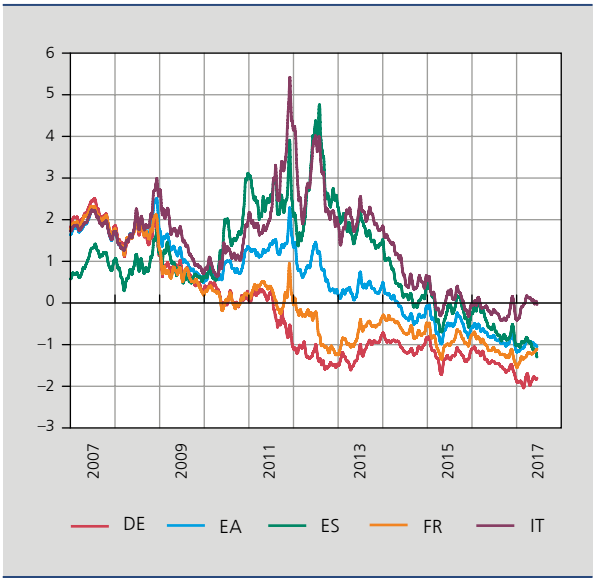
Chart 8 shows the trend in the *ex-ante* real five-year sovereign yield in the euro area, Germany, Spain, France and Italy. At the time of the financial crisis and the sovereign debt crisis, those yields diverged very widely, partly as a result of differences in inflation compensation but mainly because of divergent nominal sovereign yields. When the non-standard policy was actively implemented in recent years, the interest rates converged towards more comparable, negative levels[1].

The real interest rate is lowest in Germany, because that country has both relatively high inflation compensation and the lowest nominal interest rate. That low real interest rate has already been subject to regular criticism and has also been cited as evidence that the ECB's expansionary policy has "expropriated" German savers. But it should be noted here that structural drivers (such as demographic trends and declining investment and productivity growth) create an imbalance between saving and investment in Germany as well, as is evident from the country's large current account surplus. That imbalance is part of the reason for the low interest rate, regardless of the potential role played by the unified monetary policy (Bindseil *et al.* 2015).

Moreover, the imbalances which appeared during the crisis in the euro area require adjustments on the part of both surplus and deficit countries. Countries with a current account surplus can contribute by supporting the target for inflation below but close to 2 %. The relative price distortions between core and peripheral countries are easier to rectify in a context of higher general inflation, without any need for deflation in the peripheral countries (which would increase the real interest rate there) (Coeuré, 2016). In those circumstances, the relatively low real interest rate in the surplus countries – and the impact of that on inflation in those countries – is therefore desirable. Furthermore, the ECB has no option other than to determine the monetary policy for the euro area as a whole : a unified monetary policy can do little to influence inflation in the individual countries.

CHART 8 ***EX-ANTE*** **FIVE-YEAR REAL INTEREST RATE**[1]

(in %, ten-day averages up to 16 June 2017)



Sources : Bloomberg, ECB.

(1) Five-year nominal sovereign yield minus five-year inflation compensation according to inflation swaps for the countries considered.

3.3 Macroprudential policy must ensure financial stability in an interest rate environment hostile to profitability

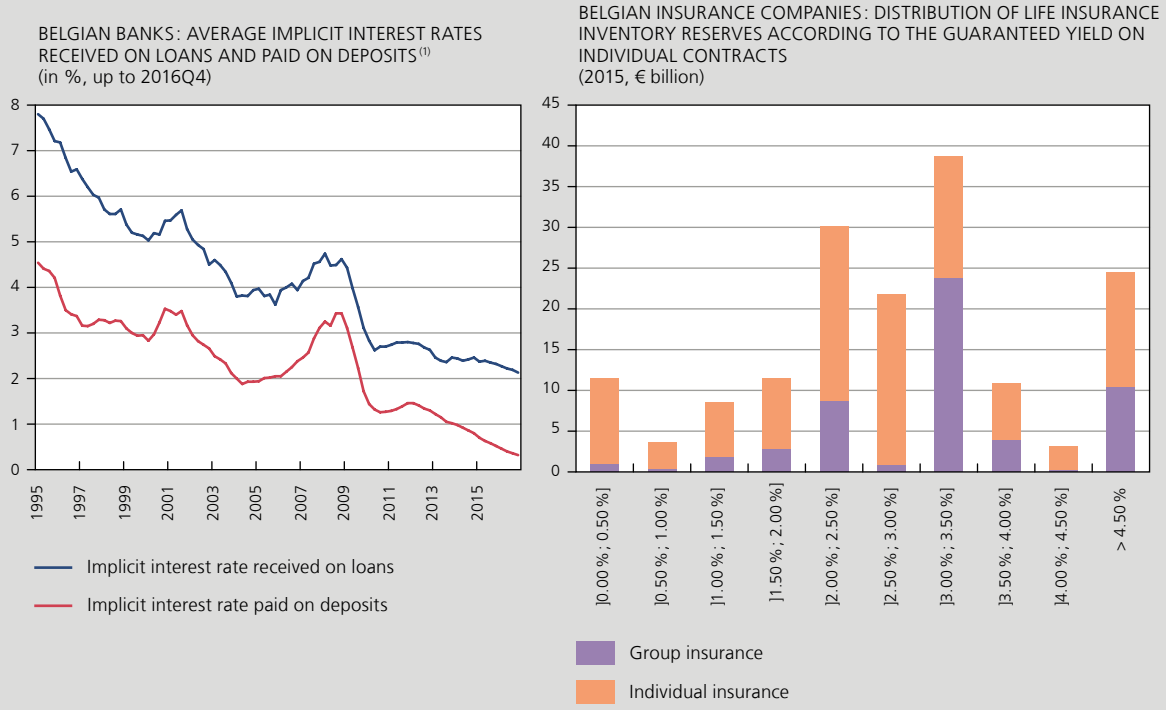
A low interest rate entails challenges for the profitability of banks and insurance companies. In Belgium, for example, the banks' business model is based on maturity transformation. Belgian banks obtain most of their funds from customers' deposits (which can be regarded as equivalent to short-term loans) and use them to grant (longer-term) loans. If there is a general fall in interest rates, banks renew their outstanding loans at lower interest rates and pay a lower rate on deposits. The implicit interest rate received on loans – defined as the ratio of the interest received over one year to the outstanding loans – and the implicit interest rate paid on deposits have been exhibiting a downward trend for several years (see chart 9). As long as the two series can fall in parallel, the pressure on net interest income is limited since banks maintain their margins. However, as implicit interest rates paid on deposits (the short-term interest rates) approach zero, a continuing decline in longer-term interest rates would exert pressure on the banks' intermediation margins[2]. If the current low interest rate environment persists, then it will start to depress banks' profitability, especially if the interest rate curve is flat. For the banks, an alternative scenario would be to refrain from further reducing interest rates on their lending, or actually to increase these rates, which would interfere with the transmission of monetary policy.

In the case of insurance companies, a persistently low interest rate environment could make it harder to honour past contracts offering relatively high guaranteed yields. Insurers have had to offer contracts more in line with market

(1) Fries *et al.* (2016) observe for the four largest euro area economies that individual deviations between r (the one-year interest rate) and r^* have tended towards a neutral position in recent years. They link that convergence to the non-standard measures implemented by the ECB.

(2) In Belgium, the interest rate on regulated savings accounts must not be less than 0.01 % for the basic rate and 0.10 % for the loyalty premium, according to the interpretation of the Royal Decree of 27 August 1993 implementing the Income Tax Code 1992.

CHART 9 MACROPRUDENTIAL POLICY MUST ENSURE FINANCIAL STABILITY IN AN INTEREST RATE ENVIRONMENT HOSTILE TO PROFITABILITY



Source: NBB.

(1) Implicit interest rates are calculated as the ratio between the cumulative flows over twelve months of interest actually received or paid on the corresponding outstanding assets or debts (quarterly average). The range of loans taken into account comprises term loans and mortgage loans. The range of deposits covers sight accounts, savings accounts and term accounts.

conditions (with lower guaranteed yields), and in Belgium regulatory measures were introduced (reduction in the maximum interest rate for long-term life insurance contracts, revision of the guaranteed yield for supplementary pensions). The financial management of the insurance sector's capital gains is also a key point for the attention of prudential policy.

In general, a low interest rate environment implies (macro) financial risks and requires (macro)prudential policy measures to enable the balance sheets and business models of banks and insurers to withstand that low interest rate environment. In particular, the overvaluation of specific financial or real assets, the adoption of excessive positions as a result of a search for yield, and the growth of the shadow banking sector could undermine the stability of the financial sector.

4. How to restore a higher interest rate?

Monetary policy thus tries to bring the real interest rate r below the equilibrium interest rate r^* in order to revive the economy and bring inflation in line with its target. This means that if economic activity recovers, monetary policy can allow r to rise towards r^* as there is less need for monetary stimulus. But if structural factors have driven r^* down in the past decades, the general real interest rate level r will stabilise at a low level.

Although economists do not all agree, most of them seem to assume that structural factors will continue to depress the level of r^*. For example, Draghi (2016a, c), Praet (2016) and Constâncio (2016) consider that the downward trend in the real interest rate is mainly due to declining productivity in the advanced economies, combined with pessimistic potential growth expectations; that has lowered the expected returns on investment and hence investment demand (see also Carvalho *et al.*, 2016; Fischer, 2016; Gordon, 2014; Rachel and Smith, 2015; Summers, 2014 and the Executive Office of the President of the United States, 2015). From that point of view, r^* could remain low in the medium term if potential growth remains weak.

Conversely, Goodhart and Erfurth (2014) and Goodhart and Pradhan (2017) predict that the natural interest rate

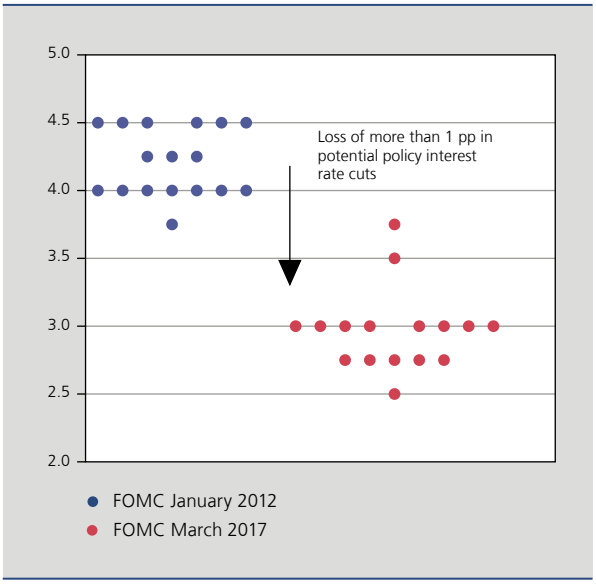
will rise again in the relatively near future. They base their prediction mainly on the gradual retirement of the baby-boom generation (gradual fall in the support ratio) who are likely to begin using their savings. However, Bean *et al.* (2015) consider that the future impact of that structural factor is hard to predict. For instance, its effect may be no greater than that of other structural forces such as the declining growth prospects. In Japan, for example, the support ratio has been falling sharply for more than ten years without any sign of an increase in the natural interest rate. Therefore, despite the sometimes divergent opinions of economists, we can probably expect fundamental forces to continue depressing the level of the natural interest rate.

Apart from challenges implied by low interest rates (see the third section), a low r^* has significant implications for the policy interest rate in the long term. This policy rate is in the long term equal to the sum of r^* and the inflation target (see the Taylor rule). Consequently, a permanently lower real equilibrium interest rate r^* causes a lower nominal equilibrium interest rate, which means that monetary policy will have less scope in future to reduce its key interest rate in the event of an economic recession. That curtails the stabilisation function of monetary policy, because the key interest rate will reach the effective lower bound more frequently.

This is not a purely hypothetical risk. Chart 10 shows the individual long-term expectations for the (nominal) policy interest rate according to members of the Federal Open Market Committee (FOMC) in the United States. That group discusses and determines the monetary policy stance. The blue dots indicate the expectations when those data were first published in January 2012, while the red dots show the expectations in March 2017. It is striking that in the space of five years the distribution of the long-term expectations has largely shifted from "4 % or more" to "3 % or lower"; it is therefore expected that, in the long term, potential interest rate cuts in the United States will have lost a full percentage point.

CHART 10 INDIVIDUAL LONG-TERM EXPECTATIONS FOR THE FEDERAL FUNDS RATE ACCORDING TO FOMC MEMBERS

(in %)



Source: FOMC.

We discuss three possible policy options aimed at remedying the adverse consequences of a low r^*. The first two are linked to monetary policy: an increase in the inflation target and a monetary policy targeting a price level rather than inflation (Williams, 2016). Finally, we discuss how structural reforms could increase r^*.

4.1 A higher inflation target has both advantages and disadvantages

One way of restoring monetary policy's ability to take action against future recessions would be to raise the inflation target to 4 %, for example (Blanchard *et al.*, 2010; Ball, 2014). Since that measure would increase the equilibrium nominal policy interest rate, there would be less risk of the policy rate reaching the effective lower bound. That would also be beneficial for banks and insurers. Since it is hardly possible for banks to cut their funding costs sufficiently at the effective lower bound (because of reluctance to impose negative interest rates on deposits), it avoids occasional downward pressure on their profitability. A higher nominal equilibrium interest rate would also make it easier for insurers to honour their past undertakings concerning nominal guarantees.

However, such a policy adjustment also brings challenges (Blanchard *et al.*, 2010). First, there is the risk that the central bank may lose credibility, e.g. if actual inflation cannot be aligned with the new target. And if today's inflation target of 2 % increases, what guarantee is there that further adjustments will not be made in the future? More uncertainty over the inflation target could cause the economic agents to incorporate higher risk premiums in nominal financial contracts. Finally, an unexpected rise in inflation (on announcement of a new policy) could trigger a redistribution effect to the detriment of savers. Although insurers, for example, benefit from higher nominal interest income, that is not reflected in higher real interest income for their customers, the savers. For that reason, an increase would need

to be phased in gradually so that it can be taken into account in new contracts.

When this article was written, few monetary policy-makers and commentators in the euro area were debating the possibility of raising the inflation target. In the United States, however, a group of eminent economists have advocated a reappraisal of the current inflation target through an open letter to Janet Yellen, Chair of the Fed. At a press conference she in turn stated that this question will be studied in the future (Financial Times, 2017).

4.2 In theory, a price level target could be helpful

Another option is for monetary policy to aim at aligning the price level with a predefined path ("price-level targeting"), e.g. a 2 % annual increase in the price level. The great difference compared to an inflation target is that in the case of a price level target the policy-makers take account of earlier deviations from the target. Imagine that, following a period of low inflation, the price level is lower than its target; a price level target would then aim at *higher-than-average* inflation to restore the price level to its target. In contrast, in the case of an inflation target, the price growth target remains unchanged (Bank of Canada, 2011)[(1)].

In theory, a price level target has some advantages over an inflation target. Although a price level target does not necessarily increase the equilibrium policy interest rate, that measure can still shorten the periods in which the policy rate sits at the effective lower bound. If the policy interest rate has reached the effective lower bound and inflation is persistently low, economic agents know that monetary policy will have to provide an additional stimulus by way of compensation (so that inflation is higher than average). They will therefore increase their inflation expectations, lowering the real interest rate and stimulating economic growth. That enables the central bank to raise the interest rate more rapidly. A price level target can therefore be a useful measure in the context of a low r^* (Williams, 2017b). In addition, consumers have more certainty over the long-term price level because the policy makes adjustments for deviations between the price level and the target. One can therefore expect the nominal risk premiums to be lower.

(1) By way of example, the Bank of Canada (2011) compares a 0 % inflation target with a constant price level target. Assuming the situation in which the price level is on target and inflation rises from 0 % to 1 %, an inflation target will aim at zero growth in the level of prices. However, a price level target will aim at negative inflation so that the price level reverts to its starting value. Conversely, if inflation had fallen to –1 %, a price level target would aim at positive inflation. That reasoning also applies if, for example, the intention is that prices should rise by 2 % per annum and inflation deviates from that average target.

It is important to note that the success of a price level target depends on the credibility of monetary policy and the degree to which consumers maintain rational expectations (Hatcher and Minford, 2016). If these conditions are not met, the theoretical advantages of a price level target vanish, and an inflation target may even be better (Bank of Canada, 2011). Since an increase in the inflation target and a price level target both have their drawbacks, it is advisable to find ways of raising r^* (the real equilibrium rate).

4.3 In the euro area, structural reforms are needed to make r^* great again

Given the decline in the real equilibrium interest rate r^*, possibly followed by stagnation at a relatively low level, potential reforms concerning the price stability objective of the central bank could only treat the symptoms of fundamental economic developments. An increase in the level of r^* therefore necessarily entails reforms other than those concerning monetary policy, namely structural reforms that affect the real economy, either by boosting investment demand or by limiting the supply of savings. Furthermore, an appropriate supply of risk-free assets could help to raise the interest rate on risk-free assets.

Encouraging innovation and reversing the downward trend in potential growth in advanced economies are among the key ways of stimulating investment demand (Draghi, 2015, 2016a, b, c; Praet, 2016). Measures could be implemented in the medium term. On the one hand, generally speaking, those measures could consist in strengthening total factor productivity by diverting resources from the least productive to the most productive businesses, introducing new innovation and management techniques, and promoting entrepreneurship. On the other hand, potential growth could be adjusted upwards by enhancing human capital via high-quality education and lifelong learning. More particularly in regard to the labour market, some countries could consider measures to increase the participation rate and improve the activation of the unemployed.

A favourable investment climate could be promoted by fiscal and regulatory measures. The investment plan for Europe (Juncker plan) and the European Fund for Strategic Investments are practical examples. Furthermore, an appropriate macroprudential policy could stimulate investment demand in the long term, to the extent that financial stability forms the basis for sound, sustainable economic growth and minimises uncertainty over expected future returns. In Europe, in particular, reforms such as the Capital Markets Union could improve the diversification of (and access to) funding sources (and thus

facilitate investment). Finally, public investment could be encouraged in the advanced economies.

Conversely, it seems harder to limit the supply of savings, as that depends partly on demographic factors. If the sustainability (and credibility) of pension systems improves, however, households will have less reason to save for their retirement. Moreover, as the growing inequality may be a factor in the expansion of the savings supply, it also seems important to ensure that growth benefits everyone (inclusive growth).

Finally, an increased supply of risk-free assets would reduce the pressure on the yields on those assets. On that subject, the European Systemic Risk Board and the European Commission (2017) proposed an initiative whereby pools of existing sovereign bonds would be divided into (safe) senior tranches and junior tranches of securities backed by those bonds (sovereign bond-backed securities – SBBS). The creation of SBBS could then expand the supply of risk-free assets thanks to diversification via the pooling of securities, without imposing the mutualisation of sovereign debts.

Conclusion

Since interest rates have fallen substantially worldwide throughout recent decades, it seems that their current low level is due to global structural factors. In general, those factors probably supported the supply of savings and depressed the demand for investment. They could be diverse in character, covering for example sociodemographic trends such as population ageing and increased inequality, and economic changes such as the slackening pace of innovation and the decline in potential growth. As a result of these structural factors, the equilibrium real interest rate, which reflects the macroeconomic equilibrium accompanied by stable inflation, has fallen in the United States and in the euro area, in particular, dropping to historically low levels, as the latest estimates show.

Apart from structural factors, there are also cyclical factors which partly account for the current low level of interest rates. Since the great recession, those cyclical factors have exerted downward pressure on interest rates and thus prolonged the downward trend in rates which had already persisted for years. The central banks, in particular, tried to counter the fall in inflation and economic activity by taking real interest rates below their equilibrium level in order to stimulate demand.

In the medium term, central banks should revise their monetary policy rates upwards once the price stability outlook becomes more favourable, although they cannot guarantee that interest rates could recover to levels comparable to those reached in the past. If central banks no longer aim to encourage demand, they will align real interest rates with the natural interest rate of the economy. However, that rate is still influenced by fundamental structural changes relating to the supply of savings and investment demand. If those structural changes continue to depress the equilibrium interest rate, then interest rates in general will stagnate at relatively low levels.

The persistence of low interest rates would imply monetary and financial risks. The leeway available to central banks for revitalising the economy would be smaller, for example, if they were constrained by an "effective lower bound" when cutting policy interest rates. Moreover, an interest rate environment hostile to the profitability of financial intermediaries could trigger a hunt for yield, among other things. It is therefore necessary to assign a key role to macroprudential policy, which must ensure that the balance sheets and business models of banks and insurance companies remain balanced.

Given these potential risks, an increase in the general level of interest rates seems desirable, preferably via a rise in the natural real interest rate. Such an increase entails economic measures to counter the factors depressing real interest rates. The structural measures would essentially aim to encourage innovation and promote a climate conducive to investment. Measures that would diminish the need for precautionary savings, such as reforms supporting the sustainability of social security, could also increase the real equilibrium interest rate. Alternative strategies modifying the central banks' price stability objective have the major drawback of potentially damaging central bank credibility.

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