



DIRECTORATE-GENERAL FOR INTERNAL POLICIES

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ECONOMIC AND SCIENTIFIC POLICY **A**

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**Ultra-low/Negative Yields on
Euro-area Long-term Bonds: Reasons
and Implications for Monetary Policy**

**Monetary Dialogue
September 2016**

In-Depth Analysis





DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Ultra-low/negative yields on euro-area long-term bonds: reasons and implications for monetary policy

Monetary Dialogue 26 September 2016

COMPILATION OF NOTES

Abstract

The notes in this compilation discuss the main factors underlying the extraordinary low levels of long-term rates across the euro area, assess the risks for financial stability and the implications for ECB monetary policy. The notes have been requested by the Committee on Economic and Monetary Affairs as an input for the September 2016 session of the Monetary Dialogue.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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INTRODUCTION

Sovereign bond yields have recently reached new record lows across euro-area countries, notably with the 10-year Bund rate hitting negative territory. Long-term rates do not seem to reflect any more the risks borne by investors and/or long-term growth perspectives. While low interest rates partly stem from low inflation, they also reflect heightened risk aversion as well as the effects of ECB expanded asset purchase program. The existence of a potential bubble in the bond market is a major risk to financial stability and an additional constraint for ECB monetary policy.

An in-depth analysis of the main factors underlying the extraordinary low levels of long-term rates across the euro area is provided in this compilation of notes, which also makes an assessment of the risks for financial stability and of the implications for ECB monetary policy stemming from the current situation in the bond market. The papers prepared by the members of the Monetary Expert Panel have been requested by the Committee on Economic and Monetary Affairs as an input for the September 2016 session of the Monetary Dialogue. The main conclusions and policy options are summarised below.

The contribution of **Daniel Gros** (Centre for European Policy Studies) focuses on the secular drivers of long-term interest rates. Recent empirical literature has found that it might be possible to reconcile two observations: first, that interest rates have declined throughout the developed world, following a common trend, and second, that the global investment and savings ratios have remained roughly constant. It seems possible to explain these two developments through the impact of ageing, lower growth and an increase in the risk premium on global capital markets. Since these secular drivers of lower rates are unlikely to change quickly, one must conclude that low rates are likely to remain for some time.

One conclusion that is often drawn from this perspective of 'low for long' is that inflation targets should increase because the world capital market might need negative real rates to remain in equilibrium.

Another implication for monetary policy is often overlooked: if global drivers are behind low bond yields everywhere, the ECB might not be able to influence them in the euro area. In other words, with integrated global capital markets national monetary policy can no longer be expected to have an impact on bond yields at home. The evidence seems to support this view. Activism by the ECB, for example, extending the bond purchase programme, might thus be largely ineffective.

But President Draghi has stated that, while monetary policy cannot change the long-term rate trend or equilibrium value of bond rates, it should try to lower rates below their equilibrium when there is a negative output gap and inflation persistently stays below target. The ECB thus tries to influence long-term rates by buying bonds, negative rates on its policy instruments and by providing 'forward guidance'. How much these instruments have influenced long-term rates remains controversial, but most estimates are below one percentage point. Gros argues that it has been probably much less; and the global downward trend of bond yields discussed here reinforces the view that the ECB's influence might be rather limited.

The paper by **Jacob Funk Kirkegaard** (Peterson Institute of International Economics) argues, first, that today's exceptionally low long-term nominal interest rates in the euro area are the outcome of a combination of the ECB's highly accommodative monetary policies, particularly the public sector purchase program (PSPP), structural risk factors inducing market participants to accept safe but low returns, and the lack of a strong market price response from sovereign borrowers, who continue to restrain the supply of bonds. It

is highlighted how, when shifting from nominal to real long-term yields in the euro area, today's situation comes at the end of a long period of declining real long-term rates in the euro area. And that in real terms, market investors have been willing to accept significantly negative real yields in the core euro area for a number of years, meaning that today's situation in real yield terms is not historically unique.

Secondly, the paper argues that today's exceptionally low nominal long-term bond yields will significantly constrain future ECB options for additional monetary stimulus, and that recent years' "non-standard monetary policy instruments" will in the future be required tools for the ECB to counter even normal cyclical downturns. Limited implications for the euro area banking sector stability is foreseen, though an extension of today's low yields will put pressure on bank business models relying mostly on net interest rate margin income from maturity transformation of deposits. Today's low long-term yields are seen as generally supporting consumption in the euro area, but could cause trouble for some insurance and life insurance businesses, while internationalization and sophistication of national financial systems are crucial determinants of how today's low long-term yields are transferred to the real economy in individual euro area members.

According to **Andrew Hughes Hallett** (University of St Andrews) ultra-low and negative interest rates are not logically different, one being a natural extension of the other. But they have different implications for how the economy works. Both rely on the assumption that economic decisions will respond to changes in borrowing costs. But there are many reasons why this may not be true, and most economies will need an additional policy instrument, beyond monetary policy, to help low interest rates to boost spending in a recession – more so the more serious or longer lasting the recession.

Second, their impact depends on the financial structure of the economy. Economies where savers hold their assets in bank deposits, and firms mostly borrow from banks, will not respond very much to low or negative rates. But where they have more options, borrowers or firms can choose to borrow outside the banks. The impact of policy will be larger.

Third, there may be political economy constraints; for example if the financial system lacks competition or can limit the fall in interest rates, or the central bank protects savers against negative rates, vs. the case where savers have diversified assets and firms have greater choice.

Fourth, the degree of market integration and home bias varies. This affects the willingness of savers, owners of capital or firms to move their assets abroad. That in turn influences the effectiveness of the exchange rate channel.

Put together, these factors suggest that the long run equilibrium rate of interest has fallen to zero or lower in the Euro-zone (Holsten et al 2016). If so, low or negative interest rates may be here to stay.

The goals of **Grégory Claeys'** (Bruegel) paper are to understand why interest rates are currently so low and to determine if this level is justified by fundamental factors or if unconventional monetary policies are artificially lowering long-term rates.

The decline in yields over the last 30 years are the result of reducing inflation, low risk premia in the EU and, most importantly, the fall in the real interest rate. The decrease in the real rate is itself driven mainly by the secular decline of the 'neutral' rate, i.e. the rate which equates demand and supply of funds compatible with full employment and price stability.

That is why central banks cannot be blamed for the actual level of long-term real rates: they adopt, to fulfil their mandate, the necessary policies to influence market rates in order to make them consistent with neutral rates, over which they have little influence.

Given that the neutral rate is an important guide to monetary policy (and represents a good benchmark to determine if the current level of rates is justified), a growing empirical literature has tried to estimate where this neutral rate is. Although there is a lot of uncertainty around the main results, there is some clear evidence of time-variation in the neutral rate of interest, with a clear downward trend since the 1960s, which accelerated after 2008.

The determinants of the fall in the neutral rate are all the factors affecting the supply and demand for funds. These include demographics, lower productivity growth, lower investment, rising inequality and shifting preferences for less risky assets at home and abroad.

The precise neutral rate estimates should be treated with caution, but the similar trends and orders of magnitude generated by various methodologies suggest that the decline in real rates observed over the last 10 years is not the result of an overly accommodating monetary policy but of a combination of structural and cyclical factors.

The disappointing recoveries observed in the US and even more so in European countries have raised the possibility that we might have entered a period of secular stagnation. Understanding the potential mechanism at work behind this phenomenon could thus be crucial to understand why rates are currently so low.

The main driver of secular stagnation appears to be the structural mismatch between the high proclivity of people to save and the low demand for those savings to be translated into risky productive investment, leading to a lower and possibly negative real interest rate to clear the market for funds.

Although secular stagnation is an appealing hypothesis that provides an explanation for many of the economic features of the last 30 years, including the secular decline in real rates, it is still too early to settle the debate. Nevertheless, even if secular stagnation is still a hypothesis, most of the structural features of secular stagnation are already weighing on growth and on interest rates.

Low rates are the symptoms of our diseases, not their cause. It is therefore crucial to tackle the structural causes behind the fall in long-term rates, but also to find solutions for the harmful consequences that lower equilibrium rates could have for the conduct of monetary policy.

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Ultra-low/negative yields on euro-area long-term bonds: reasons and implications for monetary policy

Daniel GROS

IN-DEPTH ANALYSIS

Abstract

The importance of monetary policy for the present ultra-low interest rates is often over-estimated. As emphasised by the ECB President himself, monetary policy cannot determine long-term rates directly, and its influence on long-term real rates is even more limited and indirect. Moreover, long-term bond yields have fallen to unprecedented low levels throughout developed countries. The influence of any single central bank on bond yields in its currency area must be quite limited if global capital markets are integrated. The importance of the ECB's policy in driving down rates in the euro area is widely assumed to be substantial. But even the ECB does not attribute more than about a 1 percentage point decline in rates to QE. The author of this study believes that the impact of QE has been much smaller, due to the state of global markets. It is widely accepted that a sudden reversal of rates to 'normal' would pose a threat to financial stability, but few believe that this is likely to materialise any time soon.

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EXECUTIVE SUMMARY

- Long-term rates have been subject to a strong global trend over the last decade, which is common to all developed economies.
- Rates are generally lower in savings surplus countries (i.e. countries with persistent current account surpluses) such as Germany, Japan and most smaller Northern European countries, than in savings deficit countries, like the UK or the US. But the differences have narrowed recently. The existence of this global trend suggests that the influence of any one central bank might be limited.
- Real rates, i.e. nominal interest rates adjusted for inflation, are the key variable for savings and investment decisions. Their decline over the last few decades remains difficult to explain.
- Latest research suggests that the decline is due to combination of factors, like lower growth plus higher savings and lower investment propensities. But estimates of the right, or 'equilibrium' long-term real rate today are highly uncertain. Recent results vary from small positive (about 1%) to zero.
- If bond yields are driven by a global trend there is little the ECB can achieve by itself. President Draghi has stated that, while monetary policy cannot change the long-term rate trend or equilibrium value of bond rates, it should try to lower rates below their equilibrium when there is a negative output gap and inflation persistently stays below target.
- The ECB thus tries to influence long-term rates by buying bonds, negative rates on its policy instruments and by providing 'forward guidance'. How much these instruments have influenced long-term rates remains controversial, but most estimates are below one percentage point. Gros (2016) argues that it has been probably much less; and the global downward trend of bond yields discussed here reinforces the view that the ECB's influence might be rather limited.

1. INTRODUCTION

The period since the beginning of the global financial crisis in 2008 has been an extraordinary one for central banks around the world, in the sense that policy rates have been close to zero in most advanced countries for several years. However, the focus on the period since the crisis hides the important fact that the decline in long-term rates had been going on for a long time.

The existence of this trend raises a profound issue: what is the importance of the actions of any one central bank if long-term rates throughout the developed world are driven by a common trend? Gros (2015) discusses a particular aspect of this issue by showing that long-term bond rates have tended to move together on both sides of the Atlantic and that there is little evidence that bond buying by central bank(s) has had a significant impact on this relationship.

Moreover, central banks can usually determine directly only most short-term rates via their own policy instruments, which usually involve only short-term operations. This limited influence of central banks in the long term, especially long-term real rates, is universally accepted. President Draghi has thus laid out the position of the ECB ¹:

“While structural factors drive long-term real rates, monetary policy influences interest rates over the short-term. But it does so only at the margin: central banks steer market rates relative to the level dictated by those structural forces. This alters the relative attractiveness of saving versus spending, and in doing so helps keep output around potential and ensures price stability.

Today, faced with a persistent output gap and too-low inflation, our monetary policy is stimulating the economy by steering market rates below their long-term levels. And since those long-term rates have fallen very low, it is inevitable that market rates have fallen to very low and even negative levels for an extended period of time to achieve the right level of demand support.

This has been the case not just for the euro area, but also for Japan, where central bank policy rates have been near zero since the mid-90s; for the US, where they have stayed near zero since 2008 and have been raised only once since, at the end of last year; and for the UK, where policy rates have been just above zero for 7 years now.

If central banks did not do this – i.e. if we kept interest rates too high relative to their real levels – investing would be unattractive, because the cost of borrowing would exceed the return. So the economy would stay stuck in recession. Conversely, by holding market rates below the real rate of return, we encourage the investment and consumption that is needed to bring the economy back to potential. That in turn creates the conditions for monetary policy to eventually normalise.”

This view is at first sight coherent in that it provides an explanation for why the policy stance of the ECB is both important and of limited importance in explaining the persistence of ultra-low rates.

This contribution will focus on one aspect, namely the global trend in bond yields and what this common global trend implies for the effectiveness of monetary policy in any one country. The next section illustrates first briefly the common trend in global long-term bond yields. It then discusses the longer-term, or ‘secular’ drivers of bond yields at the global level, looking separately at drivers on the savings and investment side. The next section then

¹ <https://www.ecb.europa.eu/press/key/date/2016/html/sp160502.en.html>

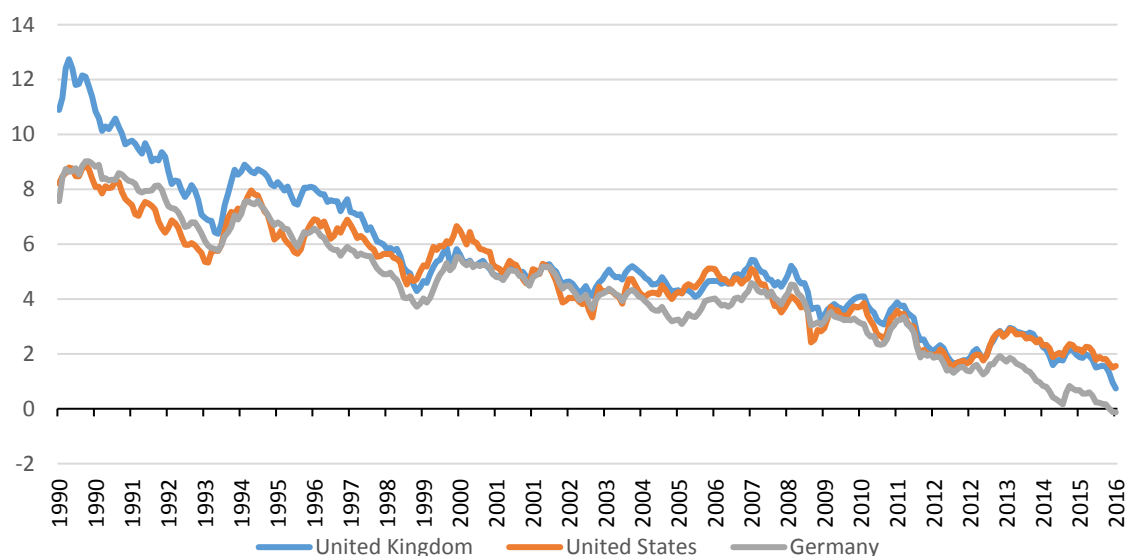
discusses the implications of this view of globally integrated markets for the effectiveness of the ECB's policy. Section 4 concludes.

2. SECULAR DRIVERS OF BOND YIELDS

The widely accepted view that the period since the beginning of the global financial crisis in 2008 has been an extraordinary one for financial markets and central banks is potentially misleading because the focus on the post-crisis period obscures the fact that rates had been declining for decades before the crisis.

Figure 1 below shows the (nominal) long-term government bond yields for the US, the UK and Germany (as representing the risk free rate for the euro area). It is apparent that there has been a common trend for over a quarter of a century. The very close alignment of the trend between these three currency areas suggests that flexible exchange rates and independent national monetary policies have not led to diverging paths of long-term rates. Moreover, the figure also shows that most of the time, but not always, German bond yields have been below US yields. However, the gap which has opened up in recent years seems unprecedented in size. Interestingly this gap opened up even before the ECB started its government bond buying programme. This is a first indication that the importance of QE might have been overrated.

Figure 1: Long-term interest rates in major currency areas since 1990



Source: OECD, 2016.

2.1. What drives real long-term rates? The framework

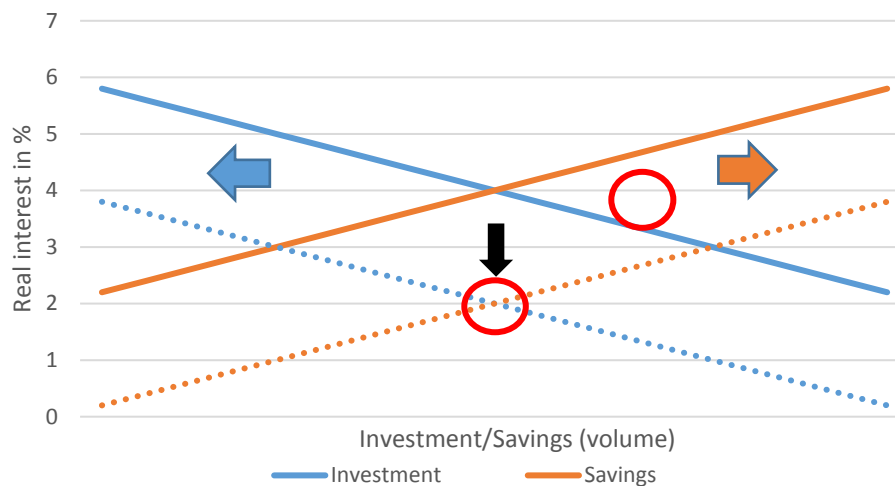
In order to find an explanation for the observed trend decline in global real interest rates, both theoretical and empirical literature has recently aimed to identify the secular drivers in a framework that takes the interest rate as the price that leads to equilibrium between the demand for investment and the supply of savings. This approach assumes that national capital markets are linked by one global market that leads to one global interest rate. This approach therefore focuses on global variables, for example the investment or savings to GDP ratios for the entire world and some weighted average of national interest rates.

The usual approach is simple: one assumes that there is a schedule that represents the supply of savings and the demand problem for investment, as depicted in Figure 2 below.

The demand for investment is assumed to decline if interest rates go up and vice-versa for savings.

The key point is that these supply and demand schedules can shift if other factors shift. For example, it is widely assumed that ageing might at first increase the amount of desired savings at any given interest rate. Ageing might thus lead, under certain conditions, to a shift of the supply curve of savings to the right, as depicted in the figure below. Investment demand is also widely assumed to be affected by growth prospects. This implies that a fall in trend or expected growth rates would lead to lower investment demand at any given interest rate. i.e. the demand curve for investment would shift to the left, as shown in figure 2 below. The implication is that an ageing world that grows more slowly as population growth slows might lead to much lower interest rates.

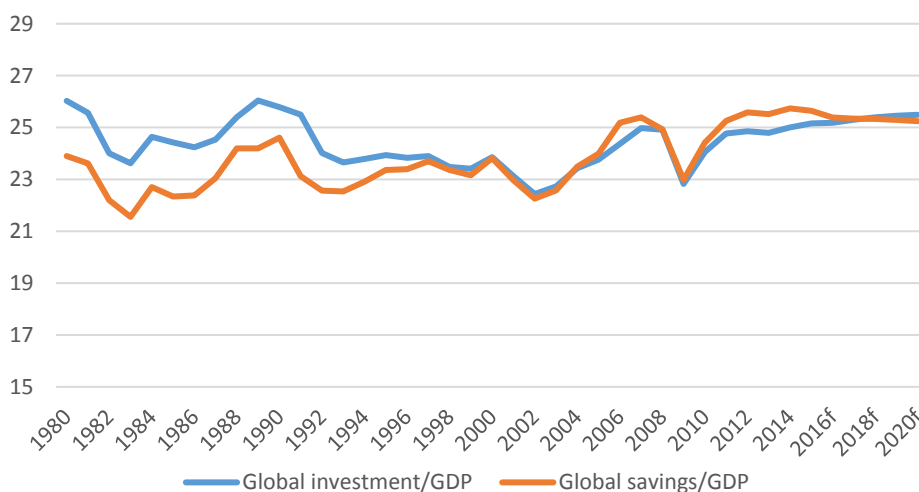
Figure 2: Savings and investment - possible equilibria



Source: Ludolph and Barslund (2016)

One should note that a shift in any one schedule alone would lead to lower rates and a change in the equilibrium savings and investment rates. But another stylised fact is that at the global level savings and investment rates have been rather stable over the same period as the observed decline in interest rates, as shown in Figure 3 below.

Figure 3. Global investment and savings



Source: IMF WEO 2016.

The natural conclusion is that only a contemporaneous shift in both supply and demand can have produced the combination of much lower rates and stable investment and savings rates.

The slope of the investment and savings curves is very difficult to pin down empirically. Bean et al. (2015) emphasise that even extreme cases, i.e. a complete insensitivity of either desired investment or desired savings cannot be ruled out². However, most of the literature assumes that this is not the case. Central banks are especially loath to accept this hypothesis as it would mean that their models of how interest rates are transmitted to the economy do not reflect reality.

The sensitivity of both savings and investment to changes in the interest rate has been analysed in a number of empirical studies. DeFina (1984) summarises all estimates that had been put forward by researchers by the time and finds that the percentage change in savings associated with a one percentage point increase in real interest rates varies widely between 0% and 5.8%. Recent calculations by the IMF (2014a) estimate the (semi-)elasticity of investment to the real interest rate to be about -0.5 , and an (semi-)elasticity of saving to the real rate of about 0.15 .

The strength of any reaction of savings or investment to interest rates can of course vary from country to country, but any analysis of the global capital market must assume that there exists a meaningful global average. The values of the (semi-)elasticities mentioned above imply that even small shifts in the curves can lead to significant changes in interest rates. For example, if the (global) savings schedule were to shift by only 1%. It would take a fall in interest rates of 6% to re-establish savings at the previous level. Conversely, this also implies that central banks would have to engineer huge falls in interest rates if the target were to lower savings. For investment the assumed sensitivity to interest rates is about 3 times higher. But even here major change would be required if policy were to target an increase investment. For example, it would take a fall of 4 percentage points in the relevant interest rate to increase investment by 2%. Given that investment represents only about 20% of GDP (in the euro area), this implies that the 2% increase in investment stimulated by a fall in interest rates of 4 percentage points would represent an increase in demand of only 0.4 % of GDP.

The uncertainty about the investment and savings schedules makes it difficult to explain why the observed phenomena is still high. Recent contributions have nevertheless analysed secular trends that coincide with the decline in real interest by using the averages of the estimates of the slopes mentioned above.

The following section thus briefly reviews recent analyses of secular drivers that may have shifted desired savings and investment. The period since the beginning of the global financial crisis in 2008 has been an extraordinary one for central banks around the world.

2.2. What drives bond yields? The evidence I: a savings glut?

As shown above, both the savings and investment schedules must have change to produce lower rates with constant savings (and investment) ratios. We start with factors that might have moved the savings schedule.

Age-saving profiles

Analyses on the effect of ageing on the real interest rate often make the assumption of a hump shape of savings, which is predicted by the life cycle model developed in the seminal contribution by Modigliani and Brumberg in 1954. The theory convincingly argues that saving takes place when people are in their high-earning years, typically starting in their late 30s

² See appendix for an illustration.

until they reach retirement. While the theoretical basis has been further established in extensions to the initial model, the fundamental empirical problem is that reliable country-level age-saving profiles cannot be studied using cross-sections. In order to disentangle cohort and time effects from the age-related propensity to save, panel data with sufficient waves and all relevant financial, as well as socio-economic variables, is required.

Börsch-Supan (2003) conducted the most comprehensive study on the issue by constructing synthetic panels from cross-sectional data. The authors analyse six advanced countries - the United States, the United Kingdom, Germany, the Netherlands, Italy and Japan – and their results indeed show the abovementioned hump shape for most countries. However, the analyses find differences in the exact shape of the age-savings profiles across countries that cannot be easily accounted for. Once again, available data does not allow us to disentangle the drivers of national propensities to save. Parts of the cross-country variation can be attributed to the generosity of domestic welfare systems and down-payment ratios; however, many other variables are not captured by standard survey data and therefore enter the residual, likely leading to unobserved heterogeneity³. Further problems arise from the level of aggregation in typical survey data. While some household characteristics can be controlled for, defining age as the age of the head of a respective household raises further issues because the head might change over the course of a panel.

It is for all the above reasons that the intuitive negative causal relationship from relative number of middle-aged citizens to the real interest rate is subject to uncertainty. The timing of the two appears too perfect for us not to ascribe at least parts of the decline in real interest rates to the increased number in the age-cohort with the highest propensity to save. However, despite the fact that this cohort will gradually enter into retirement over the next two decades, a complete reversion of the trend does not follow from the most sophisticated empirical analyses.

Within-country income inequality

While inequality between countries has fallen, within-country inequality has risen over the past few decades⁴. This observation has most remarkably been signalled by Piketty (2014). He illustrates the rising share of income held by the top decile of the population for a number of advanced and emerging economies.

The rising marginal propensity to save with an increase in income has been stressed by several country-level U.S. studies, starting with Dynan et al. (2004) who present evidence that the rich indeed save relatively more. These findings are supported by later U.S. studies (Saez and Zucman, 2014). We hesitate to establish a link between rising within-country inequality and the decline in real interest rates, however, for two main reasons:

First, while within-country has indeed risen in many OECD countries, detailed studies on the effect of rising inequality on savings are only available for the U.S. Second, as Bean et al. (2015) point out, the argument does not pass the timing test as the rise in within-country inequality began more than two decades before global real interest rates started declining.

Regardless of the causal effect of within-country inequality on global real interest rates, there appears to be no evidence of a trend reversal in the short to medium term.

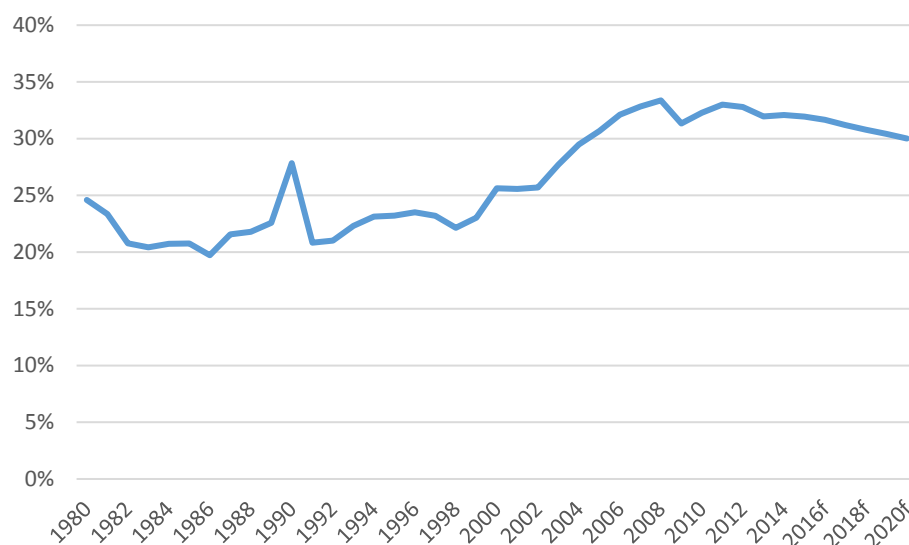
³ Standard panel data techniques cannot be applied to synthetic panels in the same way to eliminate confounding factors. In addition, even if longitudinal data were available, eliminating important factors obviously also limits our understanding of the underlying processes.

⁴ Note that we do not consider catch-up growth in this review as the mapping to real interest is highly uncertain. Neither the timing coincides with the decline in real interest nor is there convincing evidence that the income level of a country itself has an impact on the desired saving schedule.

Emerging markets savings and Chinese financial market integration

After 2000, emerging markets savings relative to GDP increased significantly. Figure 3 displays developments from 1980 to forecast values of 2020.

Figure 3. Emerging market and developing country saving rates as a percentage of GDP, 1980 to 2020



Source: IMF WEO, 2016.

The IMF (2014) notes that global saving rates went up by 1.7 percentage points in emerging economies between 2000 and 2007, of which 1.5 percentage points were due to higher emerging market savings, 0.8 percentage points were due to the higher share of emerging markets in global GDP and a 0.6 percentage point decline is explained by lower relative saving rates in advanced economies.

While foreign exchange accumulation in the aftermath of the 1997-1998 crisis in the whole of Asia has certainly contributed to higher demand for safe advanced-economy assets, Bean et al. (2015) stress that China in particular has been a drag on global interest rates. The combination of a rise in savings and large current account surpluses caused by China's export-led growth model led to an extensive outflow of funds. These went mainly into advanced economies where they dragged down real interest rates, enabled by Chinese financial market integration. Underlying drivers for high net saving rates are manifold and deeply rooted in all three sectors (Tao Yang, 2012). Ma and Yi (2010) identify corporate restructuring, the Lewis model of transformation and rapid ageing as the main driving forces. Ma and Tao Yang (2013) argue that in the medium term, these forces will plateau and slightly reverse. This is confirmed by IMF forecasts that predict a decline in both Chinese gross national savings and a more moderate current account. In the same vein, Chinese foreign exchange reserves have dropped sharply between the end of 2014 and 2016; however, latest numbers show that this trend is already halting (IMF, 2016a).

All in all, China and other emerging markets are unlikely to put further downward pressure on global real interest rates; but a complete reversal of current forces cannot be expected.

2.3. What drives bond yields? The evidence II: an investment strike?

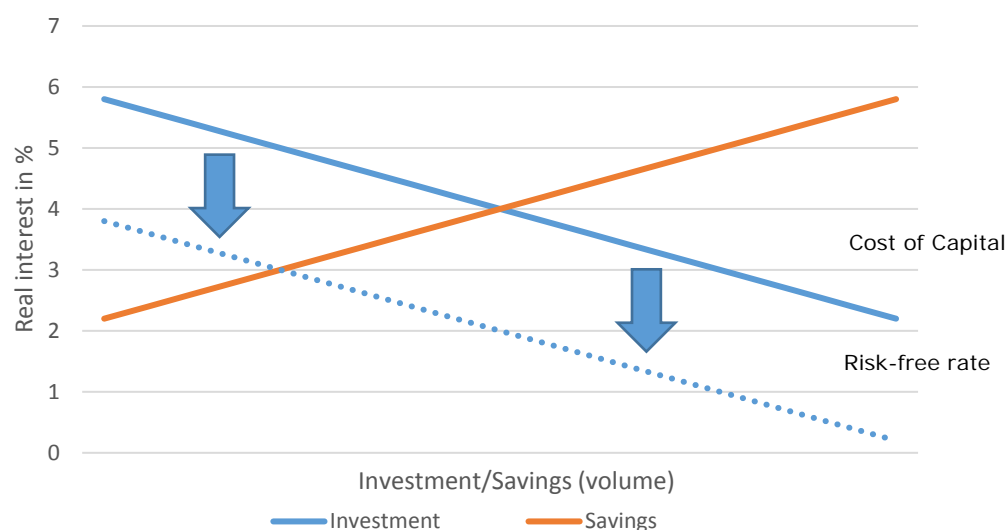
We now turn to factors that might have reduced investment (Ludolph and Barslund, 2016).

The price of risk may have risen

The focus here is on explaining the decline in the yield on government bonds yields, which typically represent the risk-free interest rate. However, investment decisions do not depend on the risk-free rate, but the cost of capital, which in turn can be decomposed in a risk-free rate plus a risk premium. If the risk premium increases one would expect that desired investment falls, even if the riskless rate does not change. An increase in the risk premium can thus be thought of as a shift downwards of the investment schedule, which would lead (at an unchanged savings schedule) to a lower risk-free rate. An increase in the risk premium (on the financing of investment) is thus equivalent to a shift of the investment schedule to the right.

A similar decomposition can be seen if one looks at how investment decisions are taken at the level of the enterprise. The key decision variable for investment decision is usually the expected rate of return from a project relative to the weighted average cost of capital (WACC), the weighted average of a company's debt servicing costs and its cost of equity. When the equity risk premium goes up, the WACC increases vis-à-vis the risk-free rate, making corporate investment relatively less attractive.⁵

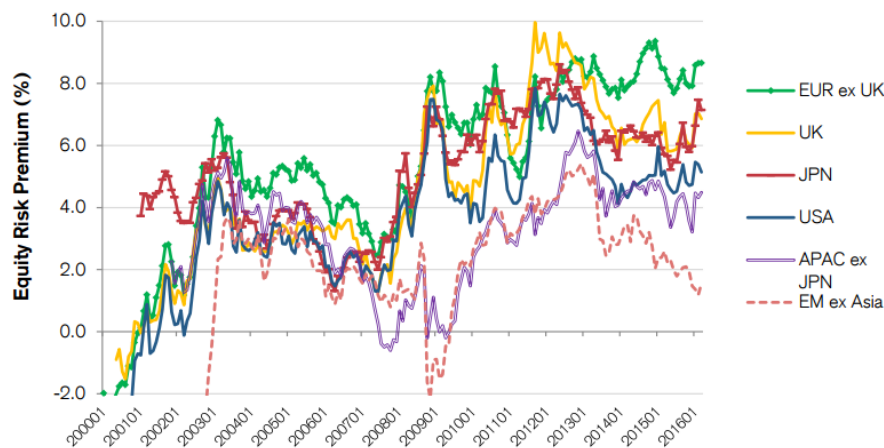
Figure 4: Impact of an increase in the equity risk premium



Source: Ludolph and Barslund (2016).

The risk premium seems indeed to have been rather volatile over the last decade or so. Figure 5 below shows estimates of the aggregate equity risk premium for most advanced and emerging economies between 2000 and 2016.

⁵ Note that it is the rise in the equity premium, not its existence as such that triggers the result.

Figure 5. The equity risk premium, 2000-2016, beginning of year data

Source: Credit Suisse (2016)

Overall, the equity risk premium has increased globally, with the exception of emerging market economies where it fluctuated around a constant level over the time period under consideration.

It needs to be emphasised that the risk premium can only be roughly estimated, usually from dividend yields and stock market prices. However, many different estimates of the risk premium yield similar results in that there appears to have been a clear increase in the risk premium. The reasons for this increase in the risk premium are not quite clear. A shift in preferences towards safe assets among investors is one that is often cited.

However, the increase in risk aversion among investors is mostly observed across asset classes, not within them. Emerging market sovereign bonds premia have not risen over the past two decades, while the spread between corporate and sovereign bonds has remained more or less constant (Bean et al., 2015; Rachel and Smith, 2015).

Relative price of capital goods

Cheaper capital may have two effects on investment: first, it may trigger more investment as lower returns are needed. Second, a given amount of investment can be maintained by dedicating a smaller share of overall production to capital-intensive projects. As illustrated convincingly by Rachel and Smith (2015), the 30% decline in the relative price of capital goods since the 1980s had an overall negative effect on investment as the elasticity of substitution between labour and capital is not sufficiently high (see also Thwaites, 2015).

Reduced profitability of investment

The above decline in the relative price of investment was predominant until the early 2000s. In the aftermath of the global financial crisis, a different force took over: a drop in investment profitability (IMF, 2014). In the near to medium term, we do not expect higher substitutability between labour and capital, nor do we see any signs of increasing investment profitability, absent substantial structural reforms.

The decline of public investment in advanced economies

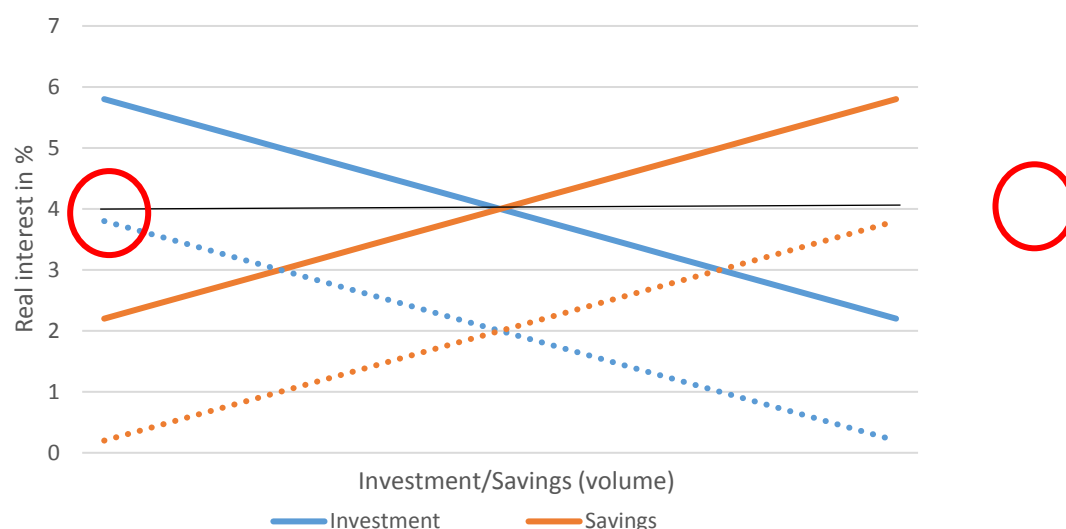
Public investment in advanced economies has been on a declining path since the 1980s, putting downward pressure on real interest rates (IMF, 2014b). Latest IMF (2016b) analyses do not predict a reversal of this trend in the near future.

3. WHAT CAN THE ECB ACHIEVE? GLOBAL VERSUS LOCAL INTEREST RATES

As mentioned above, the literature on the determinants of global interest rates assumes that all relevant national capital markets are linked via the global capital market so that in the end the interest rate is the same everywhere. If one accepts this hypothesis national central banks could not influence bond yields in their own jurisdiction because any slight change in a national (or currency area) interest rate would attract such large capital flows that any incipient interest rate differential would disappear very rapidly.

With globally integrated capital markets, i.e. assuming perfect capital mobility, countries could borrow and lend abroad whenever they need to invest or disinvest, without being constrained by domestic saving decisions. A country hit by a shock (affecting the saving-investment balance) and not large enough to affect the global equilibrium (i.e. the interest rate), would then develop either a current account surplus (i.e. domestic saving exceeds domestic investment) or a current account deficit (i.e. domestic saving falls short of domestic investment).

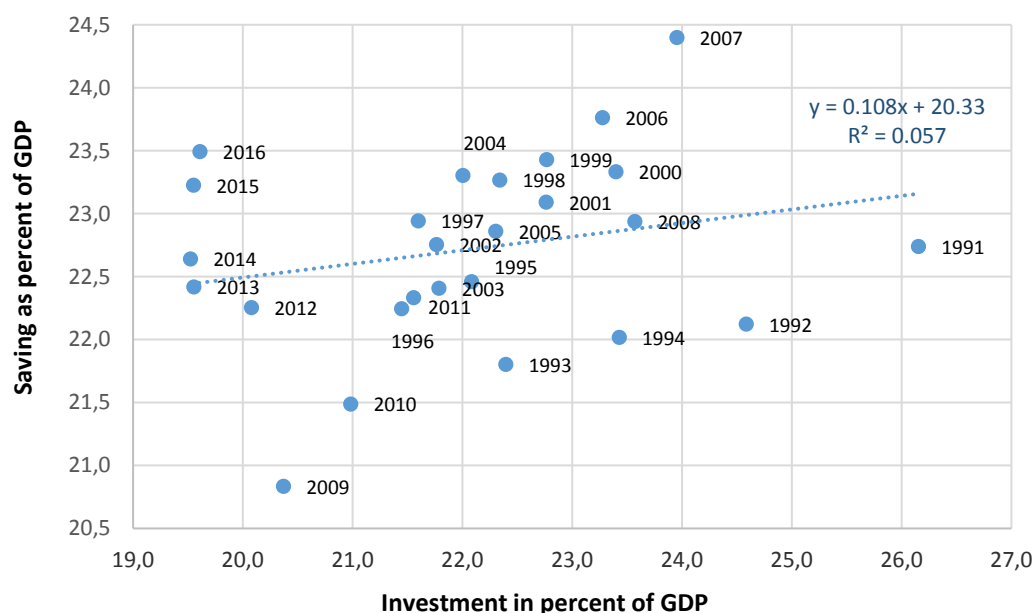
Figure 6. The impact of shifting savings and investment schedules with globally integrated capital markets



Source: Ludolph and Barslund (2016)

As an illustration Fig. 6 shows the same shifts in the savings and investment schedules as those used to illustrate global equilibrium. The resulting shift in the equilibrium is now totally different: if the investment schedule shifts left, for example because of higher risk premia due to the euro crisis, investment will fall to the point where the new investment schedule intersects with the unchanged interest rate (red circle to the left). If savings increase, for example because of the ageing of the euro area population, savings will likewise increase up to the point where the new savings schedule intersects the unchanged interest rate (red circle to the right). The result will be current account surplus, as savings will exceed investment. This is indeed what seems to have happened in the euro area since the outbreak of the euro crisis.

This insight that savings and investment should be able to evolve independently if global capital markets were fully integrated was first developed and tested empirically by Feldstein and Horioka (1980).

Figure 7: Investment and savings in the euro area

Source: own calculations on IMF (WEO) data.

Figure 7 shows the data for the euro zone since 1991. These data do not suggest any relationship between savings and investment. This would tend to support the hypothesis of globally integrated capital markets. The changes since the crisis confirm this impression: since 2008 investment has fallen severely in the euro area, whereas savings have tended to remain roughly constant.

As mentioned above, it becomes difficult to see a major role for the ECB in affecting (long-term, real) bond yields if the euro area capital market is integrated into the global capital market. Under the hypothesis of full integration action by the ECB would be totally ineffective to change rates in the euro area. One can of course imagine channels through which the ECB would still have some influence on euro area bond yields. For example, capital market integration might not be 100%, for example, because of currency risk, implying that a difference between domestic savings and investment is not always fully offset by capital flows, permitting a small difference between euro area and global interest rates. Moreover, one could argue that the global 'equilibrium' rate represents some long-term value which might be the same for all countries (with open capital markets), but in the short term local interest rates could remain slightly different from this global long-term equilibrium value.

However, even if one accepts these arguments, it remains clear that action by the ECB can at most have a temporary and probably marginal impact on bond yields in the euro area. This is also the impression one gains from the data on (nominal) bonds yields presented above, which showed that the transatlantic interest rate differential has rarely been larger than one percentage point.

4. CONCLUSIONS

This contribution has focused on the secular drivers of long-term interest rates. Recent empirical literature has found that it might be possible to reconcile two observations: first, that interest rates have declined throughout the developed world, following a common trend, and second, that the global investment and savings ratios have remained roughly constant.

It seems possible to explain these two developments through the impact of ageing, lower growth and an increase in the risk premium on global capital markets. Since these secular drivers of lower rates are unlikely to change quickly, one must conclude that low rates are likely to remain for some time.

One conclusion that is often drawn from this perspective of 'low for long' is that inflation targets should increase because the world capital market might need negative real rates to remain in equilibrium. Since bond yields cannot go much into negative territory, under certain circumstances this might require an inflation rate higher than 2%. Given the uncertainty surrounding the level of equilibrium rates today (as opposed to the decline, which seems indisputable), the need for higher inflation targets seems debatable. But this issue was not discussed here.

This contribution has instead emphasised another implication for monetary policy, which is often overlooked: if global drivers are behind low bond yields everywhere, the ECB might not be able to influence them in the euro area.

In other words, with integrated global capital markets national monetary policy can no longer be expected to have an impact on bond yields at home. The evidence seems to support this view. Activism by the ECB, for example, extending the bond purchase programme, might thus be largely ineffective.

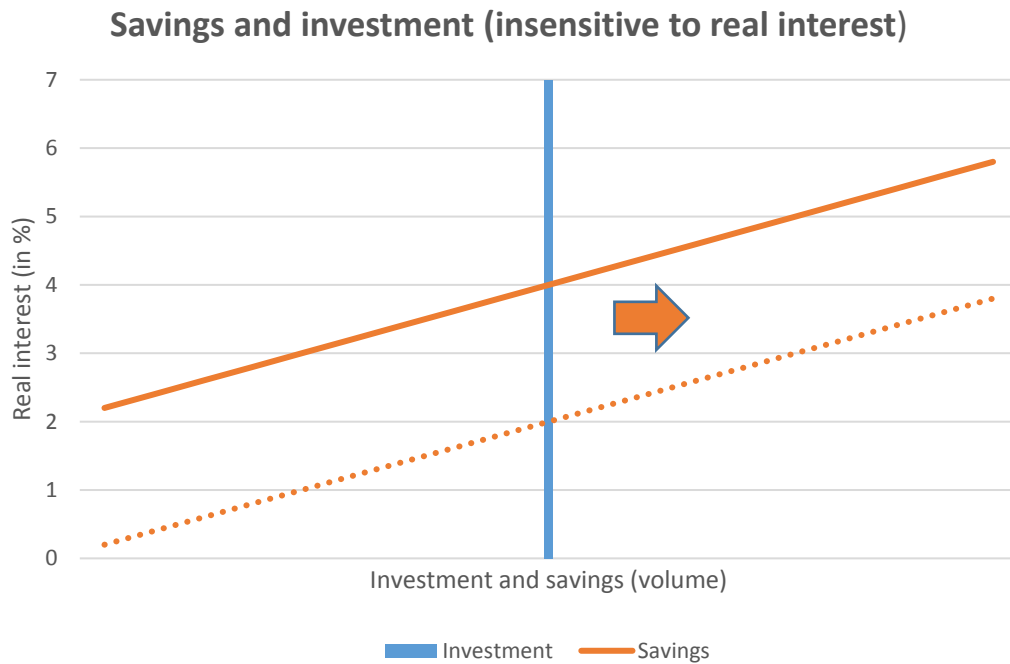
There is a different area where action might be required. The 'low for long' scenario is now priced in the market. This implies that a normalisation of rates (i.e. a return to higher levels) could lead to financial stability problems if the value of bonds held by financial intermediaries declines suddenly. This is an issue that deserves further research and close attention by the authorities.

REFERENCES

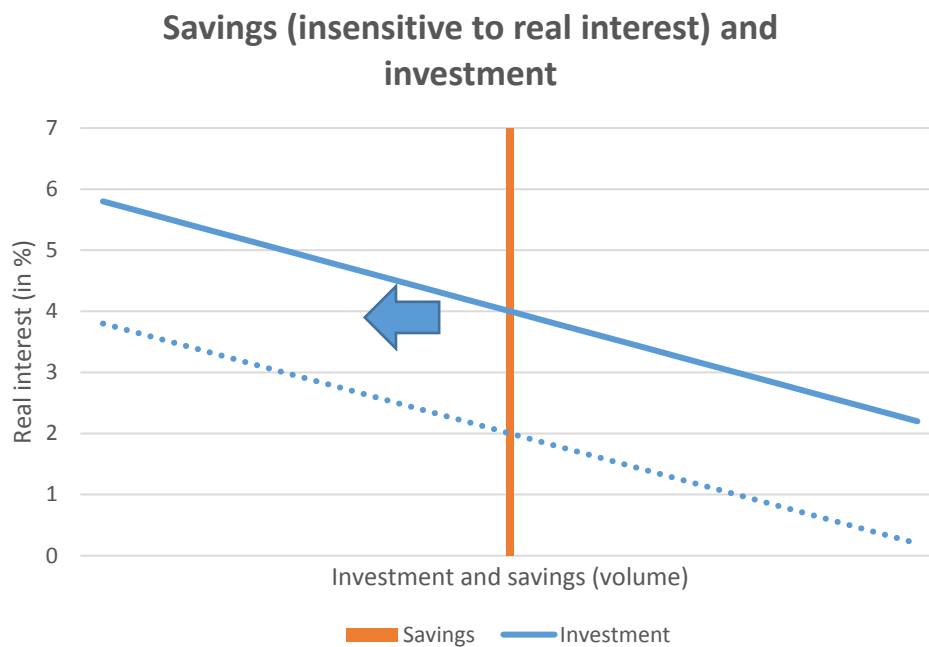
- Allianz Global Investors. 2016. QE Monitor April 2016 - Focusing on policy implementation (for now). Available online at: https://www.allianzglobalinvestors.de/MDBWS/doc/QE+Monitor_May+2015_e.pdf?4bc8334c2b03239835b06160629ef69e41f64da6
- Bean, C., C. Broda, T. Ito and R. Kroszner. 2015. Low for long? Causes and consequences of persistently low interest rates. Geneva Reports on the World Economy, CEPR Press
 - Börsch-Supan, A. 2003. Life-Cycle Savings and Public Policy: A Cross-National Study of Six Countries. Academic Press, San Diego, USA
 - Breedon, F., J. S. Chadha and A. Waters. 2012. The financial market impact of UK quantitative easing. BIS Papers No 65
 - Brumberg, R. and F. Modigliani. 1954. Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data. In K. Kurihara, ed., Post Keynesian Economics, Rutgers University Press, New Brunswick
 - Credit Suisse. 2016. HOLT Macro Insights – March 2016. Credit Suisse Market Commentary
 - DeFina, R.H. 1984. The link between savings and interest rates: a key element in the tax policy debate. Business Review, Federal Reserve Bank of Philadelphia
 - Draghi, M. 2016. Addressing the causes of low interest rates. Speech held at the panel on "The future of financial markets: A changing view of Asia" at the Annual Meeting of the Asian Development Bank, Frankfurt am Main, 2 May 2016, available online at: <https://www.ecb.europa.eu/press/key/date/2016/html/sp160502.en.html>
 - Dynan, K. E., J. Skinner and S.P. Zeldes. 2004. Do the Rich save more? Journal of Political Economy, Vol. 112, No. 2
 - Feldstein, Martin; Horioka, Charles (1980), "Domestic Saving and International Capital Flows", Economic Journal, 90 (358): 314–329
 - Gros, Daniel (2016) "Effectiveness of the ECB programme of asset purchases:
 - Gros, Daniel (2016) "QE infinity: What risks for the ECB?", In-depth analysis, IP/A/ECON/2016-01, February 2016, <http://www.europarl.europa.eu/committees/en/econ/monetary-dialogue.html>.
 - IMF (2014), 'Perspectives on Global Real Interest Rates in World Economic Outlook, Chapter 3, <http://www.imf.org/external/Pubs/ft/weo/2014/01/pdf/text.pdf>.
 - International Monetary Fund. 2014a. Perspectives on global real interest rates. Chapter 3 IMF World Economic Outlook April 2014
 - International Monetary Fund. 2014b. Is it time for an infrastructure push? The macroeconomic effects of public investment. Chapter 3 in IMF World Economic Outlook October 2014
 - International Monetary Fund. 2016a. Time Series Data on International Reserves and Foreign Currency Liquidity. Available online at: <https://www.imf.org/external/np/sta/ir/IRProcessWeb/data/8802.pdf>
 - International Monetary Fund. 2016b. Fiscal Monitor: Acting Now, Acting Together. Washington, April
 - International Monetary Fund. 2016c. Article IV consultation on Belgium. IMF Country Report No. 16/77
 - Ludolph, L. and M. Barslund. 2016. Could the decrease in Belgian government debt servicing costs offset increased age-related expenditure? *Forthcoming working paper within the framework of the BelAge project*

- Ma, G. and D. Tao Yang. 2013. China's High Saving Puzzle. IZA Discussion Paper No. 7223
- Ma, G. and W. Yi. 2010. China's high saving rate: myth and reality. BIS Working Papers No 312
- Organisation for Economic Co-operation and Development. 2015. OECD Economic Outlook, Volume 2015 Issue 1
- Piketty, T. 2014. Capital in the 21st Century. Harvard University Press
- Rachel, L. and T. Smith. 2015. Secular drivers of the global real interest rate. Bank of England Staff Working Paper No. 571
- Saez, E and G. Zucman. 2014. Wealth inequality in the United States since 1913: evidence from capitalized income tax data. NBER Working Paper No. 20625
- Tao Yang, D. 2012. Aggregate Savings and External Imbalances in China. IZA Discussion Paper No. 6964
- Thwaites, G. Why are real interest rates so low? Secular stagnation and the relative price of investment goods. Bank of England Staff Working Paper No. 564
- Where do we stand?", Monetary Dialogue 21 June 2016,
<http://www.europarl.europa.eu/committees/en/econ/monetary-dialogue.html>.

APPENDIX



Source: Ludolph and Barslund, 2016



Source: Ludolph and Barslund, 2016

NOTES

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Ultra-low/negative yields on euro area long-term bonds: causes and implications for ECB monetary policy

Jacob Funk KIRKEGAARD

IN-DEPTH ANALYSIS

Abstract

Today's ultra-low nominal long-term bond yields in the euro area are the result of a combination of highly expansionary ECB monetary policies, deep-rooted risk factors for long-term investors in the real economy and the relative lack of additional supply of bonds from euro area governments. In contrast to nominal yields, real long-term bond yields in the euro area today are not at previously unseen low levels. The ECB's ability to conduct monetary policy in the future will be constrained by today's low long-term yields, though the latter are not the main threat to euro area banking system stability. Today's low yields are overall good for euro area consumption, but could over time cause trouble for parts of the euro area insurance and life insurance industries, as well as drive public discontent up in some of the euro area members with less internationally linked national financial systems.

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EXECUTIVE SUMMARY

This paper in the first section makes the case that today's exceptionally low long-term nominal interest rates in the euro area are the outcome of three distinct sovereign bond market circumstances. First the ECB's highly accommodative monetary policies, particularly the public sector purchase program (PSPP), which together with today's ultra-low short-term policy rates, ECB forward guidance on policy rates, and 4year central bank liquidity to banks at rates potentially as low as the -40bp deposit rate, have put significant downward pressure on long-term sovereign bond yields. Secondly, several deep-rooted structural risk factors in the euro area (and indeed global) economy induce market participants to accept today's extremely low nominal returns. These include Europe's current demographic tipping point, raising doubts about the region's long-term growth potential; today's extraordinary degree of political risk, potentially undermining the electoral dominance of the traditional governing centrist parties in Europe; and the evident lack of additional macro-economic fiscal and monetary stimulus with which to in a timely and containing manner withstand the next cyclical economic downturn. And thirdly the continuing unwillingness of governments in the euro area to respond to the strong bond market price signal through increased net bond issuance, helping to keep bonds scarce, expensive and low yielding.

The paper illustrates how, when shifting the focus from nominal to real long-term yields in the euro area, today's situation comes at the end of a long period of declining real long-term rates. And that in real terms, market investors have been willing to accept significantly negative real yields in the core euro area for a number of years, making today's situation in real yield terms a historically recurring event.

The paper in its second section argues that today's exceptionally low nominal long-term bond yields will constrain future ECB options for additional monetary stimulus, and that recent years' "non-standard monetary policy instruments" will in the future be required tools for the ECB to counter even normal cyclical downturns. Monetary policy in the euro area will be more complex in the future and will not, as early in the euro era, be able to be conducted almost exclusively through varying the ECB short-term policy rates. The paper proceeds to argue a relatively limited impact of ultra-low nominal long-term bond yields on the euro area banking sector stability, though an extension of today's low yields will put pressure on bank business models relying exclusively on net interest rate margin income from maturity transformation of deposits. Today's low long-term yields are seen as generally supporting consumption in the euro area by redistributing resources from low-consuming savers to higher consuming borrowing groups in the economy. Current bond market long-term prices and yields should moreover be expected to cause trouble for some insurance and life insurance businesses focusing long-duration guaranteed return products. And lastly, the degree of internationalization and cross-border linkages of national financial systems are crucial determinants of how today's low long-term yields are transferred to the real economy in individual euro area members. Savers in euro area members with relatively isolated national financial systems and correspondingly fewer options to shift their savings into alternative non-domestic investments will suffer more financially from today's low long-term yields and will as a result be more prone to mobilize politically against especially the current ECB monetary policy.

1. INTRODUCTION

In recent quarters, nominal euro area sovereign bond yields have declined to unprecedented low levels. In most euro area members, nominal rates are now negative for at least shorter maturities, including in previous crisis economies such as Ireland, Spain and Portugal, while for German bonds nominal sub-zero yields now extend to the benchmark 10y maturity¹. Figure 1 illustrates the situation in late August 2016 for relevant euro area members and select non-euro area countries.

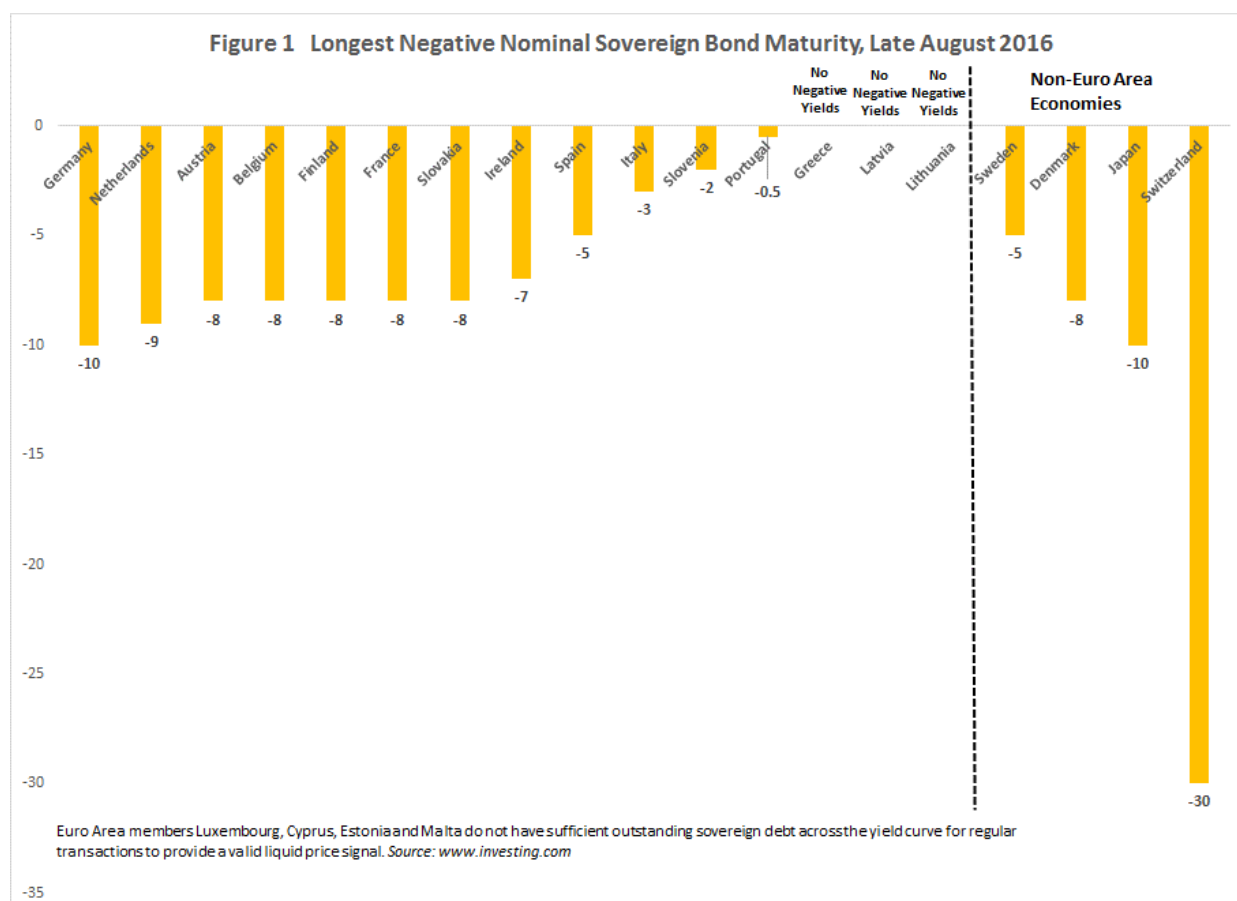


Figure 1 shows how the present-day German bond market situation, despite its headline grapping negative nominal 10y bond, is not really that different from a number other euro area members, whose negative yields begin at only marginally shorter 8y and 9y maturities. Negative nominal bond yields moreover are not confined to the euro area, but are today found also in Sweden, Denmark, Japan and (in particular) Switzerland.

Negative nominal short term yields to a large extent reflect the impact of ECB monetary policy decisions, while their extension into also longer maturities stem from a combination of central bank actions, sovereign bond market participant (e.g. buyers) behaviour, and euro area government (e.g. sellers) policies.

This paper will in section 2 analyse these three main factors for today's low nominal yields in the euro area, in section 3 evaluate the implications hereof for financial stability and future ECB policy freedom, before drawing conclusions at the end.

¹ Yield curve data for all euro area members accessed at <http://www.investing.com/rates-bonds/> on August 26th 2016.

2. THE CAUSES OF TODAY'S RECORD LOW EURO AREA BOND YIELDS

2.1. ECB monetary policy

The ECB as the euro area central bank controls the short-term policy interest rate in the common currency area, and as such is directly responsible for today's ultra-low cash and very short-term interest rates in the euro area. In response to persistently low euro area headline inflation levels and subdued economic growth, the ECB has however introduced four policies, which in combination have direct implications for also longer-term bond yields in the euro area.

First, all ECB short-term policy rates are now at all-time lows ². Since June 2014, the ECB has operated with a negative deposit rate, hereby charging banks for any overnight deposits they make with the central bank. Today, the ECB's deposit rate is set at -40bp. The ECB's main refinancing rate, at which it provides the majority of liquidity to the euro area banking system, is at zero³ and the marginal lending facility at which banks can access emergency liquidity is at 25bp. This set of policies independently dictate that euro area over-night and other very short-term interest rates on cash-like instruments (typically up to 3-6months maturities) will be very close to zero.

It important to recognize that the ECB's so-called "negative interest rate policy" concerns only the central bank's deposit rate, or in other words the cash that euro area banks hold, but for various reasons choose not to lend out or store in other ways than with the ECB. The ECB's regular liquidity provision to banks remain free to banks, and negative ECB policy interest rates in the euro area hence concern only a very small part of overall ECB monetary support for banks, and do not directly affect an interest rate faced by non-bank actors.

Secondly, the ECB in June 2016 conducted its first of four so-called targeted long-term refinancing operations (TLTRO-II)⁴, allowing euro area banks once again access to unlimited long-term 4y liquidity at no more than the main refinancing rate (e.g. zero) and, provided the bank in question increase its lending to the real economy, possibly at rates as low as the -40bp ECB deposit rate level. If euro area banks in other words lend more to euro area businesses and consumers, the ECB will pay them a negative interest rate on the cash with which to do so. The TLTRO-IIs are designed to allow euro area banks to lower their cost of liquidity further, and the first June 24th auction ⁵ saw 514 euro area banks take €399bn in new (at least) no cost liquidity, while repaying only €368bn ⁶ of earlier more expensive 4y TLTRO-I liquidity⁷, indicating a €31bn net increase in (cheaper) long-term liquidity provision to euro area banks. The fact that euro area banks hence have as 4y liquidity (early repayment after 2y is an option, but potentially only repayable by banks from 2020 onwards) available to them as they want at between 0 and -40bp suggests a very, very flat yield curve in the euro area for the duration of TLTRO-IIs.

Thirdly, the ECB has since July 2013 engaged in an explicit forward guidance regarding the future path of interest rates by communicating how it *"expects the key ECB interest rates to remain at present or lower levels for an extended period of time"*⁸. By signalling to financial markets that short-term policy rates will remain at current record low levels well

² <http://www.ecb.europa.eu/stats/monetary/rates/html/index.en.html>

³ The [minimum reserves \(MMR\)](#) liquid deposits euro area banks are obliged to keep with the ECB are similarly remunerated at zero at the moment.

⁴ https://www.ecb.europa.eu/press/pr/date/2016/html/pr160310_1.en.html

⁵ <http://www.ecb.europa.eu/mopo/implementation/omo/html/20160065.en.html>

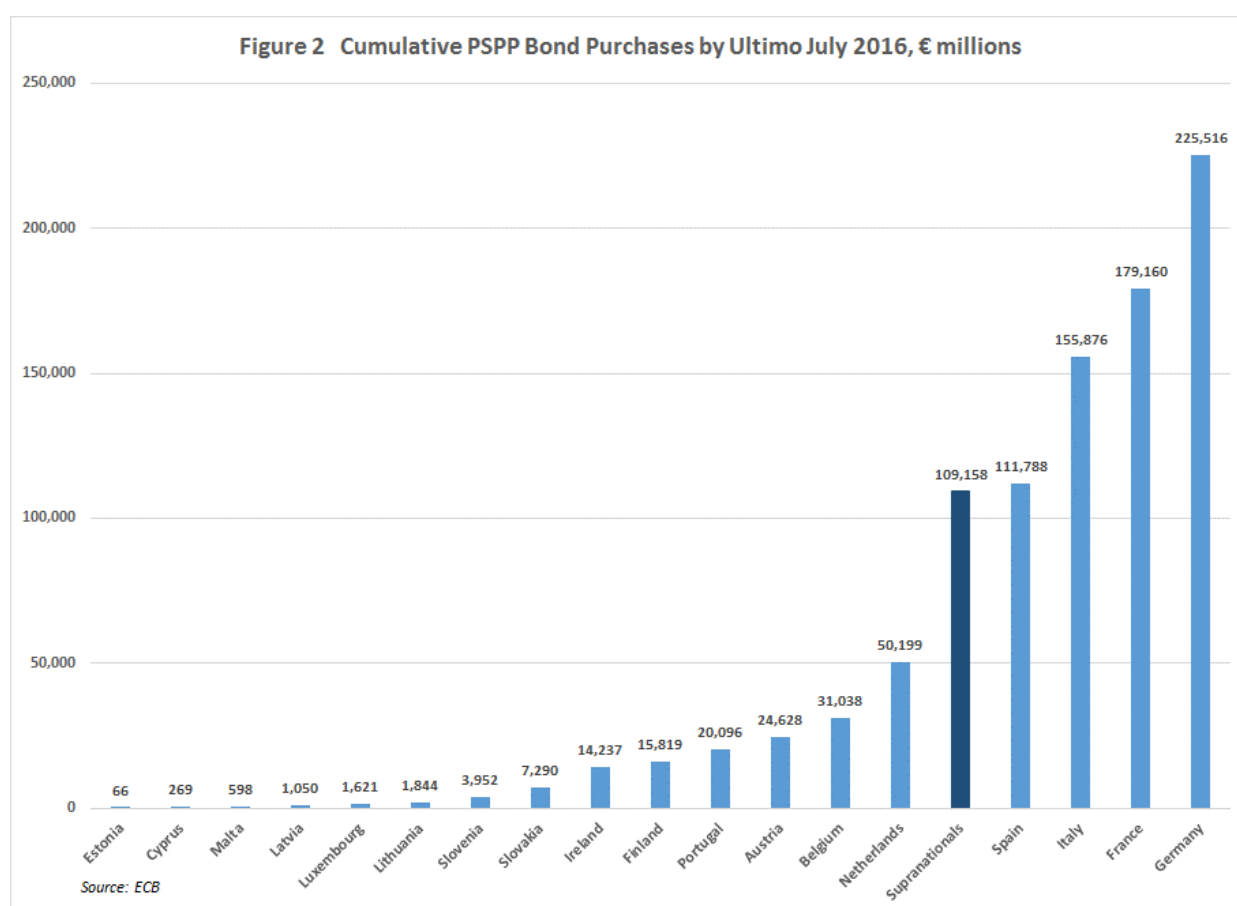
⁶ <http://www.ecb.europa.eu/press/pr/wfs/2016/html/fs160706.en.html>

⁷ [TLTRO-I liquidity](#) was offered from September 2014 at the main refinancing rate of 5bp, plus a spread of 10bp, indicating that euro area banks save up to 15bp from an early rolling of their long-term loans (otherwise only due in September 2018) from the ECB into the TLTRO-II program.

⁸ See ECB (2013) for a detailed description.

into the future, expectations and financial market arbitrage⁹ will work to push the shorter end of the yield curve downwards for at least as long as the central bank's guidance is deemed credible. In the case of the euro area, where today's prolonged period of low inflation and subdued economic growth is projected to last several years into the future, the ECB's current forward guidance is viewed as credible for at least 3-4y into the future with financial markets pricing the ECB's first increase in its policy rate only well into 2019.

Fourthly, the ECB has since October 2014 been engaged in several open-ended asset purchase programs, including beginning in March 2015 the by far largest program, the Public Sector Purchase Programme (PSPP) of euro area sovereign bonds¹⁰. To date (end-July 2016), the ECB has under the PSPP program purchased a total of €954bn worth of euro area sovereign and supra-national bonds with an average maturity of 8.3y.¹¹ Currently, ECB purchases of member states' sovereign (and agency) bonds are weighted according to the ECB capital key (e.g. member state GDP), while supranational bonds are intended to account for 10 percent of total purchases. Figure 2 shows the distribution of PSPP purchases by the ECB at the end of July 2016.



Given how total euro area consolidated gross debt (excluding Greece) when the PSPP program began in 2015 was €9.4tr, of which about €8.3tr is issued in debt between the 2 and 30 years maturities eligible for PSPP purchases, ECB buying of to date roughly €845bn of member state debt, means that the ECB today owns about 10 percent of such PSPP-

⁹ When expectations are firm that short-term interest rates will not change in the near future, the price today of continuously rolling over short-term liquidity (say 1month credit every month for 12 months into the future) will not deviate much from today's price of a single credit instrument of the same total maturity (here a 1y bond).

¹⁰ The four current ECB asset purchase programs are the Asset-Backed Securities Program, the Covered Bond Purchase Program 3, the Corporate Sector Purchase Program and Public Sector Purchase Program.

¹¹ <http://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>

eligible member state debt¹². Purchases of that magnitude will invariably have put significant downward pressure on euro area member states' entire yield curve. And while it is near impossible to disentangle the individual effects of one specific ECB policy measure on euro area bond prices, it seems safe to assume that the PSPP has caused the by far largest single downward shift in the yield curve. This conclusion is strengthened by the witnessed similar dramatic decline in euro area corporate bond yields (including the first 2-3y maturity issuances with a negative yield by non-government owned firms), following the first outright ECB corporate bond purchases in June 2016. As such, the PSPP asset purchases have proven a very effective way in which to ease monetary policy in the euro area.

As the ECB's GDP-weighted purchase scheme operates without explicit consideration of the availability of member state general government debt for purchase¹³, the significant differences in euro area members' current levels of outstanding eligible debt invariably produce different market impacts of PSPP purchases in individual countries. A far higher percent of eligible Slovakian debt (almost 20 percent of outstanding amounts) has for instance to date been purchased by the ECB than for the euro area as a whole, resulting (see figure 1) in its government yield curve being deeply negative, despite the country's relatively lower wealth levels than core founding members of the euro area.

All told, it is beyond doubt that ECB policies, and in particular the PSPP program in recent years have been instrumental in lowering euro area long-term government bond rates to current historically low nominal levels¹⁴. ECB non-standard actions have consequently been successful in providing powerful monetary stimulus, even after the standard short-term policy interest rates reached the zero-bound.

2.2. Sovereign bond market participant (buyers') action

Even as ECB policies have been the most powerful agent of recent downward pressure on euro area sovereign bond yields, long-term bond prices remain set in a market not wholly controlled by the ECB and therefore affected by other supply and demand factors. Even as the ECB has been by far the largest recent purchaser of euro area sovereign bonds, private and other bond market investors continue to hold the vast majority (about 90 percent) of euro area general government debt. Traditional private sovereign bond buyers will, as a direct result of ECB policies, have enjoyed a potentially sizable one-off capital gain on their existing sovereign bond holdings (and indeed given the anchoring role of the sovereign risk free rate on large parts of any euro denominated fixed-income asset portfolio). Particularly for banks and other asset managers, which in the longer-term faces potentially significant negative effects from the very flat yield in the euro area today, this short-term profit gain offers at least some temporary financial respite.

When it comes to euro area long-term bonds, it is similarly important to avoid money illusion (e.g. valuing assets in nominal and not real terms). Nominal long-term euro area bond yields have indeed dropped to unprecedentedly low and frequently negative levels in recent months, but that has in real terms been largely offset by declines in euro area inflation levels. Euro area real longer-term sovereign bond yields are hence today very low, but not

¹² In comparison, the Federal Reserve today owns about \$2.5tr of U.S. federal government debt, or about 13 percent of the \$18.8tr total. See <https://www.nationalpriorities.org/campaigns/us-federal-debt-who/>

¹³ The ECB's identification of eligible agencies located in individual euro area member states does to a certain extent offer the ECB the ability to increase the amount of member state assets available for purchase. The ECB expansion of the PSPP to also include eligible (e.g. investment grade rated yielding above -40bp) local government debt in the PSPP in December 2015 similarly made a substantial additional pool of public sector assets available for purchase. This is particular the case in the federal country of Germany, where almost 40 percent of potentially eligible longer-maturity (at least 2y) general government debt is issued by state and local governments.

¹⁴ This is also the conclusion of the ECB's own recent research of the topic in ECB (2016).

at historically exceptionally low levels either in the aggregate or individual member state level. This is illustrated in figure 3.

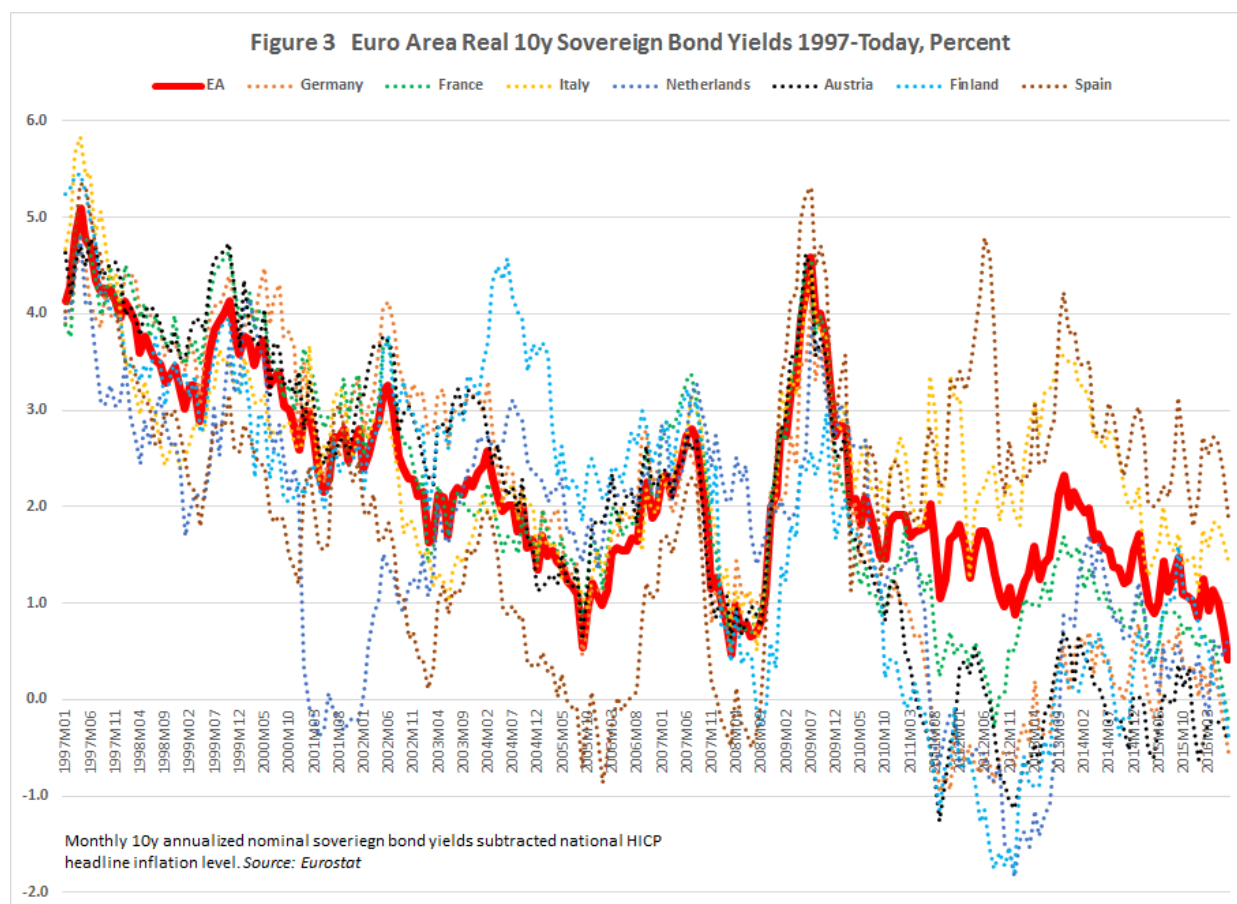


Figure 3 shows the long-term decline in real long-term sovereign rates in the euro area in the late 1990s and early 2000s, how real rates increased dramatically with the collapse of inflation during the global financial crisis, came down quickly, were steady from 2010 to 2014 and then began to drop again. Yet, the euro area average real 10y rate today is not lower than it was briefly in 2005 and 2008. Figure 3 moreover illustrates how since 2010, core euro area economies have on-off had negative real long-term bond rates, while crisis economies like Spain and Italy faced dramatically higher real rates. In real terms, the situation facing long-term bond investors in the euro area core today is hence not materially different than what it has been for the last five years. When looking at real returns, it was hence the voluntary choice of private investors to pile into safe haven core euro area long-term bonds, much more than subsequent monetary policy that drove yields downwards. The ECB's policy actions to stabilize the euro area, especially after mid-2012, indeed helped offset market driven declines in 2010-11 and increase core long-term real yields, as well as reduce them in the periphery.

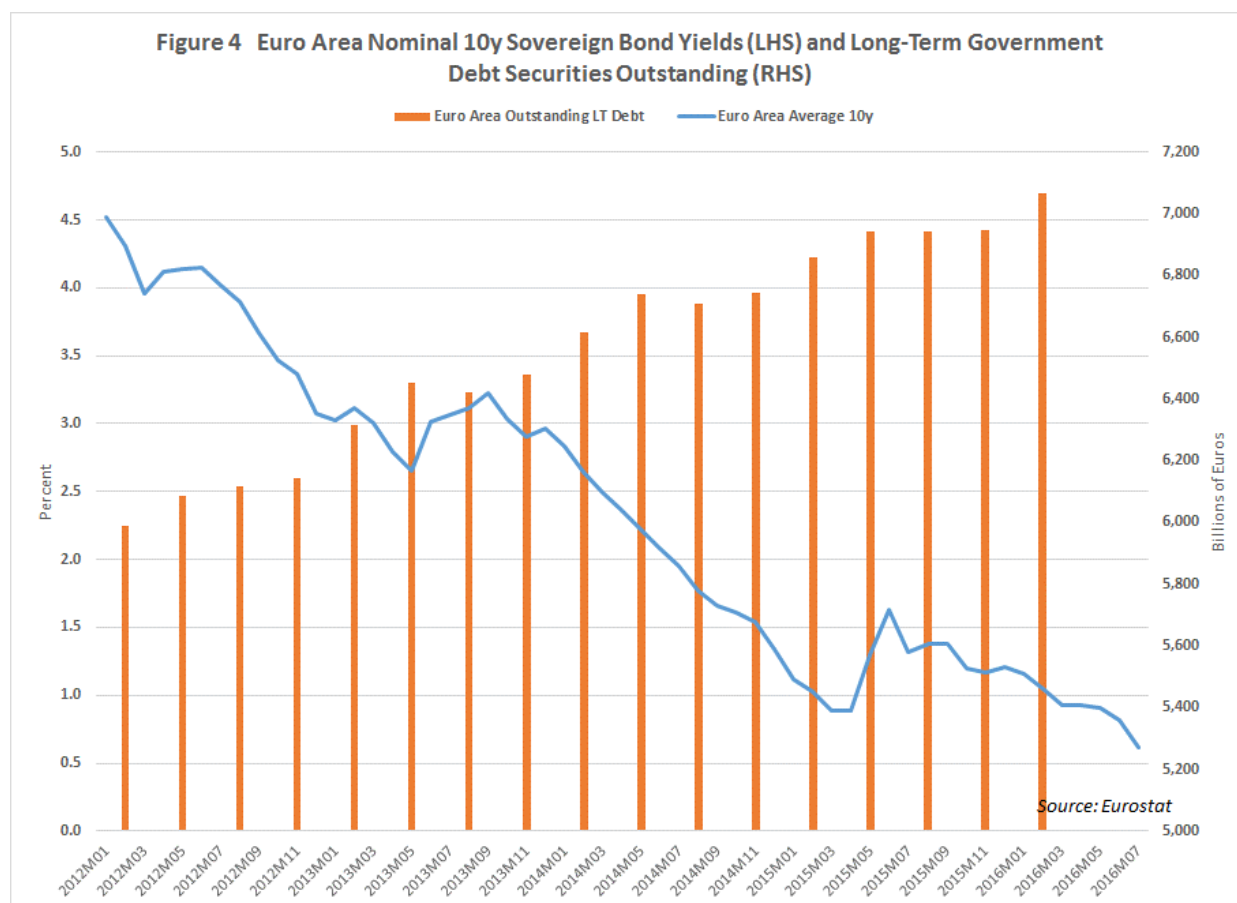
The fluctuations of real long-term yields in the euro area highlights how bond investors in the euro area core have for a long time been willing to accept negative returns after inflation. On the face it, this seems a strange choice for fixed income investors, which even as many in times of crisis will prioritize stable and safe returns and capital preservation should go to great lengths to avoid certain asset value destruction (in both real and certainly nominal terms). Part of the explanation for this tolerance likely lies in regulatory restrictions on the asset allocation of many bond market investors, as they may be compelled to allocate investments in only certainly highly liquid and highly rated asset classes, including sovereign bonds. However, particularly inside a common currency area, where as figure 3 highlights

real long-term bond returns diverged dramatically after 2010, once the ECB (and euro area political leaders) in 2012 acted to guarantee the integrity of the euro and remove redenomination risk and make “Greece a unique case” of credit risk, regulatory restrictions are unlikely to be the whole story. A significant and continuing in the face of negative domestic returns home bias among many core euro area long-term bond investors appears also to play a role. Such home bias can to a degree be justified on the basis of for instance such investors’ greater understanding of domestic economic and political circumstances, requiring a risk/return premium to invest elsewhere even when inside the euro area. The scale of the still present real 10y sovereign bond return premium – in figure 3 shown to be 150-200bp between Spain/Italy and core euro area members – inside the euro area does not appear justified by such considerations. Instead it suggests a lingering doubt about the long-term stability of the euro among many long-term bond investors. To the extent that such fears remain among long-term bond investors, so too will they remain willing to accept negative real (and nominal) returns.

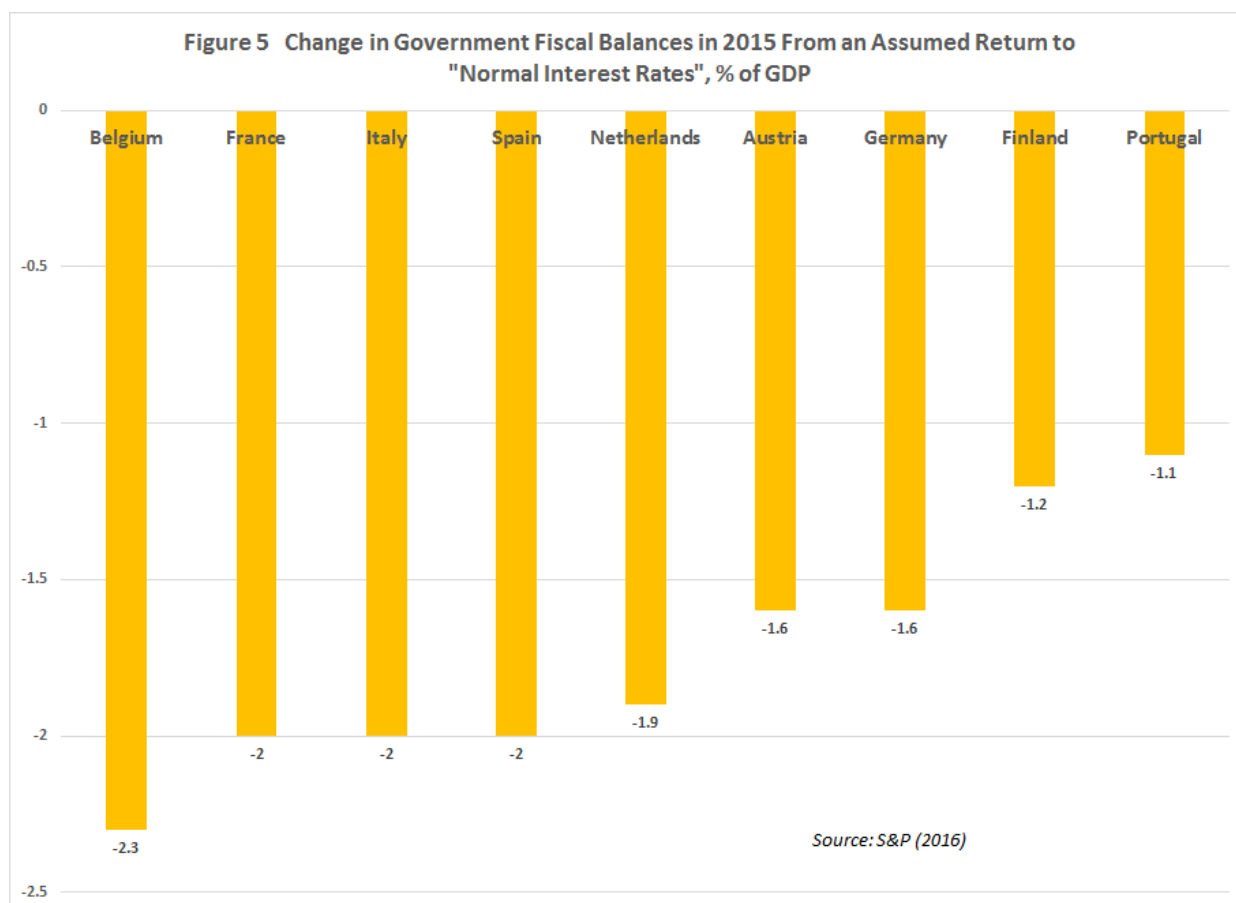
Generally elevated uncertainty and risk aversion among long-term euro area bond investors and a resulting broad willingness to accept very low and even negative returns if only they are perceived as being safe may also be related to several other big and unprecedented risk developments in the euro area and global economy. Demographic risk is real now, as the euro area in 2010 entered a historically unprecedented long-term decline in the working age population, raising concerns about the long-term productive capacity of the economy. Political risk is rising rapidly with populism surging across the euro area (and elsewhere in Europe and the United States), sparking concerns that the traditional pro-market and pro-European political centre may not hold much longer. Macro-economic crisis management risk is probably similarly at an all-time high in the euro area with additional fiscal and monetary policy stimulus options in the face of a sudden unexpected downturn very limited with public debts already high and interest rates already very low. Future minor cyclical downturns in the euro area risk therefore not to be adequately countered by macroeconomic policy, aggravating their effect and making the euro area more economically volatile in the future.

2.3. Euro area government (sellers’) policies

Markets require both buyers and sellers to regulate supply and demand and set prices, just as their proper function dictates that both respond in a self-interested and rational manner. As sovereign bond prices rise to historical heights (the implication of historically low yields), buyers should step back a little, while sellers rush new offerings to the market. Bond buyers’ lack of price sensitivity was discussed in the previous section, but is it equally clear that euro area government sellers of sovereign debts have been very slow to respond to the higher prices of their debts. Existing debt have been rolled over into cheaper rates and/or longer maturities, but in defiance of the clear market price signal there has been no acceleration in new net long-term debt issuance in the euro area, since nominal yields began to fall into even negative territory. This is illustrated in figure 4.



As average euro area long-term yields have dropped dramatically since 2012, there is no discernible acceleration in net euro area long-term sovereign debt issuance. Euro area governments have hence been complicit in maintaining relative scarcity of long-term bonds, facilitating the drift towards lower yields. The reasons for this euro area government behaviour are complex and beyond the scope of this paper, except to note that the recent decline in long-term yields have already provided euro area governments with substantial additional fiscal space, relative to “normal interest rate periods”. This is shown for select euro area members in figure 5.



Failure by euro area governments to timely and productively re-invest these sizable fiscal interest savings in the real economy at once compounds the dismissal of long-term bond markets' stimulative price signals and helps explain why governments do not feel the need to issue new net long-term debt.

Viewed in isolation long-term bond market price signals evidently point towards a more expansionary fiscal policy in the euro area. Failure by euro area governments to utilize historically low financing costs to make investments in the improvement of the euro area productive capacity – especially at a time when private investors are clearly hesitant to commit long-term capital to the real economy – hence appears a lost opportunity to boost both short- and long-term growth prospects. Ultimately, at a time of low confidence, if governments themselves are not willing to commit resources to more investments, what will compel private investors to do so?

3. IMPLICATIONS OF TODAY'S ULTRA LOW EURO AREA LONG TERM BOND YIELDS

3.1. Implications for future ECB monetary policy

ECB policies over the last several years have, as described in section 2, been extraordinarily effective in lowering euro area long-term bond yields, as well as facilitate the gradual return to credit expansion for the euro area non-financial sector¹⁵. This has provided a powerful monetary policy stimulus to the euro area economy. At the same time, euro area HICP inflation has since early 2013 remained substantially below the ECB's close-to-but-below-2%-over-the-medium-term target, implying that the central bank should move even more aggressively to expeditiously push inflation back to this desired level. Yet, today's exceptionally level of long-term bond yields in the euro area makes it clear that available sovereign bonds for purchase are already scarce. Hence, it will simply not be feasible for the ECB to dramatically increase the pace of its bond purchases without fomenting acute shortages and accompanying price bubbles in the euro area bond markets.

Recalling further how 1) ECB policy rates are already at levels so low that dropping them much further could lead to widespread cash hoarding in the euro area; 2) euro area banks have access to exceptional levels of ultra-cheap ECB liquidity to support lending to the real euro area economy; and 3) no other euro area asset financial markets exists which could provide the ECB with low-risk assets to purchase at a scale to materially supplant sovereign bond purchases, the conclusion becomes that the ECB's ability to materially expand monetary stimulus is greatly constrained by current levels of sovereign bond yields.

Only in truly exceptional and hypothetical new crisis circumstances could the central bank to provide additional stimulus potentially contemplate purchasing large quantities of riskier assets such as for instance euro area equities, or provide direct cash injections into the real economy (e.g. so-called helicopter money). Current exceptionally low euro area bond yields hence de facto dictate that the ECB's monetary policy going forward be predominantly a question about whether and if so how to maintain current levels of stimulus.

Current exceptionally low long-term bond yields further highlight the risk that a "normalization" of monetary policies, e.g. stopping asset purchases, completing the sale of such assets back to private market participants, scaling back liquidity provision for banks, and raising policy rates back towards average historical levels, will not be feasible for the ECB in time ahead of a future cyclical downturn in the euro area economy. As a result, such a future cyclical downturn could perhaps only be countered by less than optimal ECB monetary stimulus, and as a result become more economically damaging for the euro area economy. Private investors and businesses may respond to such risks of a more volatile euro area economy in the future by scaling back investments and other risk taking today.

A related issue for future euro area monetary policy is that the level of short-term ECB policy rates at the start of a future cyclical downturn may be so low that monetary policy makers will have no choice but to adopt the same so-called non-standard monetary policy measures as witnessed since 2010 in the euro area, including for instance restarting asset purchases. This would make such hitherto "non-standard" and exceptional monetary policy measures natural recurring stimulative policy actions by the ECB similar to cutting short-term policy rates.

The exceptionally low level of euro area sovereign bond yields today hence indicate that it may well become much more complex to be a euro area central banker in the future and that the ECB will continue in the future to need a bigger toolkit than what euro area publics and financial markets have been used to until today.

¹⁵ See ECB (2016b).

3.2. Implications for euro area banking sector stability

Today's exceptionally low euro area long-term interest rate levels are often linked directly to the ongoing (and in parts of the euro area accelerating) financial pressures on the euro area banking system. It is, however, important to keep in mind that the euro area banking sector currently faces a host of separate, though often mutually reinforcing challenges to its financial situation. Its dominant financial intermediary position in the euro area is under threat from both capital markets (where the sector's own supervisor and the European Commission as part of the Capital Markets Union have repeatedly suggested that they would like to see a larger role played by capital markets in euro area credit creation) and increasingly new fin-tech upstart companies offering for instance internet-based crowd funding, peer-to-peer lending and block-chain technologies. Global and euro area specific post-crisis financial regulatory tightening has materially increased capital requirements and compliance costs and are not yet today – eight years after the collapse of Lehman Brothers – completed, continuing to cloud the sector outlook. And in several euro area members, noticeably Italy, post-crisis banking sector clean-ups of non-performing loan portfolios have not yet been completed due to a combination of national governments' political unwillingness to address the issue and often extremely cumbersome domestic judicial procedures for creditors to reclaim distressed assets and restructure and resell them. It is in other words erroneous to attribute the euro area banking system's current travails overwhelmingly to the abnormal long-term interest rate environment. The muted direct impact on euro area bank profitability from low long-term interest rates can also be seen in the stable share of net interest income (at about 60 percent ¹⁶) in euro area banks' total income in recent years, suggesting that net interest margins, e.g. the difference between banks' borrowing and lending rates, have not (yet at least) been materially compressed to undermine banks' earnings power.

At the same time, however, it seems clear that those euro area banks which overwhelmingly rely on a simple business model of taking on-demand short-term deposits from the public and transforming them into longer maturity loans to the regional non-financial sector will over time face significant complications if current exceptionally long-term yields remain in place for a long time. The extremely flat yield curve in most euro area members, and particularly the fact that sizable parts of it may be outright nominally negative, significantly reduce the ability of such banks to earn a "normal size" net interest margin from the maturity transformation of money from short-term deposits to longer-term loans they perform.

This is noticeably the case, as deposit-taking banks are highly unlikely to ever be able to levy depositors of almost any size outright nominally negative deposit rates. The competitive threat of customers' simply taking their money elsewhere and to a financially stronger bank without the need to charge depositors will simply be too big. This business logic holds most true for smaller (insured) depositors, but will also constrain banks' ability to charge larger corporate clients for holding cash. Banks may instead rely on various fee-based income to earn a profit on standard deposit taking, hence de facto charging customers a stealthy "net all included" negative nominal deposit rate. Yet such business practices are unlikely to enable narrow deposit taking euro area banks to fully recoup losses from a sustained lower net interest margin.

The euro area's current exceptionally low long-term bond yields therefore do not present an independent material threat to banking sector stability today, but if current low yields are sustained for the long-term, a threat to some standard simple euro area bank business models may materialize.

¹⁶ See ECB (2016c).

3.3 Implications for the broader euro area savings environment

Lower interest rates at any maturity by definition redistributes resources from savers (who earn less) to borrowers (who pay less), a process obviously greatly amplified by the current situation in many euro area long-term bond markets (Figure 1) where outright negative nominal yields reverse the normal direction of interest payments to go from savers to borrowers. Transferring resources from savers to borrowers by cutting short-term interest rates is a standard central bank counter-cyclical policy outcome from cutting short-term interest rates to help restore investment levels and businesses' "animal spirits". By shifting resources towards borrowers (typically poorer or younger people or growth firms), low or even negative nominal long-term yields in the euro area will generally, despite the adverse effect on savers' returns, support aggregate consumption due to borrowers' higher consumption share of their income. Today's exceptionally low long-term yields in the euro area is hence stimulative for the overall economy. Declines in the long-term yields of euro area risk free sovereign bonds, e.g. a savings vehicle preferred by very risk-averse savers, however, runs the risk of changing the savings behavior of this group into so-called "target saving"¹⁷. This will reduce their consumption and depress overall economic growth, potentially cancelling out any boost to consumption from society's borrowers. To date, however, in the euro area with private consumption rising steadily in recent years, there is no evidence of widespread target-saving behavior.

The historical evidence from Japan's prolonged experience with very low real and nominal interest rates further flags a danger for some parts of the euro area asset management sector. Business models that rely on large sovereign bond portfolios and promise customers guaranteed rates of returns long into the future, found in for instance parts of the insurance and life insurance sectors, are likely to face substantial difficulties from a prolonged period of long-term bond yields at today's level.

Lastly, it is clear that the international linkages and diversity of individual euro area members' financial systems play a significant role in determining how the impact of today's exceptionally low long-term yields are felt. The wider the range of alternative long-term savings options available to savers and the greater their choices to seamlessly move their savings across borders, the more likely they will be to escape at least some of the direct negative effects of the current market situation. Financial systems on the other hand dominated by typically smaller mono-line domestically focused deposit-taking banks are likely to offer customers less alternative savings vehicles to sovereign bonds and sovereign-linked products. This risks causing resentment among local customers, who may feel "trapped" in low or negatively yielding long-term savings instruments. This again, as a consequence of such a particular character of national financial sector system, may foment political pressure on particularly the ECB to change its monetary policies.

¹⁷ Here a saver will save enough of his or her disposable income to reach a certain target level of savings, irrespective of the rate of return on savings and as a result increase his or savings rate in response to low (and particularly negative) interest rates.

4. CONCLUSIONS

This paper first argues that today's exceptionally low long-term nominal interest rates in the euro area are the outcome of a combination of the ECB's highly accommodative monetary policies, particularly the public sector purchase program (PSPP), structural risk factors inducing market participants to accept safe but low returns, and the lack of a strong market price response from sovereign borrowers, who continue to restrain the supply of bonds. It is highlighted how, when shifting from nominal to real long-term yields in the euro area, today's situation comes at the end of a long period of declining real long-term rates in the euro area. And that in real terms, market investors have been willing to accept significantly negative real yields in the core euro area for a number of years, meaning that today's situation in real yield terms is not historically unique.

Secondly, this paper argues that today's exceptionally low nominal long-term bond yields will significantly constrain future ECB options for additional monetary stimulus, and that recent years' "non-standard monetary policy instruments" will in the future be required tools for the ECB to counter even normal cyclical downturns. Limited implications for the euro area banking sector stability is foreseen, though an extension of today's low yields will put pressure on bank business models relying mostly on net interest rate margin income from maturity transformation of deposits. Today's low long-term yields are seen as generally supporting consumption in the euro area, but could cause trouble for some insurance and life insurance businesses, while internationalization and sophistication of national financial systems are crucial determinants of how today's low long-term yields are transferred to the real economy in individual euro area members.

REFERENCES

- ECB (2013) The Governing Council's Forward Guidance on the Key ECB Interest Rates. Available at http://www.ecb.europa.eu/mopo/pdf/Box_1_mb201307en.pdf?ef19e882f1c0acb99c9b452935c99194
- ECB (2016) The ECB's asset purchase programme: an early assessment. ECB Working Paper No#1956. Available at <http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1956.en.pdf>
- ECB (2016b) Economic Bulletin Issue 5, 2016. Available at <http://www.ecb.europa.eu/pub/pdf/ecbu/eb201605.en.pdf>
- ECB (2016c) Assessing The Implications of Negative Interest Rates – Slides to Speech by ECB Executive Board Member Benoît Cœuré. Available at http://www.ecb.europa.eu/press/key/date/2016/html/sp160728_slides.en.pdf
- Eurostat Online Statistical Database. Available at <http://ec.europa.eu/eurostat/data/database>
- Standard & Poors (2016). Negative Interest Rates, Available at https://media.spglobal.com/documents/SPGlobal_Negative_Interest_Rates_August_2016.pdf

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Ultra-low/negative yields on euro area long-term bonds: reasons and implications for monetary policy

Andrew HUGHES HALLETT

IN-DEPTH ANALYSIS

Abstract

Most countries have faced ultra-low interest rates in the decade since the financial crash of 2007 and the subsequent anaemic recovery. Low interest rates have resulted, in part, from deliberate policy actions; but also from market forces (shifts in demand and supply of credit) and from announced future policies that affect expectations about future rates and recovery. However, the low borrowing costs that followed have had little impact on investment or the recovery because of low expectations, latent risks in the economy, and countervailing actions such as paying off past debt and cuts in public spending. As a result, many countries (about a quarter of world GDP) made the move to negative interest rates to put extra pressure on banks/businesses who did not lend. It is unclear what effect this will have on the Euro area because the main impacts will be redistributive – depending on competition in the financial markets, the sources of bank funding, on the trade elasticities, on the degree to which cash is used and how pensions are funded. The outcomes are likely to be very uneven, helping some but leaving others damaged or unaffected. We also have to balance reasons why low/negative interest rates may enhance financial stability (lower risk premia, extra liquidity in the markets, less uncertainty) against greater instability arising because less good quality collateral is available to back loans, banks face increased capital requirements earlier, and riskier investments are made in search of yield. Complimentary strategies such as term funding, GDP bonds, or a conscious exploitation of exchange rates (both real and nominal), seem to offer a more realistic way to support the aims of low interest rate policies.

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EXECUTIVE SUMMARY

- Ultra-low interest rates at the short end of the maturity spectrum are caused in part by deliberate Central Bank policies intended to expand the economy in the face of a recession or provide the stimulus to start a recovery. But they are also due to natural market shifts in the balance of supply and demand for credit driven by the perception of a low chance of recovery in incomes or profits, the fear of uncertainty and future instability, and the need to pay off past debts before another slowdown.
- They can and have been matched by interest rate reductions at the long end, via large-scale asset purchases made by central banks. This is done to enable retail banks to lower borrowing costs and offer cheap credit where most spending decisions are made.
- A valuable bi-product is that the associated liquidity injections help stabilise stressed banking systems and financial markets. A downside is that long term investors, pension funds and insurance firms will typically make riskier investments in a search for higher yields to match their long term liabilities. This carries the potential to destabilise the financial system again.
- In practice, these policies have been moderately successful – triggering mild increases in national incomes or employment, but very little inflation pressure. A bigger difficulty has been the breakdown in the transmission mechanism between low borrowing costs and credit up take driven by the same fears of ineffective policies, uncertainty and the need to deleverage excess debt.
- A logical extension of those policies is to impose negative interest rates, in order to put greater pressure on lenders/borrowers to lend/take up low cost credit. Unfortunately this has its downsides too
- Negative interest rates have large redistribution effects that depend on the composition of banks and financial markets, the use of cash, safe haven/home biases, on the trade elasticities, and on the funding of pensions and financial regulation.
- The outcomes in the Euro-zone are likely to be mixed: Germany, the Netherlands and Nordics having a low cash usage, poor banking competition but deep financial markets, big trade elasticities, safe haven biases, state funded pensions. France, Spain, the East and peripheral economies have almost the opposite structure. Negative interest rates are likely to create diverging effects.
- There are reasons why low/negative interest rates may create financial stability (lower risk premia in key sectors or regions, extra liquidity in financial markets or banks, less uncertainty and nonperforming loans). But also reasons for greater instability (support for zombie firms, lower lending because less high quality collateral is available to back loans, banks run into capital requirements earlier, riskier investments are made).
- Complimentary strategies such as term funding, GDP bonds (limited fiscal coordination in the expanded fiscal space), or a conscious exploitation of exchange rates (real *and* nominal to encompass structural reform) offer a more realistic way to support the aims of low interest rate policies.

1. FACTORS CAUSING LOW/NEGATIVE INTEREST RATES IN THE EURO AREA

The impact of monetary policy on the economy depends on the level of long-term interest rates, being the rates that determine household consumption and business investment spending. Conventional expansionary monetary policies stimulate the economy by buying short-term government bonds to lower short-term interest rates. Arbitrage then provides the transmission from short-term to long-term rates via the yield curve. When policy rates hit or get close to zero, conventional monetary policies become disabled and inoperative on the expansionary side. A logical extension is then to have short-term rates turn negative.

Unconventional monetary policy actions are based on the idea that central banks can still stimulate the economy by intervening to change long-term market rates. They can lower market rates by undertaking large-scale asset purchases at longer maturities (quantitative easing, QE); or by purchasing corporate bonds; or by making loans to firms and businesses to lower their cost of borrowing (credit easing).

QE stimulates spending by increasing money holdings, pushing up asset prices to produce wealth effects, and lowering borrowing costs by lowering the spread of long-term interest rates over short-term rates and lowering the return on risky assets over risk-free assets. Buying corporate bonds does the same in a market where borrowing costs are typically higher; and credit easing is a way to lower borrowing costs directly.

How has it come to this? i) Low/negative interest rates have obviously been a conscious act of policy for the reasons described above. ii) Equally obviously there has been a marked shift in the balance of supply and demand for credit/investment spending in the financial crisis and anaemic recovery since, which has led to low interest rates (the price of credit) in the markets. Firms' demand for investment funds is diminished by the perception of very weak prospects for future growth or profits in their markets or the economy; by the falling price of capital; by the risk of further instability or rising real interest rates due to falling or negative inflation; because they have large cash piles of their own; or because the risks of a further slow down make it more attractive to pay off past debt than take on new debt. Against that, the injections of liquidity used to stabilise the markets and lower market rates have increased the supply of credit. That, together with falling demand would naturally lower market rates – reinforced by the cost of increased regulation and a need to pay off past debt which has further reduced credit demand that is *acceptable* at the banks. iii) There has been a fear of future inflation; but none has materialised so far. iv) There are no serious expectations of a recovery, so it becomes more attractive for firms and banks to seek safer places to employ their funds. Negative interest rates are a natural way to counter that tendency. v) Since low and negative interest rates have become a world-wide phenomenon involving \$13tn of funds, there is no competition from outside to generate upward pressure on those rates.

In view of those points, it is crucial to recall that explanations of investment spending are traditionally built round relationships of the form: $I = f(i, Y)$ where investment is related to the cost of borrowing (i) and *expected* future earnings, profits or costs (Y).

2. HOW EFFECTIVE ARE LOW/NEGATIVE INTEREST RATE POLICIES?

2.1 Quantitative Easing by Large-scale Asset Purchases

The basis of unconventional monetary policies is that financial markets are neither perfect nor complete. Therefore arbitrage tends to work imperfectly, depending on expected future interest rates as well as on the preference for short over long-term assets.

In such circumstances, monetary authorities can purchase significant quantities of Treasury securities of long maturity, or mortgage-backed securities, or corporate bonds, altering their relative supply vs. demand. This raises bond prices and lowers interest rates at that maturity. These effects then extend to other longer-term assets as investors who just sold securities to the central bank move to invest in substitutes that are closer to the asset sold than cash, adding to the downward pressure on longer-term interest rates further along the yield curve or in neighbouring markets. Using this portfolio balance or “ripple” effect, the central bank is able to affect both the spread of long-term interest rates over policy rates (term premium) *and* the return on risky assets over risk-free assets (risk premium). These are the interest rates relevant for boosting consumption and investment spending.

2.2 Impacts in the US and UK

In the U.S., before QE, there was an average excess term premium of almost 200 basis points for securities with a 10 year over a 1 year term. This premium then dropped by 75 basis points as a consequence of QE. In the UK, QE reduced the spread of corporate bonds over gilts between 2000 (for high yield bonds) and 200 basis points (non-financial bonds) after 2009, and the yield on 10-year gilts from 5% to 2% (Miles, 2012). The ripple effect to neighbouring markets or maturities, and reducing risk premia, was therefore quite strong.

Did those changes translate into gains in output and employment or losses in inflation? The answer is again consistent. A range of estimates for the US, reported in Williams (2011), suggest that these QE policies reduced interest rates by between 0.15% and 0.3% points in this period – which corresponds to having increased GDP by similar amounts each year. There was no perceptible impact on inflation, or inflation expectations.

In the UK, QE is estimated to have added 3% to the level of GDP over the 6 years since 2009 compared to what would have happened otherwise, with negligible effects on inflation [0.1% or less in the US or UK]¹. Thus, real output is higher by ½% on average each year; equivalent to an extra 0.4% on the growth rate. Unemployment typically follows output with a one to two year delay.

Initial estimates for the US suggested interest rates fell by between 30 and 100 basis points depending on the type of security (Gagnon *et al*, 2011). Subsequent studies of QE1 and QE2 found similar results, as did the studies undertaken for the UK. Later studies from the QE2-QE3 era (Chen *et al*, 2012) reduced these estimated interest rate reductions to around 30-40 basis points.

There can be many explanations for this weakening. First, “QE fatigue” may set in after a while – when the supply and quality of assets available for purchase begins to fall. Second, repeated applications of QE inevitably create expectations of inflation which undermine the downward pressure on interest rates further along the yield curve. Third, adherence to the zero lower bound means that interest rate reductions, per unit of QE, will be smaller the lower are market interest rates at the start of the exercise. Creating negative interest rates is the inevitable response.

¹ Kapetanios *et al* (2012); Joyce *et al* (2012); Bank of England (2012).

Finally, by reducing market interest rates, QE causes an economy's currency to depreciate (as long as other economies do not follow low interest rate policies too). On one hand, this is useful as it will boost net exports. That adds to the recovery. On the other hand, it is unhelpful because it will induce capital outflows which lower asset prices and raise interest rates again, undermining the impact of the low interest rate policy. Nevertheless, half the interest rate reductions appear to have come from lower risk premia that follow from QE. These reductions in risk premia therefore allow a modest but persistent increase in output due to a small but lasting fall in *real* interest rates where they matter most.

2.3 Impacts in the Euro-zone

Do the results in the Euro-zone match those in the US or UK? The ECB's low interest rates appear to have had a limited impact in the Euro-zone so far with output growth averaging at 0.3% and inflation -0.05% through 2015. This may have been because the programme is proportionately smaller than in the US and UK; or because long interest rates fell by less (½% on average) having started from a lower level. Hence it was logical to extend the low interest rate approach to negative interest rates in late 2015.

That said, there are several reasons why these policies would have a limited impact. The first is that monetary policy has had to act alone; it has not been able to take advantage of fiscal expansions at the same time. Instead, it has been undermined by the private sector's incentive to pay off or refinance past debt. This suggests very low interest rates will only be effective when conducted in conjunction with other policies. To deal with that possibility, we focus on fiscal coordination, GDP linked bonds and helicopter money in section 5.

Second, low levels of private sector lending seem to have been a problem everywhere despite greater financial stability, liquidity provision and easy credit. In surveys, 85% of the banks report QE programmes have had no effect on lending. That suggests problems in the transmission between liquidity provision and credit uptake: investment spending is below its 2008 peak; real interest rates are still high; and small businesses or consumers still prefer to pay down debt.

Third non-performing loans have increased, and now run at above 9% of GDP which makes the banks reluctant to lend. Each of these factors reduces the impact of low interest rates.

Fourth, asset purchases and low/negative interest rates are not a free lunch; they have costs. Apart from any effect on financial stability, extended balance sheets expose central banks to potential losses and imply greater risks to the economy. Portfolio rebalancing can increase vulnerabilities in the financial system, which risks financial instability in the long run. One example: it leads to excessive risk taking by insurance companies and pension funds which have to hold long-term assets in order to match their investment returns to long-term liabilities – increasingly difficult to do when yields are being pushed down.

3. FINANCIAL INSTABILITY, CONSTRAINTS ON MONETARY POLICY

3.1 Reasons to Expect Increased Financial Stability

To the extent that a low interest rate policy reduces risk premia on corporate bonds, and on bank loans or loans to governments, it has an important impact on the cost of borrowing and growth prospects. Some (Gagnon *et al* 2011) argue that this is the most important part of a low interest rate policy in practice – even if driven by the *composition* of the asset purchases used to drive down baseline interest rates. To achieve this, low interest rates need to go beyond purchases of core government bonds to corporate bonds and those of distressed governments. Their role is then to stabilise financial markets by providing new liquidity and reduced uncertainty. In difficult, potentially deflationary times, this is a considerable advantage even if the direct impacts on GDP and prices are not large.

The logic of this comment is that portfolio rebalancing may be the important effect of a low interest rate policy. If so, it is best implemented by buying assets, not from banks who may use the funds to deleverage their own debt, but from corporations and non-bank financial institutions more likely to buy corporate bonds or invest in assets which yield a return. Thus low interest rates have their effect through reducing bid-ask spreads and risk premia, or removing credit/liquidity constraints in dysfunctional or inefficient markets, rather than through low borrowing costs per se.

3.2 Reasons to Expect Increasing Financial Instability

a) A reduced default rate among firms means less creative destruction as QE eases the depression, leaving a tail of unreformed “zombie” firms in the recovery. Similarly, structural reforms might be postponed. This is true; but for those reforms to take place at all we need liquidity and fiscal space. This is what a low interest rate policy provides.

b) Mortgage and other lending declines because the central bank takes so many bonds out of the market that banks and/or firms cannot retain enough high quality bonds to act as collateral for their loans. This is important because it will damage investment spending, in particular that which embodies new technology, low costs or promotes productivity growth.

c) Investors, and specifically insurance or pension companies, enter into riskier investments in search of higher returns, QE having lowered the yields on safe investments. Likewise, speculation on higher asset prices creates a serious risk of an asset bubble (especially in housing²). Prudential regulation and higher capital ratios are needed to counter that effect.

d) There is a risk that the central bank will run out of quality bonds to buy to force interest rates down. This has already happened at the Bank of England in 2016, when it could not fulfil its quota and had to offer excessively high prices to buy the bonds it did get. The ECB is thought to face the same problem. Put differently, low interest rates obtained by market means can easily become subject to diminishing returns as the interest rate reductions, per unit asset purchased, become smaller and smaller. So low/negative interest rates become less and less effective in terms of output and employment generated. Moreover the drying up in the supply of bonds risks creating a price bubble in the asset concerned, and its near substitutes, and hence in the financial markets if there is a bust in supposedly safe assets.

e) The risk of default on an asset held by the central bank creates a possible loss on the ECB's balance sheet, instead of on the balance sheet of an already indebted government. Two points here. i) The changes to income flows wash out: the interest payments made to the ECB would cease, but the extra profits paid to national governments by the ECB will also cease. ii) The write down of the ECB's assets will have no implications for taxpayers since central banks do not need to maintain capital/asset ratios to function. Even if the ECB felt

² Feldstein, 2016.

the need to repair its capital base, it can ask shareholder governments for extra capital which to be supplied in the form of bonds – in effect replacement QE assets with new interest payments. No implications for taxpayers. The real danger here is different. If the defaulted bond is not replaced, there will be no bond to sell back into the market in the exit strategy. Realising this, private agents will expect additional inflation in the future.

4. THE EXTENSION TO NEGATIVE INTEREST RATES

Negative interest rates are not a necessary part of low interest rate or asset purchase programmes, but they are a logical extension – especially when the need to repair ineffective transmission mechanisms becomes a major issue (sections 2.3 and 5; Arteta et al 2016).

Negative interest rates usually come into play for one of two reasons: i) to deter capital inflows, exchange rate appreciations, or a loss of competitiveness; or ii) to extend an expansionary monetary policy to generate a recovery or to avoid deflation. We are not concerned with the first case, but the second leads to problems for both banks and depositors.

Drawbacks for the banks:

- a) It reduces the banks' profits (if the clients are not charged interest on deposits at the same time). This is now thought to be a serious threat to stability in the banking system.
- b) It induces contractions if the interest payments reduce the reserves held to below the required ratio. That would shrink the loan portfolio; the very opposite of what we need to generate a recovery. It may also discourage holding adequate reserves in the first place.
- c) Falling bank profits may lead to inadequate capital ratios, a safety issue.
- d) It is often unclear if negative interest rates are intended as an extension of QE, or just follow from market fundamentals.
- e) It encourages banks and businesses to hold their reserves or deposits in cash outside the reach of the central bank. This would be unfortunate as reserves held that way would not be available to be lent out as credit for investment or consumption spending. If that were to happen, it would be a further reduction in the transmission between policy and credit to additional spending; precisely the opposite of what we are trying to achieve with low/negative interest rates. Whether this actually happens depends on whether the negative rates are larger than the cost of storage plus insurance and any transaction fees. So, small negative rates ($\geq -\frac{1}{2}\%$) may not cause problems; but rates more negative than that can be counterproductive. The fact that big corporations are thought to hold unused cash deposits internally of at least \$1.7 trillion, two-thirds of the banking system, suggests that this is a risk to be taken seriously (although uncertainty about the strength of the recovery can be as much a restraint as the desire to avoid paying interest charges).
- f) A break on large negative interest rates may emerge from private bond sales at small negative yields (like those by Henkel or Sanofi) that allow investors to park their money at lower cost. This would reduce the risks posed by negative rates.

Drawbacks for the depositors (firms, investors, consumers):

- i) Negative interest rates discourage savings/deposits (so credit expansion is smaller)
- ii) They encourage banks to make loans, but imply higher risks for the banks that do so.
- iii) They raise the costs for firms if they must pay interest on their deposits, implying falling profits and a tendency not to use the banking system (leading to reduced credit).
- iv) They lead to reduced spending by consumers (and firms) who have to divert greater funds to pension contributions in order to maintain expected or contractual pension levels.

Drawbacks for policymakers:

- i) The risk that very low/negative interest rates will leave policymakers with no space to reduce their rates further should there be another recessionary shock. This will be true so long as there is some kind of threshold below which rates cannot go without becoming ineffective – as seems likely given diminishing returns and destabilising factors noted in section 3, and at point e) immediately above.
- ii) Negative rates have large (and often unwanted) redistributive effects depending on the composition of banks and financial markets, the use of cash to settle transactions, whether the currency has safe haven/home bias status, the size of export/import income and price elasticities, the structure of the domestic pensions markets (state funded, pay as you go, or privately funded), and the degree of financial regulation. Banks dependent on retail deposits,

relatively closed, facing little competitive pressure or with poor access to liquid or deep financial markets will be more exposed to negative interest rates. Similarly economies with a low cash usage, limited safe haven/home bias effects, larger trade elasticities, and a low proportion of state or pay-as-you-go pensions, will find negative interest rates are relatively successful (have a larger impact). The outcomes in the Euro-zone are likely to be mixed: Germany, the Netherlands, Sweden having a low cash usage, little competition in banks/financial markets, larger trade elasticities, but safe haven status and state funded pay-as-you-go pensions. France and the peripheral economies have almost the opposite structure. Negative interest rates are likely to have very different effects in different places.

These drawbacks have led to a new strategy by investors. Investors first bought US dollars in the expectation that the dollar would rise vs. the euro because yields/interest rates were expected to be higher in the US than in the Euro-zone. At the same time, they also bought riskier investments (equities, corporate bonds, household debt) in a search for higher yields. This is most marked for institutional investors (pension funds, insurance companies) with future liabilities to meet.

It is unclear if this was a wise policy given that bank profitability is under threat. But it has brought no response from central banks. The lesson drawn by markets is that central banks appear to be abandoning their traditional responsibility to supply the financial system with liquidity as needed. This increases the risks to the private sector. Also, with a world economic slowdown, rises in US interest rates have appeared less likely or at least weaker. The result: many investors sold off their riskier investments again to go into safer, if low yield, government bonds. This has led to purchases of safe bonds in cheaper jurisdictions (Germany, the UK, Japan, Canada, Switzerland) and to rises in the corresponding exchange rates. It is a paradox: negative interest rates have led to lower interest rates but rising exchange rates in a flight to safety from where risk premia still exist. This wiped out many of the helpful exchange rate channel effects just where they are needed most.

5. OPTIONS FOR REDUCING THE CONSTRAINTS ON MONETARY POLICY (REINFORCING THE POLICY TRANSMISSION MECHANISM)

Ultra-low interest rates may not be sufficient to spark a recovery in output or prices in bad times. Low or negative interest rates at the maturities that normally persuade businesses to invest or consumers to buy durables, does not guarantee they will do either. Faced with declining incomes and high debt levels, the private sector may prefer and in practice has preferred to save and pay off past debts as protection against future recessions. The pass-through (transmission) from cheap credit to actual borrowing and new spending is held back by this reluctance. Similarly, consumers will prefer to save rather than spend if they think that incomes may fall or jobs will be lost because the economy fails to recover – the more so, the more they are indebted.

In fact, the EU's experience of low interest rates has been that businesses and consumers alike have been reluctant to invest or spend on a scale necessary to trigger a firm recovery despite extra liquidity and low borrowing costs – partly because of the risks of continuing stagnation and soft prices, partly because banks fear increasing non-performing loans in an extended slowdown, especially when bank credit is tightly regulated³; but mainly because businesses, consumers and banks have been paying off past debts at a time when there were no other stimulus measures to counteract the impacts of deleveraging. And typically deleveraging happens in the private sector long before it takes place in the public sector (Hughes Hallett, 2016). In addition the Euro area has faced a “double whammy” of austerity policies imposed *on top* of this deleveraging process to force public sector debt reductions at the start of the recovery. That has naturally made the Euro-zone's low/negative interest rate policies less effective than they would normally be because the transmission between cheap credit and additional investment or consumer spending is undone. This makes the case for introducing alternatives to counteract any such contractionary effects. There are four possibilities.

5.1 Cheap Loans from the ECB; Term Funding at the Bank of England

Cheap loans from the ECB via its Long Term Refinancing Operations (LTRO) programme, or liquidity support to the banking sector through the Target2 payments system, in which national central banks are empowered to provide credit support to domestic banks under pressure if they are short of funds, would appear to do the same as the Bank of England's “funds for lending”. They both create extra liquidity at home and increase the value of the stock of home assets. That in turn reduces the **net** foreign liability position which leads to lower interest rates.

The Bank of England introduced its “funds for lending” scheme in 2012-15, and effectively reintroduced it as the term funding scheme in 2016. Here banks borrow directly from the central bank, either in Treasury Bills or direct loans, at below market rates. Credit based on these loans can then be extended or lent on to the private sector at market rates with the margin retained by the lender as long as it can be demonstrated that the additional credit has been used by firms/households for additional spending. If it cannot, the banks at issue are charged a penal interest rate for the original loan, rendering the whole transaction unprofitable. The catch of course is still the transmission mechanism: whether the banks can persuade firms to take up the additional credit on offer.

Thus, both programs appear to work as “funds for lending” would. Nevertheless, there are two differences:

³ Feldstein (2016)

i) Although the loans under the LTRO program were intended for domestic banks to lend onto private firms, in practice they were mostly lent on to distressed governments (to lower their borrowing costs, and to reduce the level of risk in the home banking system due to a sudden liquidity or solvency crisis). Because the loan contracts were not written with an explicit penalty clause, there was no mechanism to prevent that behaviour. The upshot was that a bank's extra liquidity was not lent on for additional spending. Instead the funds were used to ease or retire debt. Hence the main impact of this policy has been the side effects of improved liquidity and increased financial stability – and from there to lower borrowing costs and gradual improvements in output and employment. The results were clear to see in the 2012-13 era, when the spreads of 10 year borrowing rates over German rates fell dramatically in the distressed economies. Not all those improvements can be ascribed to the LTRO program itself because the loans were short term and comparatively modest, and because the Outright Monetary Transactions initiative had a larger effect. This kind of approach is also self-limiting in that distressed banks have limited supplies of collateral, or collateral of diminishing quality, to borrow against⁴.

ii) Because any loans to, or implicit borrowing by home banks were made from European institutions, those loans are in effect foreign liabilities. If you are not in control of your own money supply and prices, the net foreign liability position matters. That means the capacity to earn additional “foreign” revenues to pay off the loans and interest plays a central role, which implies that either *relative* growth or the current account balance has to improve to make that happen. If that fails, repeated loans and/or liquidity injections will be necessary to keep interest rates down until the **real** exchange rate has been forced down by enough to raise growth relative to others via an improved trade balance. That is relatively easy when you have your own currency; the nominal exchange rate can be forced down by buying foreign currencies. But in the Euro-zone this has to be done by structural reforms to depress domestic prices relative to Euro prices. This may take 6 to 10 years of recession to achieve, which condemns the economy to seek repeated loans (foreign liabilities) until the process is complete. Understandably therefore, this approach has met with little success.

5.2 Fiscal Coordination and GDP bonds in Expanded Fiscal Space

Earlier we highlighted the need to coordinate with other expansionary policies to offset the effects of deleveraging, austerity policies, tighter bank regulation that could be a constraint on the effectiveness of the ECB's low interest rate policies. Structural reform (a long term proposition designed to make the recovery self-sustaining) aside, the natural partner is expansionary fiscal policy. Indeed Fazi (2015) argues that the inability to take advantage of a coordinated package of fiscal and asset purchases is a big reason why the impact of the ECB's asset purchase programme has been relatively modest. It is the combination of the two which is important – implicit recognition that low interest rates (and monetary policy in general) may not be sufficient on their own to resolve a major recession.

Of course there are many reasons why fiscal policy has not been used, extended deficits and the sovereign debt crisis chief among them. But even countries with large fiscal im-balances could contribute a coordinated fiscal expansion by exploiting the fall in borrowing costs that low interest rate policies have made possible. Refinancing debt would enable the average Eurozone country increase its fiscal spending/reduce taxes by 0.45% of GDP for each ½% interest rate fall due to ultra-low interest rates, without suffering an increase in its debt or deficit ratios at the same time. For France that contribution could be up to 0.5% of GDP; for Germany 0.4% and so on. The contribution from the high debt countries could be larger, depending on how much the local risk premia are brought down. For Italy, the contribution could be 0.7% and up. In practice, only Italy and Portugal have taken advantage of this option by introducing fiscal expansions to fill the new fiscal space available; whereas, and

⁴Valiante (2015)

by contrast, half of the improvement in Germany's deficit ratio since 2014 represents a fiscal stimulus withdrawn.

Extending the expansionary power of low interest rates in that way appears to be purely opportunistic. It depends on being able to exploit an external change (a deliberate policy change, a secular slowdown, an unexpected shock like Brexit) when it happens. But it could be made systematic, to operate in every decision period, by introducing GDP-linked bonds. In these bonds, the interest payments are adjusted down on an agreed formula whenever GDP growth is below trend or potential output; and up when GDP growth rises above trend/potential output. That makes the adjustments symmetric⁵, with no systematic bias or loss of discipline in the long term (i.e. by forcing governments to "save for a rainy day" in good times). It also means the interest rate applied to determine repayments varies up and down as growth varies above or below its trend or potential – expanding the fiscal space available for new policy in bad times, but paying down debt in good times.

This process can be represented formally using the usual expression for the evolution of debt over time (Bank of England, 2016):

$$\Delta d_t = (r_t - g_t)d_{t-1} - pb_t \quad (1)$$

where Δd_t is the change in the debt stock to GDP ratio, d_{t-1} , at t ; r_t the interest rate used to determine interest payments at t ; g_t the growth rate at t ; and pb_t the primary balance (a deficit is $pb_t < 0$). Thus, if r_t falls whenever g_t falls, the primary deficit can increase to match the corresponding change in fiscal space (defined perhaps as a given, prespecified, or permissible, or zero change in the debt ratio). Moreover

$$var(\Delta d_t) = var(pb_t) + d_{t-1}^2 var(r_t - g_t) - 2d_{t-1}\rho_{r-g,pb}\sqrt{var(pb_t).var(r_t - g_t)} \quad (2)$$

where $var(r_t - g_t) = var(r_t) + var(g_t) - 2\rho_{r,g}\sqrt{var(r_t).var(g_t)}$ and both correlation coefficients $\rho_{r-g,pb}$ and $\rho_{r,g}$ will be positive if GDP-linked bonds are used; if r_t falls whenever g_t falls, and rises if g_t rises. If r_t falls one-to-one with g_t , then $var(\Delta d_t) = var(pb_t)$ and the additional fiscal policy will fill up all the newly available fiscal space. But in the more likely event that r_t falls by less than that, the degree of new fiscal space used will be less.

Several observations follow. Equation (1) shows that extra fiscal space will always open up in times of low borrowing costs, allowing additional fiscal stimulus to be applied at little or no extra debt. But, if done on a case-by-case basis, this depends on "good luck" (external events). Equation (2) shows that GDP-linked bonds make this *systematic* since $\rho_{r-g,pb}$ and $\rho_{r,g}$ will be positive which reduces the variability of the changes in debt for the permitted or proposed change in the primary deficit, given a fixed/reduced $r_t - g_t$ differential. What GDP bonds do is make this extra fiscal space automatic⁶ instead of a possible opportunity.

Hence we distinguish two cases: a) where r_t and g_t are negatively correlated so borrowing costs/risks rise whenever g_t falls – the conventional case for high debt countries; and b) where r_t and g_t are positively correlated – meaning lower interest payments and budget savings if g_t falls. GDP bonds institutionalise the latter, not only for new issues but also the entire debt stock if the latter is refinanced. And the markets know in advance that this can

⁵ To avoid complications, we assume zero repayments if growth turns negative

⁶ Larger debt repayments in good times do the same. The principle drawback to GDP bonds is that investors will require some premium to compensate them for the variability in their interest payments, estimated at between 0.35% to 1.5% points (Bank of England 2016), although the expected net payment foregone is zero if correctly calculated. This aspect needs further research.

be expected. So GDP bonds reduce the risk that debt becomes unsustainable while opening up space for additional fiscal policy to support low interest rates in bad times.

5.3 Helicopter Money

Helicopter money is defined as money created by the central bank, but distributed (as cash or liquidity) to banks, firms or households directly without going through the asset markets, or as a loan, or in payment of some service – as if scattered from a helicopter on high. This money can be distributed in two ways. Newly created cash could be placed in the reserves of the commercial banks, ready for lending out. As such, no asset purchases are involved (which makes the central bank's balance sheet look worse since there is no possibility of an exit strategy to redeem the new assets and reduce the bank's balance sheet). Hence, this approach is an extreme form of "funds for lending", but is otherwise likely to have an impact similar to QE. However, it also suffers the same drawbacks: there is no certainty that firms/households will want to borrow to invest or spend, or that the banks will risk making new loans even if they would now be more profitable.

The second way to distribute the money is to make *ex-gratia* payments to the population, as a tax rebate, or a rebate for some competition infringement, or as "cash for clunkers". The idea here is that, in the hands of consumers or firms, the money is more likely to be spent and create a boost for aggregate demand in the economy. However, even if it did, the revenues from that increased demand are most likely to be deposited back in the banks with no guarantee that they will be lent out again. So, while helicopter money in this form may partially repair the transmission problem, it will do so only in the short term.

Skidelsky (2016) suggests a variant in which the helicopter money is provided on a pre-paid card whose balance gradually reduces over time (ie is combined with negative interest rates). This may enhance the short term effect, but there is nothing to encourage lending out the cash redeposited in the banks; and nothing to prevent those who wish to save from doing so using their regular income, while substituting helicopter money for spending.

There are other reasons why helicopter money may be ineffective. We need to get exactly the right quantity of money created – enough to create an effective stimulus, but not so much as to trigger escalating inflation expectations. With no exit strategy, this is difficult to do. Moreover, the quantity of money created needs to be set and distributed by the central bank (even if through the agency of others) in order to ensure that special interests are not favoured. If the distribution is made through government accounts, financial markets may fear swollen fiscal deficits and debt in the long term. That would raise long interest rates, potentially offsetting the entire policy – in the same way that rising inflation expectations would impose risk premia. However, the biggest potential drawback is the simplest: there is still no guarantee that the new helicopter money would be spent. If consumers fear for the sustainability of the welfare system in the downturn, or if, in the absence of growth, firms prefer to pay down debt, the new money will be saved instead of spent. There is plenty of evidence that this is likely to happen. Japan has supplemented her QE programme with helicopter expansions on several occasions in the Abenomics regime, but to no great effect. Consumers have preferred to save the extra cash, and firms have invested abroad rather than at home. In the UK, compensation for insurance misselling amounted to 2% of GDP without visible expansionary effect. The risk therefore is that helicopter money also fails to repair the transmission mechanisms to any degree.

5.4 The Exchange Rate Channel

Given that the impact of asset purchasing programmes has been rather small, but tempts pension and insurance funds to invest in more risky assets while eroding the profit margins of banks with the potential for destabilising financial markets and increasing the number of nonperforming loans, it is not surprising that many economists have concluded that the

exchange rate channel may be a more effective route by which low/negative interest rates can benefit the home economy.

The exchange rate channel works as follows: lower asset yields in a low interest economy prompts capital outflows and hence a depreciation of the domestic currency and hence extra exports, but lost imports from trade partners who face an appreciating currency in their export markets. This is clear to see in the Euro-zone. Since QE was announced in late 2014 the euro has depreciated, aided by a secular appreciation of the US dollar. This may have been an important factor in the tentative upturn in the prospects for growth in the Euro-area. As such, it is a potentially important aspect of low interest rates and large scale asset purchases and should be taken into account in assessing the impact of those policies.

Most of the literature has been concerned with the damage to outsiders. But there are two reasons why that damage may be less than thought. First, if low/negative interest rates are successful in rescuing the domestic economy from recession without causing financial instability but lowers the cost of capital in the process, then domestic demand will not fall as far as it might have done and the demand for imports will be sustained allowing outsiders to continue exporting. The consensus view in the literature is that reviving import demand, an income effect, will outweigh the loss of exports through the price effect. If so, the net effect is positive – the low interest rate countries being larger than their trading partners [Lavigne et al (2014)]. However this conclusion depends on the elasticities. If the advanced economies are commodity or component importers, then the presumption of larger income elasticities will be justified.

Second, if falling yields at home trigger a capital outflow, the associated asset sales will depress their price and increase interest rates – partially offsetting the effectiveness of the asset purchases. As a result [Lavigne et al (2014)] the damage is more likely to arise from financial disruption caused by abrupt capital withdrawals from smaller economies with less financial depth when low interest rates come to an end. We have seen such behaviour in East Europe and the BRICS. It suggests an exit strategy needs to be carefully calibrated and communicated in and beyond Euro-zone markets.

Allied to that, investors, seeing falling yields in low interest rate economies, will look for higher yields and hence more risky investments elsewhere, transferring risk taking to other economies and easing monetary conditions in those economies. Prudential regulation would limit this effect. But, like the issues in the paragraph above it follows from monetary easing in general, conventional or unconventional, and is not specifically a problem in Europe. This supplies a conclusion. Increased risk taking behaviour may be less severe for the economy as a whole, than it is for specific institutions, sectors or interest groups.

Conclusions from this section: a) at conventional export price elasticities and import income elasticities, the exchange rate channel may have the largest numerical overall impact of the low interest rate effects. But b), because of the inevitable “J-curve” effect (due to the time taken for the demand for exports and imports to adjust and the long term elasticity values to be reached), it will take time for those impacts to materialize. And c) this strategy can only be effective if others, the trading partners, are not following low/negative interest rate policies at the same time since otherwise there will be no **net** (or effective) depreciation of the currency. This poses a difficulty for the Euro-economies because their principle trading partners are within the Euro-zone, meaning that there can be no net depreciation internally except by competitive price deflation; and because nearly half of OECD debt is covered by low or negative interest rate policies, which means the external exchange rate channel is half as effective as it might have been.

Nonetheless, despite these qualifications, the exchange rate channel may still be a more effective way to get low/negative interest rates to affect the economy positively because it circumvents the damaged transmission mechanism problem between policy and spending.

There are three further points specific to the Euro-zone: i) because of a series of conflicting factors, these effects are likely to be somewhat smaller, in the Euro-zone and on outsiders, than much of the literature has suggested. ii) A specific example is the safe haven effect in Germany (and perhaps elsewhere) in which lower/negative interest rates across the Euro-zone tends to encourage capital inflows which offset the trade effects of low interest rates. And iii), although the trade and investment benefits may appear more important to the smaller economies, they will in fact principally accrue to the more competitive economies within the Euro-zone. Thus asset purchase programmes, low policy rates or funds for lending subsidies need to be undertaken in combination with structural reform measures for distributional purposes. This converts the programme into a long term operation in which the full benefits will be slow to arrive.

6. CONCLUSIONS

Ultra-low and negative interest rates are not logically different, one being a natural extension of the other. But they have different implications for how the economy works. Both rely on the assumption that economic decisions will respond to changes in borrowing costs. But there are many reasons why this may not be true, and most economies will need an additional policy instrument, beyond monetary policy, to help low interest rates to boost spending in a recession – more so the more serious or longer lasting the recession.

Second, their impact depends on the financial structure of the economy⁷. Economies where savers hold their assets in bank deposits, and firms mostly borrow from banks, will not respond very much to low or negative rates. But where they have more options, borrowers or firms can choose to borrow outside the banks. The impact of policy will be larger. Third, there may be political economy constraints; for example if the financial system lacks competition or can limit the fall in interest rates, or the central bank protects savers against negative rates, vs. the case where savers have diversified assets and firms have greater choice. Fourth, the degree of market integration and home bias varies. This affects the willingness of savers, owners of capital or firms to move their assets abroad. That in turn influences the effectiveness of the exchange rate channel. Put together, these factors suggest that the long run equilibrium rate of interest has fallen to zero or lower in the Euro-zone (Holsten et al 2016). If so, low or negative interest rates may be here to stay.

⁷ Posen (2016)

REFERENCES

- Arteta, C., M. Kose, M. Stocker, T. Taskin (2016) "Negative Interest Rate Policies: Sources and Implications", DP 11433, Centre for Economic Research, London
- Bank of England (2012), "The Distributional Effects of Asset Purchases", *Bank of England Quarterly Bulletin*, Q3, 254–66 (available from <http://www.bankofengland.co.uk/pub-lications/Documents/news/2012/nr073.pdf>)
- Bank of England (2016), "Making a reality of GDP-linked sovereign bonds", *G20 IFA Working Group*, August (<http://g20.org/English/Documents/Current/201608/t201608193167>)
- Blanchard O., P. Mauro and J. Ancalin (2016), "The Case for Growth-Indexed Bonds in Advanced Economies Today", Policy Brief PB2016-2, Peterson Institute, Washington DC.
- Borensztein, E. and P. Mauro (2004), "The Case for GDP-Indexed Bonds" *Economic Policy*, 38, 165-216
- Chen, Han, Cúrdia Vasco and Ferrero Andrea (2012) "The Macroeconomic Effects of Large-Scale Asset Purchase Programmes" *The Economic Journal* 122 (564): F289–F315 (at https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr527.pdf)
- Fazi, Thomas, (2015), "QE in the Euro-zone has failed", *Piera.co.uk* (available at http://www.piera.co.uk/articles/qe_in_the_eurozone_has_failed)
- Feldstein, Martin (2016), "The Fed's Unconventional Monetary Policy", *Foreign Affairs*, May-June, 105-115 (available at <https://www.washingtonspeakers.com/images/pdfs/The%20Fed's%20Unconventional%20Monetary%20Policy.pdf>)
- Gagnon, Joseph, Raskin Matthew, Remache Julie and Sack Brian (2011), "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases", *International Journal of Central Banking*, 7, 3–43 (at <http://www.ijcb.org/journal/ijcb11q1a1.htm>)
- Holsten, K., T. Laubach and J. Williams (2016), "Measuring the Natural Rate of Interest: International Trends and Determinants", WP 2016-11, Federal Reserve Bank of San Francisco, San Francisco, August
- Hughes Hallett, A. (2016), "Effectiveness of the ECB Programme of Asset Purchases: where do we stand?", Economics Committee, European Parliament (<http://www.europarl.europa.eu/committees/en/econ/monetary-dialogue.html>)
- Joyce, Michael, David Miles, Andrew Scott and Dimitri Vayanos (2012) "Quantitative Easing and Unconventional Monetary Policy – an Introduction" *The Economic Journal* 122 (564): F271–F288 (at http://personal.lse.ac.uk/vayanos/Papers/QEUMCI_EJ12.pdf)
- Kapetanios, George, Haroon Mumtaz, Ibrahim Stevens and Konstantinos Theodoridis (2012), "Assessing the Economy Wide Effects of Quantitative Easing", *The Economic Journal* 122 (564): F316–F347 (available at <http://www.bankofengland.co.uk/research/Pages/workingpapers/2012/wp443.aspx>)
- Lavigne, Robert, Sabrata Sarker, Garima Vasishta (2014), "Spillover Effects of Quantitative Easing on Emerging Market Economies", *Bank of Canada Review*,

2014, 23-33 (at <http://www.bankofcanada.ca/wp-content/uploads/2014/11/boc-review-autumn14-lavigne.pdf>)

- Miles, David (2012), "Asset Prices, Saving and the Wider Effects of Monetary Policy", Speech at the pro-Manchester Business Conference, March (www.bankofengland.co.uk/archive/Documents/historicpubs/speeches/2012/speech549.pdf)
- Posen, Adam (2016), "Negative Rates are not the Drama they Seem", Financial times, 24 August
- Skidelsky, R. (2016), "A Tweak to Helicopter Money Will Help the Economy Take Off" Financial Times, 5 August
- Williams, John C. (2011), "Unconventional Monetary Policy: Lessons from the Past Three Years", *Economic Letter* October 2011, Federal Reserve Bank of San Francisco (available at <http://www.frbsf.org/economic-research/publications/economic-letter/2011/october/unconventional-monetary-policy-lessons/>)
- Valiante, Diego (2015), "The Visible Hand of the ECB's Quantitative Easing", DP 407, Centre for European Policy Studies, Brussels (available at https://www.ceps.eu/system/files/WD408_DV_QE_0.pdf)

NOTES

DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Low long-term rates: bond bubble or symptom of secular stagnation?

Grégory CLAEYS

IN-DEPTH ANALYSIS

Abstract

Yields on European sovereign bonds have reached historically low levels in 2016. The goals of this paper are to understand why interest rates are currently so low and to determine if this level is justified by fundamental factors, or if rates are artificially low because of unconventional monetary policies. The decline in yields over the last 30 years is the result of various factors: the fall in inflation, lower risk premia in European countries, and most importantly the fall in the real interest rate driven by a secular decline in the 'neutral' rate. Consequently, central banks are not fully responsible for the actual level of long-term real rates, because they adopt, to fulfil their price stability mandates, the necessary policies to influence market rates in order to make them consistent with neutral rates, over which they have little influence. Low rates are the symptoms of our diseases, not their cause. It is therefore crucial to tackle the structural causes behind the fall in long-term rates, but also to find solutions for the harmful consequences that lower equilibrium rates could have for the conduct of monetary policy.

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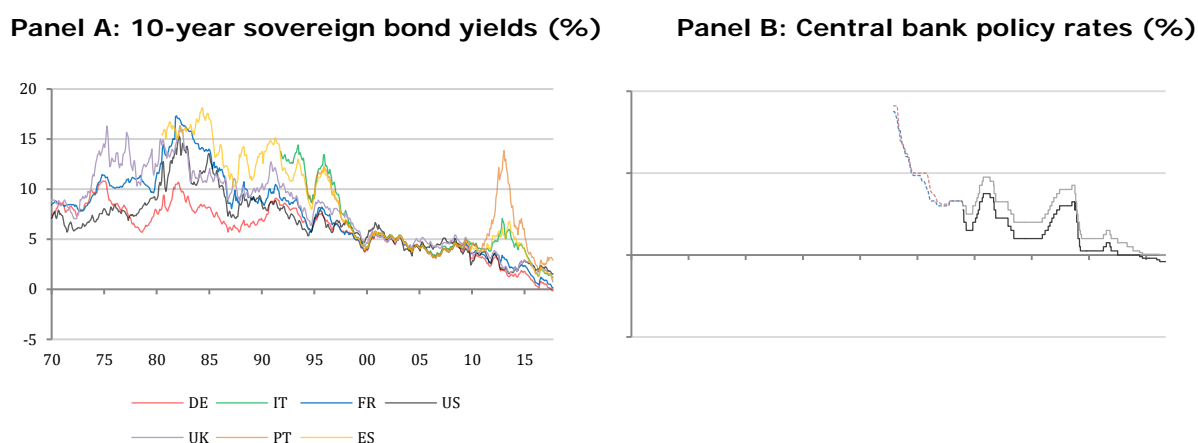
EXECUTIVE SUMMARY

- Yields on European sovereign bonds have reached historically low levels in 2016: most of them stand today between 0 percent and 1.5 percent, while they were clearly above 10 percent at the beginning of the 1980s. This secular decline in long-term sovereign yields is not limited to the euro area, and can also be observed, for instance, in the US, the UK, Japan and Switzerland.
- The goals of this paper are to understand why interest rates are currently so low and to determine if this level is justified by fundamental factors or if unconventional monetary policies are artificially lowering long-term rates.
- The decline in yields over the last 30 years and the most recent falls are the result of various factors: reducing inflation, low risk premia in European countries and, most importantly, the fall in the real (i.e. inflation adjusted) interest rate.
- The decrease in the real rate is itself driven mainly by the secular decline of the 'neutral' rate. This rate is defined as the short-term equilibrium rate between demand and supply of funds compatible with full employment and price stability.
- That is why central banks cannot be blamed for the actual level of long-term real rates: they adopt, to fulfill their mandate, the necessary policies to influence market rates in order to make them consistent with neutral rates, over which they have little influence.
- Given that the neutral rate is an important guide to monetary policy (and represents a good benchmark to determine if the current level of rates is justified), a growing empirical literature has tried to estimate where this neutral rate is. Although there is a lot of uncertainty around the main results, there is some clear evidence of time-variation in the neutral rate of interest, with a clear downward trend since the 1960s, which accelerated after 2008.
- The determinants of the fall in the neutral rate are all the factors affecting the supply and demand for funds. These include demographics, lower productivity growth, lower investment, rising inequality and shifting preferences for less risky assets at home and abroad.
- The precise neutral rate estimates should be treated with caution, but the similar trends and orders of magnitude generated by various methodologies suggest that the decline in real rates observed over the last 10 years is not the result of an overly accommodating monetary policy but of a combination of structural and cyclical factors.
- The disappointing recoveries observed in the US and even more so in European countries have raised the possibility that we might have entered a period of secular stagnation. Understanding the potential mechanism at work behind this phenomenon could thus be crucial to understand why rates are currently so low.
- The main driver of secular stagnation appears to be the structural mismatch between the high proclivity of people to save and the low demand for those savings to be translated into risky productive investment, leading to a lower and possibly negative real interest rate to clear the market for funds.
- Although secular stagnation is an appealing hypothesis that provides an explanation for many of the economic features of the last 30 years, including the secular decline in real rates, it is still too early to settle the debate. Nevertheless, even if secular stagnation is still a hypothesis, most of the structural features of secular stagnation are already weighing on growth and on interest rates.
- Low rates are the symptoms of our diseases, not their cause. It is therefore crucial to tackle the structural causes behind the fall in long-term rates, but also to find solutions for the harmful consequences that lower equilibrium rates could have for the conduct of monetary policy.

1. INTRODUCTION

Yields on European sovereign bonds have reached historically low levels in 2016: German 10-year government bond yields stand at 0.03 percent, French at 0.25 percent, and Italian and Spanish yields are respectively at 1.37 percent and 1.07 percent. All were well above 10 percent at the beginning of the 1980s (Figure 1a). This secular decline in long-term sovereign yields is not limited to the euro area; it is also observed in the United States, the United Kingdom, Japan and Switzerland. Short-term policy rates in the euro area and elsewhere are also at historically low levels and far from their long-term average (Figure 1b). Given that short-term rates are constrained by the zero lower bound, this has resulted in a flattening of the whole yield curve.

Figure 1: European interest rates



Source: OECD Statistics, Bloomberg.

Note: DF and MRO rates refer respectively to the European Central Bank's Deposit Facility and Main Refinancing Operations rates. The German Discount Rate is the equivalent of today's ECB Marginal Lending Rate.

It is therefore legitimate to ask if the current levels of long-term yields on European sovereign bonds are justified, or if there is some kind of European bond market bubble fuelled by ECB monetary policy. Unwarranted unconventional monetary policies that keep rates artificially low could distort the allocation of resources and produce harmful side effects. There is concern about a potential increase in financial stability risks because investors are searching for yield and because the profits of insurers, pension funds and banks are being strongly squeezed. There is also a fear that inequality could increase because of the rise in prices of assets that are held by only a small fraction of the population¹.

Of course, a bubble is generally difficult to identify in real time and is more easily characterised *ex post* by the rapid escalation in an asset price that is unwarranted by its fundamentals and is followed by its contraction. The objective of this paper is therefore to try to understand why interest rates are currently so low and to determine if this level is justified by fundamental factors, or if it is an artificial phenomenon.

¹ For our assessments of the potential side effects of unconventional monetary policies, see Claeys and Darvas (2015) and Claeys, Darvas, Leandro and Walsh (2015).

2. WHAT ARE THE DETERMINANTS OF LONG-TERM RATES?

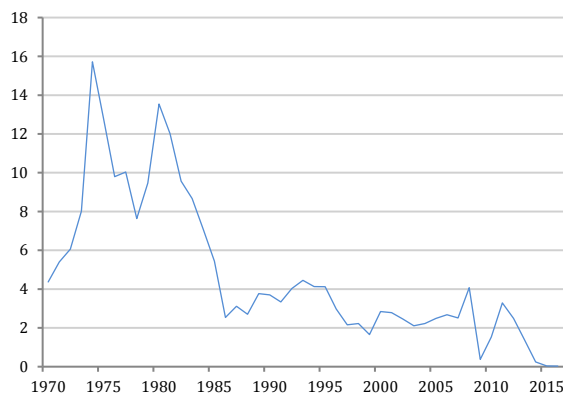
Nominal rates can be primarily decomposed into real (ie inflation-adjusted) safe rates, term premia including inflation expectations, and risk premia (to compensate investors for various risks, such as default and liquidity). Movements in long-term yields can be explained by changes in these three main components. Let's take a look at them in turn.

First, a big part of the story behind the decline of nominal long-term rates in the last 35 years has been the fall in inflation and inflation expectations. On average, inflation in the euro area fell from more than 15 percent per year at the beginning of the 1980s to around 2 percent at the end of the 1990s (Figure 2). This is mainly a consequence of the adoption by the central banks of advanced economies of credible inflation targeting regimes (with a clear mandate of price stability defined by low and stable inflation, generally around 2 percent) after the surge in inflation at the end of the 1970s and the beginning of the 1980s. In that sense, central banks have had a clear impact on long-term rates by anchoring inflation expectations around their targets.

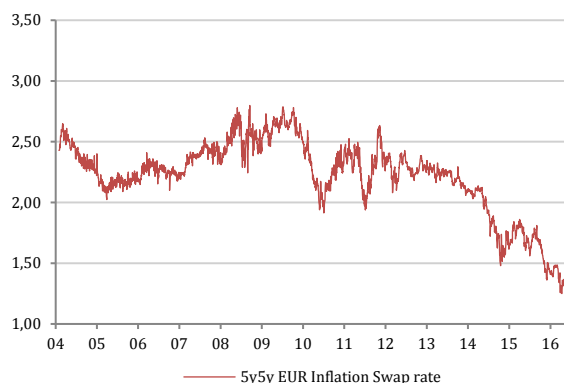
In addition, Figure 2 also shows a more recent fall both in headline inflation, which has been trending around 0 percent for the past two years (Panel A), and in market-based inflation expectations to well below the ECB's target of "below but close to 2 percent" (Panel B). This has surely contributed to the recent decline in nominal rates.

Figure 2: Euro-area inflation

Panel A: Headline CPI inflation (%)



Panel B: Market-based inflation expectations (%)

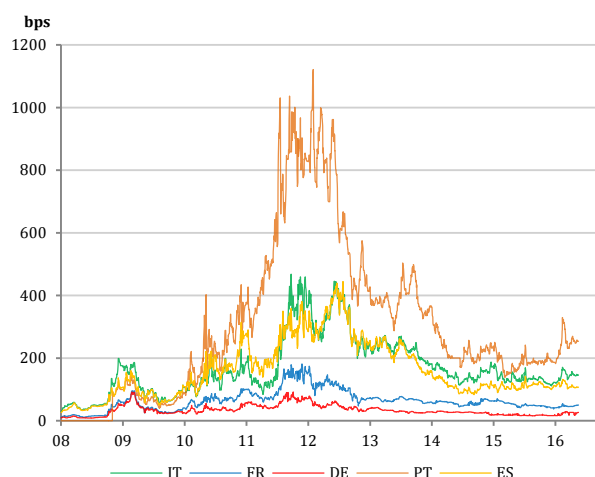


Source: World Development Indicators (World Bank), Bloomberg.

Second, long-term sovereign bond yields are also affected by changes in the risk premium. As Figures 1 and 3 illustrate, this was the case during the euro-area crisis when there was a rapid increase in the probability of default and the re-denomination risk related to a potential break-up of the monetary union. Independent central banks generally do not have a direct impact on this component of long-term interest rates because it depends mainly on the solvency of governments and therefore on the health of public finances. However, the recent crisis has shown that sovereign bond markets can also be affected by self-fulfilling liquidity crises. Central banks can avoid these bad equilibria in which there is a run on the bond market by playing the role of lender of last resort in the same way that they do for the banking sector to avoid self-fulfilling bank runs (De Grauwe, 2013). The ECB decided to assume this role in 2012 when it announced the creation of its OMT (Outright Monetary Transactions) programme, a potentially unlimited but conditional purchase programme for bonds issued by euro-area governments, aimed at *"safeguarding an appropriate monetary policy transmission and the singleness of the monetary policy"*. This put an end to the liquidity crisis and resulted in a quick fall in country risk premia across the euro area. However, the

spreads did not return to the negligible pre-crisis levels because market participants realised that credit risks still differed in the different countries of the euro area, despite the monetary union (see again Figures 1 and 3).

Figure 3: 10y sovereign credit default swap in the euro area



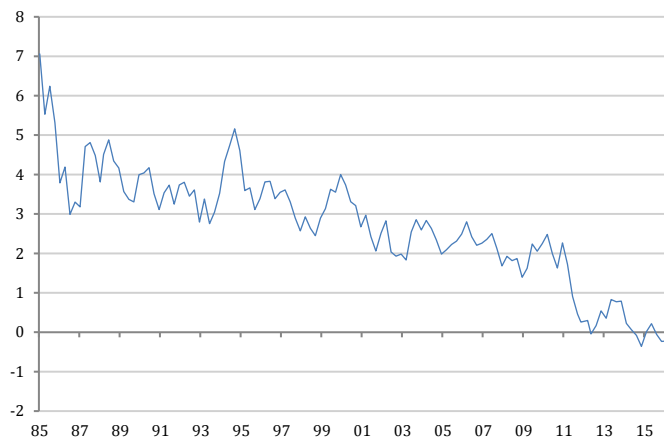
Source: Eikon Reuters.

Note: Credit default swaps (CDS) are financial agreements under which the seller will compensate the buyer in the event of a loan default or other credit event.

Finally, while inflation might have been the most important factor behind the downward trend in nominal rates from 1980 to the end of the 1990s, most of the decline over the last 15 years is a result of the global fall in long-term real safe rates² (Figure 4). In turn, real long-term rates are mainly determined by the expected path of short-term rates over the life of the asset plus a small additional term premium for holding long-term debt instead of rolling over short-term debt across the entire period.

² To be clear, there are no perfectly safe assets. By safe asset we mean the safest assets available for which the default risk premium is almost negligible. In addition these assets generally benefit from a negative premium because holding them allows investors to hedge themselves partly against recessions, given their negative correlation with risky assets during crisis episodes in which risk aversion increases. This is the case, for instance, for US Treasuries, German Bunds and Swiss bonds.

Figure 4: Long-term 'world' real interest rate



Source: Bruegel based on Bloomberg.

Note: The 'World' real interest rate is based on data for G7 countries' (except Italy) real 10-year yields computed by Bloomberg (as the difference between the generic 10-year yield and core CPI) and weighted according to the real average GDP per country over the whole time period. Note that our measure takes into account the availability of the data across countries by including them gradually into the sample.

3. THE CONCEPT OF NEUTRAL RATE OF INTEREST AND MONETARY POLICY

Does that mean that central banks are responsible for the fall in real rates because they have signalled their willingness to leave their policy rates at very low levels for a long time? Yes and no. To understand why real rates have steadily declined over the last 15 years, it is very useful to introduce the concept of the 'neutral rate of interest' (also called the natural rate, Wicksellian rate, or simply r^* by some economists).

This rate is defined as the short-term equilibrium rate between demand and supply of funds compatible with full employment of capital and labour resources and with price stability (ie inflation around the central bank's target). This concept was first introduced by Wicksell (1898) before being resuscitated a century later in New Keynesian models, in particular by Woodford (1998), and in practice thanks to the advent of inflation-targeting regimes in most of the world's central banks and their use of the short-term rate as the main monetary policy instrument.

The neutral rate points to the level of the real interest rate when monetary policy is neither stimulating nor restraining economic growth. If market rates are above neutral rates³, investment and consumption are discouraged: the economy cools down and could ultimately end up in recession and in deflation if rates are maintained at that level for too long. On the contrary, if market rates are below neutral rates the economy heats up and inflation rises above target. That is why central banks are not really responsible for the actual level of long-term real rates as they adopt, to fulfil their mandates, the necessary policies to influence market rates in order to make them consistent with neutral rates over which they have little influence.

In normal times, central banks simply adjust the short-term rate up and down to influence medium to long-term market rates that are relevant for economic decisions related to investment or consumption of durable goods. However, when short-term rates reach the zero lower bound, central banks need to rely on unconventional tools to affect directly the medium and long-term part of the yield curve. To do that, they have developed a diverse array of tools: forward guidance (ie communication about the likely future course of monetary policy), negative policy rates and, most importantly, changes in the size, composition and maturity of their balance sheets, mainly through asset purchases.

Since 2008, the ECB has gradually resorted to all of these policies. First, it reduced its policy rates, and at -0.4 percent its deposit rate is now even slightly in negative territory (Figure 1b). The ECB also provided very quickly long-term lending to European banks with favourable conditions. Since 2013, the ECB has provided forward guidance on the future path of its policy interest rates. Finally, the ECB has put in place a diversified asset purchases programme that originally included Asset Backed Securities (ABS) and covered bonds, but which was vastly expanded in 2015 with the inclusion of sovereign and European supranational bonds and, later, of corporate and local government bonds⁴.

³ We use 'neutral rates' in plural because we think it is possible, as in Brzoza-Brzezina and Kotłowski (2014), to extend the concept of neutral rate, originally thought of as a benchmark for the short-term policy rate, for each maturity of the yield curve (or each class of securities) therefore forming a whole 'neutral yield curve' that we can compare with the actual market yield curve. For simplicity, in the rest of the paper, we use the singular to talk about the short-term neutral rate and the plural to talk about the whole 'neutral yield curve'.

⁴ For details on the policies implemented by the ECB since the beginning of the crisis, see Claeys (2014), Claeys, Leandro and Mandra (2015) and Claeys and Leandro (2016).

4. THE CURRENT LEVEL OF THE SHORT-TERM NEUTRAL RATE OF INTEREST

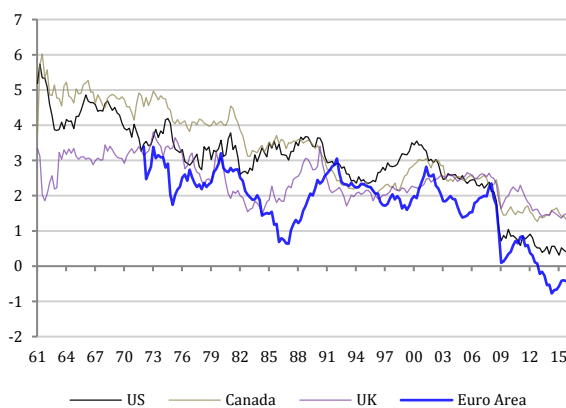
As we have seen, the neutral rate is an important guide to monetary policy, and thus represents a good benchmark to answer our original question and determine if current interest rate levels are justified by fundamentals or if rates are distorted by the central bank's policies. It is therefore critical to know where this neutral rate is.

Unfortunately, this value is not directly observable. In addition, historical averages of past real rates do not shed light on the current or future level of neutral rates and therefore on the adequate level of interest rates: what was considered 'normal' in terms of interest rates in the past might not be 'normal' in the future. It is therefore necessary to estimate the neutral rate.

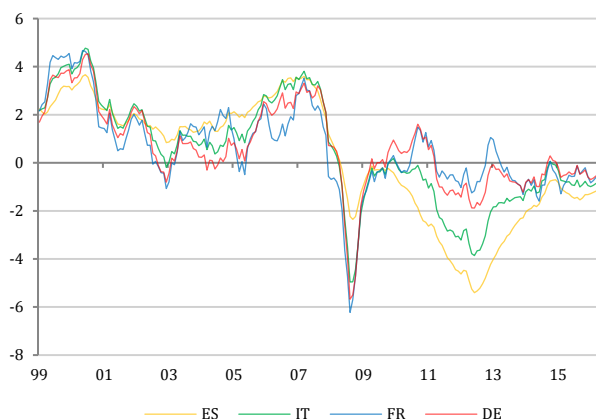
In theory, this neutral rate depends mainly on the following factors: the saving behaviour of households and the potential growth rate of an economy (mainly determined by productivity growth and population growth). In a simple model, such as the Solow model (1956), the saving behaviour of households is fully exogenous, so the equilibrium rate depends only on technological change and population growth. In micro-founded models, such as the Ramsey model or New Keynesian models, household preferences (their patience represented by the discount rate, and their inter-temporal elasticity of substitution for consumption) will, combined again with population and productivity growth, determine the equilibrium rate in the long run. However, in more sophisticated models, such as Eggertsson and Mehrotra (2015), in which households can transition from borrowing to saving over their lifecycles, an increase in inequality or a tightening of borrowing limits can also impact negatively on the equilibrium rate.

Figure 5: Examples of estimated neutral rates (%)

Panel A: World neutral rates (%)



Panel B: European neutral rates (%)



Source: Holston, Laubach and Williams (2016) and Fries *et al* (2016).

In practice, various empirical approaches have been proposed to estimate the neutral rate, ranging from statistical filters extracting unconditional trends of observed real interest rates to fully-fledged DSGE models, and including semi-structural approaches. For instance, Holston, Laubach and Williams (2016), whose main results are reported in Figure 5a, use a semi-structural approach to filter the data on output, inflation and short-term interest rates to extract highly persistent components of the natural rate of output, its trend growth rate and the natural rate of interest for the US, the UK, Canada and the euro area. They find evidence of time-variation in the neutral rate of interest in all four economies, with a clear downward trend in estimated neutral rates since the 1960s, accelerating after 2008. Their results also indicate substantial co-movement in the estimates of the neutral rate across

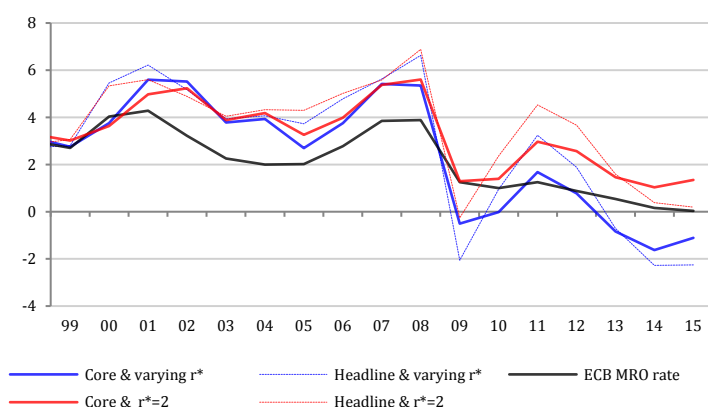
economies, suggesting an important role for global factors. These main findings appear to be robust to alternative methodologies⁵.

Focusing on the euro area, Figure 5a suggests a collapse in the equilibrium rate after 2008 and points towards a negative value of the neutral rate for the last few years. Fries *et al* (2016), using a similar method, estimated time-varying national natural rates of interest for each of the euro area's largest four economies (Germany, France, Italy and Spain) since the creation of the euro in 1999. Their results (Figure 5b⁶) also suggest that equilibrium rates in the euro area's biggest countries have drifted very far into negative territory in recent years.

The determinants of the fall in the neutral rate are all the factors affecting the supply and demand for funds. These include demographics, lower productivity growth, lower investment, rising inequality, shifting preferences for less risky assets at home and abroad. Another interesting empirical exercise is therefore to attribute more precisely the decline of the neutral rate to these various components. Rachel and Smith (2015) explain the fall of global real rates by 450 basis points (bps) since 1980 as follows: while a reduction in the growth trend explains a decline of rates by 100bps (and 50 bps are left unexplained), demographics, the increase in savings in emerging markets invested in safe assets, the rise of inequality, and lower investment (coming from a fall in relative prices of capital goods and from lower public investment) have exerted a drag on real rates equivalent to 300bps.

However, the empirical version of the equilibrium rate estimated in most of these papers is slightly different from the one described in the previous section. Estimated r^* are generally defined as the long-run equilibrium rate that should prevail once all cyclical factors have died out, while the neutral rate described previously is the optimal rate that ensures full employment and price stability at all times, taking both the structure of the economy and cyclical shocks into account.

Figure 6: 'Taylor Rule' for the ECB using a time-varying r^*



Source: Bruegel based on Eurostat, AMECO, Holston, Laubach and Williams (2016).

Note: The 'Taylor rules' take the following form: $r = \text{inflation} + r^* + 0.5(\text{inflation} - \text{target}) + 0.5(\text{output gap})$, using the latest output gap estimations from the European Commission, either core HICP or headline HICP inflation for the euro area, and r^* either constant and equal to 2 percent or the time-varying estimates of Holston, Laubach and Williams (2016).

Hence, central banks should not try to set their policy rates precisely at the level of this estimated r^* , but at a level compatible with this r^* and the current economic situation (determined by the output and inflation gaps). In a simple Taylor rule, this r^* could be

⁵ See for instance other estimates of the US neutral rates by Hamilton *et al* (2015), Kiley (2015) or Lubik and Matthes (2015).

⁶ We thank the authors for sharing their data with us and allowing us to publish their results in our paper.

thought as the, now time-varying, 'intercept' of the rule. To illustrate this point, we plot several versions of a simple Taylor rule for the ECB in Figure 6, following Taylor's original specifications and coefficients (Taylor, 1993). We use headline and core inflation data from Eurostat and the (albeit imperfect⁷) output gap estimates from the European Commission, while for r^* we use either the time-varying estimates of Holston, Laubach and Williams (2016), or a constant r^* equal to 2 percent (the value that was used originally by Taylor but that happens to be also the pre-crisis average of equilibrium rates in the euro area). Comparing the two versions of the simple rule with core inflation (the blue and red solid lines of Figure 6), we can see that although their prescriptions were pretty similar before the crisis, they have diverged since 2008. The prescribed monetary policy taking into account both the economic situation and the evolution of the equilibrium rate has indeed been trending between 150 and 250 basis points below the one implied by a constant equilibrium rate. Moreover, this modified Taylor rule calls for a negative policy rate since the end of 2012, suggesting that the current level of ECB rates and additional unconventional policies to push the yield curve lower are justified.

Nevertheless, these numbers should not be taken too literally. A lot of uncertainty surrounds these neutral rate estimates: their values are volatile⁸ and the confidence intervals reported in the literature are generally quite large. Given the limitations of estimation methods – in real time in particular – neutral rate estimates should not be used as a direct target of monetary policy (either directly or in a Taylor rule as we have done⁹) but as one important indicator among others to inform the decision making of the ECB governing council. In any case, given the complex and dynamic nature of today's economies, some discretion in policymaking is preferable to following a simple rule. However, to come back to our original question, the overall trend and the order of magnitude¹⁰ of these estimates do not suggest the build-up of a bubble in the bond market. On the contrary, this growing empirical literature shows that the substantial decline in real rates observed over the last 10 years is not the result of an over-accommodative monetary policy but of a fall in the neutral rate, itself a result of a combination of structural and cyclical factors.

⁷ Darvas and Simon (2015) assess the output gap estimations of the European Commission and provide an alternative less volatile methodology.

⁸ For instance, *prima facie*, the very quick and steep decline of the equilibrium rate in 2009 seems counterintuitive given that it should be the result of structural changes. However, a quick reassessment of future productivity growth, expectations of hysteresis effects coming from a big crisis, the breakdown of the financial system and the impact of enhanced regulation and supervision could explain this steep fall in the long-run equilibrium rate.

⁹ In addition, Taylor rules use output gap estimates that are also very difficult to estimate in real time as shown by Darvas and Simon (2015).

¹⁰ Two quick reality checks also support this order of magnitude for the neutral rate: the current level of inflation, which is well below target, and the absence of obvious financial bubbles (see Claeys and Darvas, 2015) also suggest that monetary policy is not over-expansionary.

5. THE DECLINE IN THE NEUTRAL RATE OF INTEREST AND THE SECULAR STAGNATION HYPOTHESIS

As we have seen, the current decline in interest rates is strongly associated with pessimistic expectations about future economic prospects, in particular in advanced countries. The disappointing recoveries (in terms of both GDP and employment rates) observed in the US and even more in European countries, and the continuous downward revisions of potential growth estimates, have raised the possibility that we might have entered a period of secular stagnation. Understanding the mechanism that might be at work behind this phenomenon could thus be crucial to help understand why rates are currently so low.

The term secular stagnation was coined by Hansen (1939) to describe *“sick recoveries which [...] leave a hard and seemingly immovable core of unemployment”* taking place in the aftermath of the Great Depression. The main symptoms of secular stagnation described by Hansen were low growth, low employment and low interest rates because of the combination of low capital formation and a high savings rate. Hansen believed that the driving forces behind this phenomenon were the low population growth of the time and the fact that there were no new territories or techniques in which to invest. Ultimately, Hansen was proved wrong by the massive increase in government spending triggered by the second world war and, most importantly, by the post-war economic boom, the baby boom and a new wave of innovation.

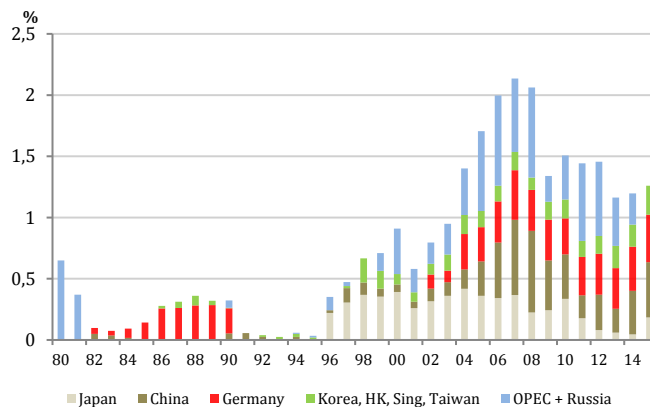
However, the secular stagnation hypothesis was resurrected by Summers (2013) and Krugman (2011, 2013a, 2013b) in the aftermath of the Great Recession. The secular stagnation concept describes well many features of the current slow recovery affecting the US, Japan and Europe. Unlike Hansen’s original idea, today’s version of the secular stagnation hypothesis does not rely as much on a technological slowdown, even if some research – eg Gordon (2014) – focuses on this aspect. The main driver of secular stagnation today appears to be the structural mismatch between the high proclivity of people to save and the low desire for those savings to be translated into (risky) productive investment, leading to a lower and possibly negative real interest rate to clear the market for funds.

According to this hypothesis, economies prone to secular stagnation (ie with low neutral rates) tend to oscillate between two unenviable situations. Either the real interest rate is constrained from equilibrating at full employment by the zero lower bound on nominal interest rates, leading to a chronic insufficiency of aggregate demand. With an inflation target of 2 percent, real rates cannot go below -2 percent, which might not be low enough to ensure full employment. Or the real interest rate consistent with equating investment and saving at full employment is so low that it is not consistent with sustainable finance and generates bubbles. Permanent negative real rates might not be compatible with financial stability if, at negative rates, some investors have a tendency to invest in ‘unworthy’ projects (bubbles) instead of ‘worthy’/productive projects (maybe because of a relatively lower elasticity of supply of ‘worthy’ projects to the real rate), and if the regulation and supervision of the financial system is not effective enough.

This theory could therefore explain the current situation but also some important features of previous decades: the fact that full employment was obtained only at the price of increased leverage and bubbles (.com, housing), and the secular downward trend in inflation and long-

term real interest rates. Secular stagnation would explain today's slow recovery but also the Great Moderation¹¹ and Greenspan's conundrum¹² (Greenspan, 2005).

Figure 7: Current account surpluses to world GDP (%)



Sources: World Development Indicators (World Bank).

The main factors behind secular stagnation are found on both the supply side and on the demand side for savings. On the supply side, the last two decades have seen an increase in savings concentrated in the hands of savers with a low propensity to invest in risky activities. As highlighted by Bernanke (2005) in his famous 'Global Savings Glut' speech, some governments in emerging markets – China and oil-exporting countries in particular – have been accumulating huge international reserves since the end of the 1990s, overwhelmingly invested in safe assets (ie sovereign bonds from advanced countries). This was fuelled by significant current account surpluses (Figure 7) resulting from an over-reliance on exports and exchange rate interventions. In addition, an historical rise in inequality in advanced countries took place, driven by a massive increase in wages and capital gains at the very top of the income distribution, and a stagnation in real revenues for the bottom half of the distribution since the end of the 1970s (Piketty, 2014). This resulted in an increase in savings/wealth of the most affluent part of the population, characterised by a lower propensity to consume. This increase in savings at the global level should have supported an increase in capital expenditure across the world, but this is not what we observed in practice. One explanation might be that these particular savers might not maximise their risk-adjusted returns but might have other objectives with a preference for 'nominal safety' or liquidity, resulting in the absence of risk-taking investors and a high demand for safe assets (a movement amplified during the crisis by the drastic decrease in the global safe-asset supply: from \$20 trillion in 2007 to \$12 trillion in 2011, as highlighted by Caballero and Farhi, 2014).

On the demand side, a variety of structural changes could explain the lower demand for savings for financing investment in advanced countries (see Figure 8). There could be a lack of profitable, or more probably sufficiently safe, private investment opportunities in advanced economies: this would also explain the tendency to invest in bubbles that could be seen as safer during the build-up phase, in particular in housing, despite all the evidence to the contrary¹³. As suspected by Hansen in the 1930s, low population growth in advanced countries could translate into low future demand for goods and services and could weigh on current investment. Other factors could also drive the decline in capital expenditure: the fall

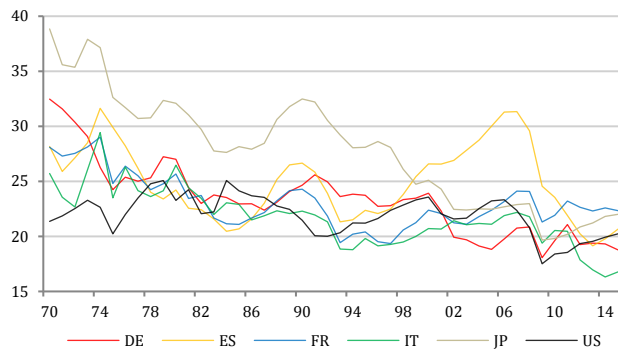
¹¹ The Great Moderation refers to the period between the early 1990s and 2007 during which the volatility of business cycle fluctuations was reduced in many advanced countries. During that period, GDP growth was steady and inflation was stable and around 2 percent.

¹² Greenspan's conundrum refers to the episode in 2005 during which 10-year US Treasury yields failed to increase and even trended lower despite a raise of the Fed policy rate by 150 basis points.

¹³ See for instance Jordà *et al* (2016).

in the relative price of durable equipment; a broken financial sector or one that has wrong incentives (Claeys, 2016); poor managerial incentives to invest within companies; a technological slowdown or at least a difficulty in rewarding innovators; monopoly positions in some industries leading to huge rents leading to disincentives to increase production; and finally the reduced capital intensity of leading industries (think General Motors, 220,000 employees worldwide, 400 offices and plants, market capitalisation of \$48bn vs. Whatsapp, 55 employees, 1 office and valued at \$19bn, ie 40% of GM).

Figure 8: Gross capital formation (investment) as % of GDP



Source: World Development Indicators (World Bank).

6. SHOULD WE TAKE THE SECULAR STAGNATION HYPOTHESIS SERIOUSLY?

Although secular stagnation is an appealing hypothesis that provides an explanation for many of the economic features of the last 30 years, it is still very early to settle the debate. In the euro area in particular, the recovery has just started, so it is so far very difficult to distinguish the secular from the cyclical trend. The cyclical component could still be very strong in the aftermath of a one-in-a-century crisis, in particular because the European crisis was characterised by some significant policy mistakes, with a fiscal policy that was on aggregate pro-cyclical from 2011 to 2014 (and broadly neutral in 2010 and 2015 at a time where it should have been counter-cyclical), and a monetary policy that was often very slow and behind the curve. In terms of investment, a vicious circle of weak demand and sluggish investment also emerged during the crisis. Various hysteresis effects are also at work, leading to lower productivity growth resulting from cuts to investment and R&D during the crisis and from the destruction of human capital because of the prevalence of very high unemployment rates for almost a decade now.

In particular, as suggested by Rogoff (2015), the current slow recovery and the low-rate environment could more simply be the result of the *“debt super-cycle”*. Unlike the V-shaped recovery of ‘standard’ recessions, financial crisis are often followed by U-shaped recoveries, because of the length and the difficulty of the deleveraging process. This would also imply low safe real rates, because of the deleveraging taking place after an asset price bust and the move away from risky assets, as shown by Gourinchas and Rey (2016). In that case, the policy response should be straightforward and twofold: support the deleveraging process by facilitating debt write-downs and maybe by increasing temporarily the inflation target, while implementing strong micro- and macro-prudential policies to avoid a repeat. This could well be a good description of the current European situation in which the banking sector has not been totally cleaned up (eg non-performing loans still represent a big part of some banks’ portfolio, especially in the periphery) and private debt is still very high.

Given that the global savings glut – one of the main factors behind the secular stagnation hypothesis – is mostly the result of bad government policies, secular stagnation could also prove temporary if those policies are changed, as argued by Bernanke (2015). A transformation of the Chinese economic model away from exports towards internal demand, and the steep fall in the oil price, should result in a reduction of excess savings in emerging markets. In order to accelerate the end of the global savings glut, it would thus be important for emerging countries to avoid intervention in foreign exchange markets, while advanced economies should reduce the remaining barriers to capital flows towards emerging markets.

The cyclical arguments clearly have some merit and are definitively playing a big role in the current situation, but they do not explain fully why the decline in long-term real rates preceded the crisis. In fact, the trend in real and neutral rates between 2000 and 2007 (Figures 4 and 5a) has continued in the aftermath of the crisis with a very similar slope. In addition, although the sum of global current account surpluses has receded since the global savings glut peak of 2005, the equilibrium real rate has continued to decline, suggesting that the external factor is important but that it might not be the main factor. Focusing on the euro area in particular, the monetary union also displays some of the most worrying features of secular stagnation. Even Germany, the top-performing country of the union, is characterised by low domestic demand, low wage growth, low inflation, an aging society and a heavy reliance on exports to ensure full employment. In addition, Germany’s ever-increasing current account surpluses could be seen as a symptom of too much saving and not enough investment. In many countries of the periphery, growth and full employment before 2008 were obtained through leverage and bubbles. Today, these countries are characterised by low investment, lower potential growth and also low population growth. The periphery is now following the same export-led economic model as Germany by regaining competitiveness through prices to improve exports, but domestic demand is still very weak. This has led to an even larger current account surplus for the whole euro area, driving fears that the euro

area could soon replace China and oil exporters in the global savings glut as the main savings' exporter.

Overall, the secular stagnation hypothesis is still an hypothesis, but a frightening one, and even if the particular mechanism described by Summers and Krugman or its secular nature is proved wrong over time, most of the features of secular stagnation are already present today and are weighing on growth and – to come back to the main topic of this paper – on interest rates. Imbalances leading to a global savings glut in emerging markets and now in Europe, the historical rise of inequality, the various disincentives to invest, aging populations and slowing productivity growth, are real structural problems in need of solutions, whether secular stagnation is underway or not.

7. CONCLUSIONS

The decline in long-term rates on European sovereign bonds in the last few years results from a combination of factors: a fall in inflation expectations, a return of risk premia to levels more in line with credit risks (unlike before or during the euro crisis) and most importantly a fall in real rates driven by a secular decline in neutral rates. These fundamental factors are the main drivers of the decline in long-term yields in Europe, making it very difficult to qualify the current bond market as a bubble. In our view, low rates are the symptoms of our diseases, not their cause. Instead of accusing central banks, it is crucial to tackle the causes behind the fall of long-term rates, but also, in the meantime, to find solutions for the harmful consequences that lower equilibrium rates could have for the conduct of monetary policy.

If the neutral real rate is negative or around zero, even if inflation is around the 2 percent target, steady-state policy rates would be around 2 percent. This would give less leeway to cut rates when next recession arrives. For comparison, in the US, the average reduction during the past nine recessions in the Fed policy rate was equal to about 5.5 percentage points. All else being equal, a lower neutral rate implies that episodes in which monetary policy is constrained by the zero lower bound are likely to be more frequent and longer. This implies that the ECB would need to rely more heavily on unconventional policies, the effects of which are less certain, and which are more difficult to calibrate given their relative novelty. Moreover, given the particular institutional arrangement of the monetary union, the use of these policies has been politically controversial, which in turn delayed their implementation in the euro area. The ECB's quantitative easing programme started six years after the beginning of asset purchases by the US Federal Reserve and the Bank of England. The reluctance to use this type of policy could lead to permanent suboptimal monetary policymaking in the euro area, should this set of policies become the ECB's main instruments because of a fall in the neutral rate.

If the equilibrium rate remains very low or even negative for a prolonged period, the ECB should reassess its monetary policy framework and its inflation target. This target is not set in stone and is defined by the ECB itself. The (below but close to) 2 percent target might have been suitable for the first years of the ECB and may have helped anchor inflation expectations at a low and stable level at a time when the neutral rate was around 2 percent, but it might not be a well-suited inflation target for a low r^* era. The ECB should determine if it would be wise to raise its inflation target (for instance to 4 percent) so that the market can clear at a lower real rate. Of course, this is a very serious decision and there would be some risks involved. Some have argued that a change to the target could lead to a loss of credibility of the central bank and dis-anchor fragile expectations. We don't think that this would be the case, but the main benefit of the 2 percent inflation target is that, at this level of inflation, many economic agents behave as if there were no inflation at all. A higher level could change that and revive indexation of contracts and thus second-round effects when there is a shock to headline inflation (for instance from energy prices).

Finally, lower neutral rates and their potential impact on monetary policy should also lead to a reassessment of the role of fiscal policy in tackling recessions and slow recoveries and in supporting monetary policy in that regard. In this type of episode, governments should take advantage of the high demand for safe assets and the low rates on long-term sovereign bonds to finance a surge in public infrastructure and R&D. As suggested by De Long and Summers (2012), given the current negative real rates, the higher multiplier at the zero lower bound and the positive impact of public investment on future potential growth, this could even result in a decrease in the debt-to-GDP ratio in the long run. As shown by Claeys, Darvas and Leandro (2016), the current European fiscal framework is, in practice if not in theory, highly ineffective and has contributed to the anaemic economic recovery in Europe. That is why it is time to design better and maybe more systematic fiscal policies in the euro

area that would support the economy during recessions and recoveries, first by reforming the fiscal rules and then by enhancing the automatic stabiliser properties of European fiscal policies at the national and European levels.

REFERENCES

- Bernanke, B. (2005). "The global saving glut and the US current account deficit". Speech (No. 77). Board of Governors of the Federal Reserve System, March 10, 2005
- Bernanke, B. (2015). "Why are interest rates so low, part 3: The Global Savings Glut", Brookings Blog, April 1, 2015.
- Brzoza-Brzezina, M. & J. Kotłowski (2014). "Measuring the natural yield curve". Applied Economics, 46(17), 2052-2065.
- DeLong, J.B. & L.H. Summers (2012). "Fiscal policy in a depressed economy". Brookings Papers on Economic Activity, 2012(1), 233-297.
- De Grauwe, P. (2013). "The European Central Bank as lender of last resort in the government bond markets". CESifo Economic Studies, 59(3), 520-535.
- Caballero, R.J. & E. Farhi (2014). "On the role of safe asset shortages in secular stagnation". In: Secular Stagnation: Facts, Causes and Cures, 111-122.
- Claey's, G. (2014). "The (Not So) Unconventional Monetary Policy of the European Central Bank since 2008". Policy Brief prepared for the Economic and Monetary Affairs Committee (ECON) of the European Parliament.
- Claey's, G. (2016). "Quelle place pour les marchés financiers en Europe ?" Revue d'Économie Financière, 123, forthcoming.
- Claey's, G. & Z. Darvas (2015). "The Financial Stability Risks of Ultra-loose Monetary Policy". Bruegel Policy Contribution, No. 2015/03.
- Claey's, G., Z. Darvas & A. Leandro (2016). "A Proposal to Revive the European Fiscal Framework", Bruegel Policy Contribution, No 2016/07
- Claey's, G., Z. Darvas, A. Leandro & T. Walsh (2015). "The Effects of Ultra-loose Monetary Policy on Inequality". Bruegel Policy Contribution, No. 2015/09.
- Claey's, G., A. Leandro & A. Mandra (2015). "European Central Bank Quantitative Easing: the Detailed Manual". Bruegel Policy Contribution, No. 2015/02.
- Claey's, G. & A. Leandro (2016). "The European Central Bank's Quantitative Easing Programme: Limits and Risks". Bruegel Policy Contribution, No. 2016/04.
- Darvas, Z. & A. Simon (2015). "Filling the gap: open economy considerations for more reliable potential output estimates". Bruegel Working Paper, No. 2015/11.
- Eggertsson, G.B. & N.R. Mehrotra (2014). "A model of secular stagnation". NBER Working Paper Series, No. 20574.
- Fries, S., S. Mouabbi, J.S. Mésonnier & J.P. Renne (2016). "National Natural Rates of Interest and the Single Monetary Policy in the Euro Area". Paper presented at the 3rd IAAE annual conference, Milano Bicocca, 23 June 2016, revised version: September 2016.
- Gordon, R.J. (2014). "The Demise of US Economic Growth: Restatement, Rebuttal, and Reflections". NBER Working Paper Series, No 19895.
- Gourinchas, P.O. & H. Rey (2016). "Real Interest Rates, Imbalances and the Curse of Regional Safe Asset Providers at the Zero Lower Bound NBER Working Paper Series, No. 22618.

- Greenspan, A. (2005) "Federal Reserve Board's Semi-annual Monetary Policy Report to the Congress". Testimony before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, February 16, 2005
- Hansen, A.H. (1939). "Economic progress and declining population growth". *The American Economic Review*, 29(1), 1-15
- Hamilton, J.D., E.S. Harris, J. Hatzius, & K.D. West (2015). "The equilibrium real funds rate: Past, present and future". NBER Working Paper Series, No. 21476.
- Holston, K., T. Laubach & J. Williams (2016). "Measuring the natural rate of interest: International trends and determinants". In: NBER International Seminar on Macroeconomics 2016. *Journal of International Economics*.
- Jordà Ò., M. Schularick & A.M. Taylor (2016). "The great mortgaging: housing finance, crises and business cycles". *Economic Policy*, 31(85), 107-152.
- Kiley, M. (2015). "What Can the Data Tell Us About the Equilibrium Real Interest Rate?" Finance and Economics Discussion Series 2015-077. Washington: Board of Governors of the Federal Reserve System.
- Krugman, P. (2011). "The Return of Secular Stagnation", *The New York Times*, November 8, 2011.
- Krugman, P. (2013a). "Bubbles, Regulation, and Secular Stagnation", *The New York Times*, September 25, 2013.
- Krugman, P. (2013b). "Secular Stagnation, Coalmines, Bubbles, and Larry Summers", *The New York Times*, November 16, 2013.
- Lubik, T.A. & C. Matthes (2015). "Calculating the Natural Rate of Interest: A Comparison of Two Alternative Approaches," Federal Reserve Bank of Richmond Economic Brief, October 2015, EB15-10.
- Piketty, T. (2014). *Capital in the Twenty-First Century*. Harvard University Press, Cambridge.
- Rachel, L. & T.D. Smith (2015). "Secular drivers of the global real interest rate". Bank of England Staff Working Paper, No. 571.
- Rogoff, K. (2015). "Debt supercycle, not secular stagnation". Remarks at Closing Panel, Rethinking Macro Policy III, IMF, Washington DC, April 16, 2015.
- Solow, R.M. (1956). "A contribution to the theory of economic growth". *The Quarterly Journal of Economics*, 65-94.
- Summers, L.H. (2013). Speech at the IMF 14th Annual Research Conference In Honor Of Stanley Fisher, International Monetary Fund, November 8, 2013.
- Taylor, J.B. (1993). "Discretion versus policy rules in practice". In: Carnegie-Rochester conference series on public policy (Vol. 39, pp. 195-214). North-Holland.
- Wicksell, K. (1898). *Interest and Prices*. English translation reprinted New York: Augustus Kelley, 1962.
- Woodford, M. (1998). "Doing without money: controlling inflation in a post-monetary world". *Review of Economic Dynamics*, 1(1), 173-219.

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