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Critique of accommodating central bank policies and the 'expropriation of the saver'

A review

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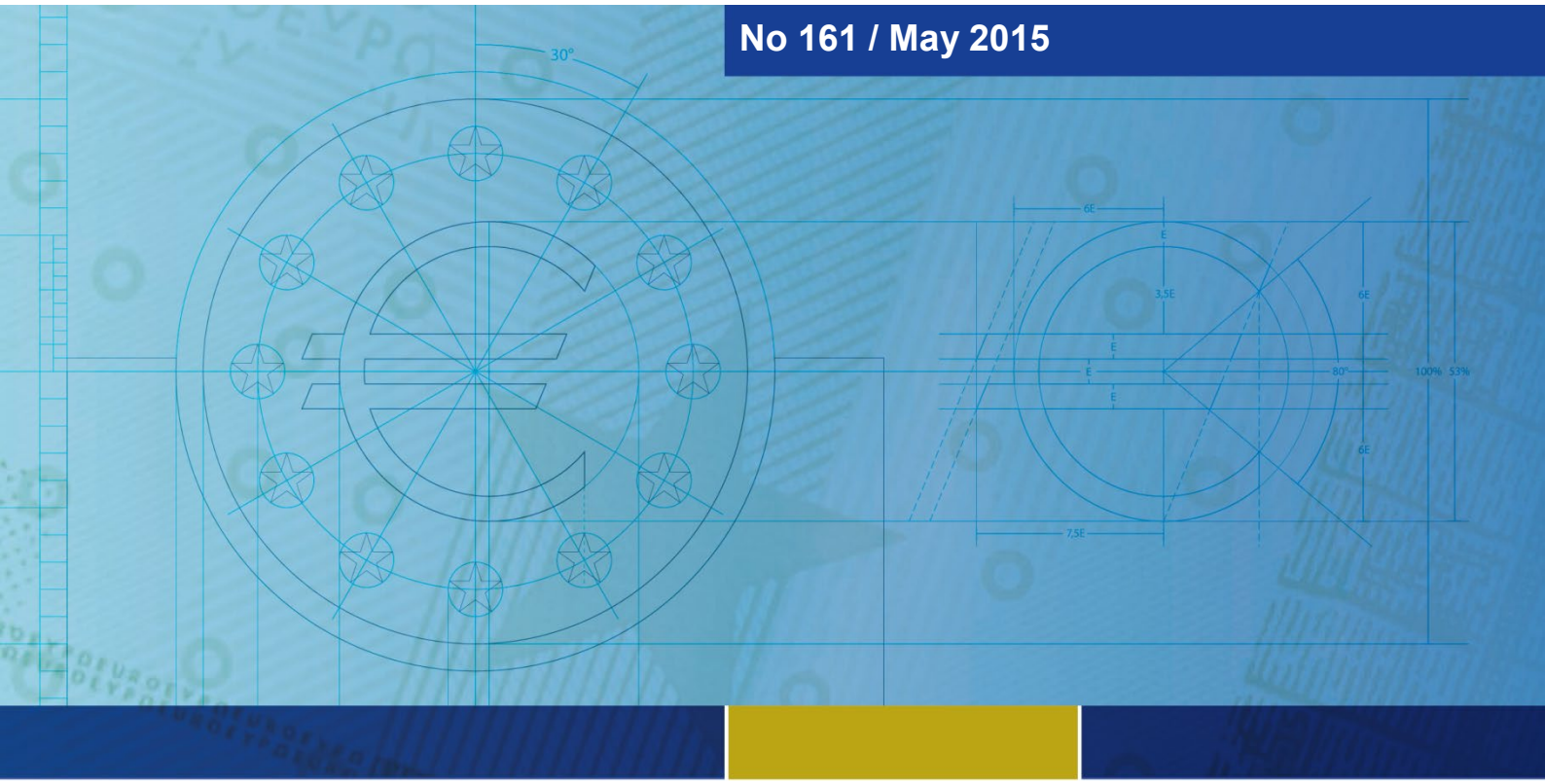

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Abstract

In parts of the German media, with the support of a number of German economists, the ECB's low nominal interest rate policy is criticised as unnecessary, ineffective and as expropriating the German saver. This paper provides a review of the relevant arguments. It is recalled that returns on savings are anchored to the real rate of return on capital. Good monetary policy tries to avoid being a source of disturbance in itself, and may be able to smooth the effects of temporary external shocks, but beyond that cannot structurally improve the real rate of return on capital. Against this general background, the paper critically analyses a number of recent arguments as to why low interest rate policies could actually be counterproductive. Finally, the paper reviews what can be done about the medium to long-term real rate of return on capital, which remains in any case the basic issue for the saver, focusing on the specific case of Germany. The key policies identified relate to demographics, education, labour markets, infrastructure and technology. Low growth dynamics in the coming decades and correspondingly low real rates of return on investments are not inevitable.

JEL codes: E43, E52, O40

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1 Introduction and overview

After a number of previous cuts to its key interest rates, and having adopted additional non-conventional accommodative monetary policy measures, the ECB was, in June 2014, the first central bank of a large currency area to set a negative remuneration rate for excess reserves held by banks with the Eurosystem [1]. This led to a further decline in a number of market rates, including negative nominal yields for some short-term risk-free assets (as had already been seen during the sovereign debt crisis). In parts of the German media, with the support of a significant number of German economists, the ECB's policy was criticised as ineffective, counterproductive, and as implying the expropriation of the German saver. According to Mark Schieritz (Die Zeit Online, 3 July 2014), the topic, during the summer of 2014, "dominated the media debate like no other economic policy topic". The topic has remained prominent amongst German economists and the media ever since. [2]

Besides the tabloid press [3], a number of prominent figures have also supported the case. Georg Fahrenschon, previously Finance Minister of Bavaria and President of the German Savings Bank Association, develops the "expropriation" argument in particular:

"The European Central Bank was founded following the example of the Bundesbank, with the objective of price stability. Today, it stands for an unprecedented phase of low interest rates that expropriates the saver, damaging the savings culture and putting more and more pressure on the self-provisioning of people, banks and insurance companies… This now raises the question of how deeply an institution without democratic legitimacy can dig into the pockets of the people… Low interest rates are a drug with significant side effects: they hide structural problems, harm health in the long term and, the longer they are taken, the more difficult it becomes to

1 The first central bank ever (and so far the only one) that has tried to set its operational target interest rate at negative levels was Danmarks Nationalbank, as described, for instance, by Jørgensen and Risbjerg (2012). As of July 2012, monetary-policy counterparties of Danmarks Nationalbank had to pay 20 basis points for placing liquidity in certificates of deposit with the central bank. As Jorgensen and Risbjerg (2012) note, the negative rates were passed through to the money markets and achieved their objective of stopping the appreciation of the krone against the euro. Interbank turnover fell, but no particular market disruptions were noted. However, one issue was that the banks did not really pass on the negative rates to retail depositors, creating a profitability issue in the long term. In 2015, both the Swiss National Bank and Danmarks Nationalbank set interest rate at unprecedentedly low levels by setting the deposit facility (in an environment of excess liquidity) to -75 basis points.

2 E.g. DZ Bank (2015) published a study on the expropriation of the German saver and other unintended effects of low interest rate policies, which found high media attention.

3 The German tabloid "Bild" (J.W. Schäfer, "Sparer sind die Ober-Deppen", 6 June 2014) summarised this view as follows: "Der Zins-Klau macht alle Sparer zu Ober-Deppen!... Die Gefahr von Altersarmut ist so gross wie nie! Und sie wird viele Deutsche zwingen, viele Jahre länger zu arbeiten als eigentlich geplant. Rentner, die sich nebenbei noch etwas dazuverdienen, sind schon heute keine Seltenheit. Künftig wird es für die meisten auch mit 70 oder 75 noch heissen: Statt Sonne auf Mallorca Regale einräumen oder Prospekte austragen zu Hause. Den Euro-Notenbankern sei Dank…"

overcome this addiction" (Börsenzeitung, 22 March 2014, "A common Europe has to be built on trust"). 4

"The savers in all of Europe are unsettled and asset values are destroyed" (Börsenzeitung, 6 June 2014, "Placebo policy at the expense of the saver"). 5

According to media reports, Paul Kirchhof, a leading German lawyer (previously a member of the German Constitutional Court and once a candidate to become Finance Minister in the Merkel Government in 2005, and twice President of the Deutscher Juristentag) took the position that the low interest rate policy of the ECB contradicts the fundamental legal right of citizens, enshrined in the German constitution, to receive a positive return on savings ("Spiegel Online", 11 December 2013):

"Kirchhof attacks the policy of the ECB: Europe currently needs low interest rates, as otherwise states will no longer be able to pay their debts, says Kirchhof. Nevertheless, [German] constitutional law guarantees to each citizen that his or her financial capital will yield some return every year. 'This promise is no longer fulfilled. A key idea of private ownership has been abolished'."[6]

A number of politicians have also made similar arguments, and leaders of the euro-critical party "Alternative für Deutschland" have fully supported the expropriation argument (AfD Press Release of 5 June 2014 "The European Central Bank decides on the expropriation of the saver").

An example of a variant on the expropriation argument is that made by Holzhausen and Sikova (2014), which emphasises the distributional consequences of the low interest rate policies of the ECB, and seems to suggest that German households are the main victims of accommodative monetary policies in the euro area (while other countries benefit):[7]

"… the current policy stance of the ECB might be justified. Nonetheless, it is not without costs. Low interest rates are a bane for savers but a boon for borrowers. Moreover, monetary policy does not affect all eurozone members equally." (p.3)…. While households in countries strongly affected by the crisis are relieved, others, namely German households, are suffering from the very same measures. This

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4 [D]ie Europäische Zentralbank wurde einst nach dem Vorbild der Bundesbank gegründet mit dem Ziel der Geldwertstabilität. Heute steht sie für eine beispielslose Niedrigzinsphase die die Sparer enteignet, die Sparkultur beschädigt und die Institutionen der Eigenvorsorge der Menschen, Banken, und Versicherungen… immer weiter unter Druck setzt. Damit wird schon jetzt die Frage aufgeworfen, wie tief eine demokratisch nicht legitimierte Institution wie die EZB in die Taschen der Menschen greifen darf…. Niedrigzinsen sind eine Droge mit erheblichen Nebenwirkungen: sie decken strukturelle Probleme zu, schaden langfristig der Gesundheit und je länger sie genommen werden, desto schwieriger wird der Entzug. (Börsentzeitung, 22 March 2014, "Ein gemeinsames Europa muss auf Vertrauen bauen").

5 "Die Sparer in ganz Europa werden verunsichert und Vermögenswerte zerstört" (Börsenzeitung, 6 June 2014, "Placebopolitik auf Kosten der Sparer").

6 *"Kirchhof attackierte die Politik der EZB: Europa brauche derzeit zwar niedrige Zinsen, weil sonst die Staaten ihre Schulden nicht mehr bezahlen könnten, sagte Kirchhof. Gleichwohl verspreche das Verfassungsrecht jedem Bürger, dass ihm sein Finanzkapital jährlich einen Ertrag bringt. "Dieses Versprechen wird nicht mehr erfüllt. Eine Kernidee des Privateigentums ist abgeschafft."*

7 Hans-Werner Sinn also considers Germans to be the main victims of low interest rate policies and estimates their cumulative losses since 2008 at EUR 300 billion, compared to a scenario in which 2007 interest rate levels had remained in place (Frankfurter Allgemeine Zeitung, 4 December 2014, "Germans lose EUR 300 billion because of low interest rates").

undoubtedly represents a challenge for the European monetary union; over time, the criticism from the countries on the short end of monetary policy is bound to get louder and more intensive while the losses are accumulating." (p. 8).

Beyond the alleged expropriation of the saver, a number of **additional problems and negative side effects of low interest rate policies** have been emphasised by observers, and some have gone so far as to argue that low interest rates are fundamentally counterproductive, even with regard to the aim they are supposed to achieve. For example, it has been argued that low nominal interest rates have a negative income effect on households, which is recessionary. Other German economists have argued that at a very low level, interest rates lose their effectiveness as a credit allocation mechanism and lead to dangerous asset price bubbles and financial instability. Finally, some German economists have argued that low ECB interest rates do not have monetary policy objectives, but aim to ensure the cheap financing of sovereigns: they will eventually be detrimental because they undermine incentives to governments to reform and restore unambiguous debt sustainability (Sinn, 2013, p. 18).

To balance German media and academic opinion, it should be acknowledged that other journalists and economists [8] have rejected the expropriation of the saver hypothesis and have defended the ECB's low interest rate policy as necessary. Moreover, the debate is not an exclusively German one. That low interest rates are a form of financial repression [9] at the expense of the saver was argued, for instance, by Bill Gross, a bond fund manager and founder of one of the largest global fund management companies, PIMCO. According to Bloomberg ("Americans Can't Retire When Bill Gross Sees Repression", by Jeff Kearns, Steve Matthews and Katherine Peralta, March 25, 2014):

"Feeble returns on the safest investments such as bank deposits and fixed-income securities represent a 'financial repression' transferring money from savers to borrowers", says Bill Gross, manager of the world's biggest bond fund. Workers 65 and older, struggling with years of depressed yields, are the only group of Americans who are increasingly employed or looking for jobs, according to Labor Department participation-rate data. "We're going to be financially repressed for decades," Gross, the 69-year-old billionaire co-founder of Pacific Investment Management Co., told Bloomberg Radio Feb. 7, citing the Federal Reserve interest-rate policy that aims to cut borrowing costs. "I hate to be gloomy, but, yes, for the next 10 years, the oldsters, and I'm in that camp, are going to be disappointed in terms of the policy rate." About 75 million baby boomers, born from 1946 to 1964, are starting to retire and face meager returns as a by-product of the Fed's decision to hold its benchmark rate near zero since December 2008."

Also the BIS (see Borio, 2012, Caruana, 2014, or Borio and Disyatat, 2014) or American Academics (Cochrane, 2013), raise doubts as to the appropriateness and

[8] E.g. Mark Schieritz in Die Zeit (5 June 2014), Robert von Heusinger in Frankfurter Rundschau (6 June 2014), Norbert Häring in Handelsblatt (10 June 2014), Ulrich Schäfer in Süddeutsche Zeitung (5 June 2014), Marcel Fratzscher in an interview with Der Spiegel (18 November 2013), Interview mit Peter Bofinger, Der Standard, 17 November 2013, Carl Christian von Weizsäcker (Der Spiegel, 21 December 2013), Jan Mallien in Handelsblatt (9 April 2015). For a survey of the debate in Germany, see also Jens Münchrath in Handelsblatt, 20 November 2014.

[9] On low interest rates as an instrument of financial repression see also van Riet (2013).

efficiency of the aggressive easing measures of global central banks. Rajan (2013) also discusses the side effects of low interest rates.

Central bankers have at various occasions defended the rationale of low interest rate polices, and insisted on separating the issue of long-term real growth (and long-term real interest) rates from monetary and inflation issues. For example, Weidmann (2014b) notes that "What monetary accommodation definitely cannot do is tackle the root causes of low growth potential in the euro area – the structural barriers that hamper competition, innovation, and hence productivity". Weidmann notes the crucial role of investment (which is driven by real return prospects): "An increase in investment is a precondition for higher growth rates. Durable growth requires reforms that cut red tape, spur innovation, and make labour costs more calculable. This is not only conducive to higher growth potential in the future: it acts as a nearer-term stimulus in its own right. Investment is not only in one year's supply: it is also today's demand". Coeuré (2013a) notes that "In the long run, real rates are determined by natural economic forces, by productivity-enhancing public intervention and by the quality of our market institutions that are beyond the reach of monetary authorities. …. Looking forward, the welfare of euro area savers will … depend on efforts to lift productivity by investing in technologies and skills – more than on any decision the ECB has taken and will take in the future" (see also Coeuré, 2013b). Federal Reserve Chair Janet Yellen gave similar explanations in a Senate Hearing (11 February 2014, House Financial Services Committee Hearing on Federal Reserve Semi-Annual Monetary Policy Report to Congress, Panel I): "…interest rates are low. And they're low not just because the Fed arbitrarily decided to set them at a low rate, but because the fundamentals of the economy are generating low interest rates … normally we think of interest rates as reflecting … a balance between savings and investment, the strength of those forces in the economy. And in the aftermath of the downturn, the desire to borrow money for private investment is weak. And reflection of that is low rates. If we were to try to keep interest rates above the levels called for by fundamentals, we would have a yet weaker economy". This paper will explain this position as exemplified by Weidmann, Coeuré and Yellen [10] in more detail, and will also analyse some of the arguments that low interest rates are counterproductive.

The rest of this paper proceeds as follows: Section 2 recaps the basic economic foundations of central bank interest rate policies, and how the setting of short-term nominal rates, and the possible adoption of additional non-conventional measures (if the so-called "zero lower bound" is reached), is determined by the rate of return on capital and economic fluctuations. The long-term real interest rate is considered as given in this section, and will be further discussed in Section 4. Section 3 reviews recent criticism of low interest rate policies, including the various arguments as to why interest rate policies are ineffective or even counterproductive. Section 4 discusses the factors driving long-term real interest rates, and why real interest rates are currently so low. Section 5 focuses on the German case: what could be done concretely in the case of Germany to restore better growth dynamics and higher real rates of return on investment? Section 6 concludes.

[10] Ben Bernanke, Chairman of the Board of Governors of the Federal Reserve System from 2006 to 2014, devotes his first post in his Blog launched on 30 March 2014 to the same subject, and unsurprisingly argues similarly (http://www.brookings.edu/blogs/ben-bernanke/posts/2015/03/30-why-interest-rates-so-low).

2 The relationship between nominal and real interest rates

2.1 Arbitrage condition between nominal and real interest rates

This section reviews why in the long term (see below), nominal interest rates are closely linked to the sum of the real rate of return on capital and the inflation rate. This implies that a central bank does not have a degree of freedom in choosing (or even influencing) the long-term real rate of return on a saver's investments. The real interest rate on money investments will, in the steady state, be equal to the real rate of return on capital. By "long term", we mean everything around or beyond five years. This is a time horizon beyond which monetary policy impulses and exogenous shocks are typically assumed to have had their full impact (mostly, it is assumed in the literature and by central banks that monetary policy impulses are effective over a two-year horizon). This time horizon is much shorter than that of the typical saver, as working life before retirement is around 40 years, and so the average horizon of savers may be seen as around 20 years [11].

Central banks usually control a short-term nominal interest rate as their *operational target* of monetary policy (Bindseil, 2014). The operational target of monetary policy is an economic variable which the central bank wants to control, and indeed *can* control, to a very large extent on a day-by-day basis through the use of its monetary policy instruments. It is the variable (i) for which the policy making committee decides the level in each of its meetings, (ii) which gives guidance to the implementation officers in the central bank as to what to actually do on a day-by-day basis in the inter-meeting period, and (iii) serves to communicate the monetary policy stance to the public. [12] Thornton (1802, p. 254), who is usually praised as the most advanced monetary policy theorist before the 20th Century, views central bank policy as "Bank Rate" (discount facility rate) policy, and analyses how Bank Rate policy should be conducted. The idea that Bank Rate needs to follow the real rate of return on capital, in order to allow control of the expansion of money and hence of inflation, was first spelled out by Thornton:

"In order to ascertain how far the desire of obtaining loans at the bank (the Bank of England) may be expected at any time to be carried, we must inquire into the subject of the quantum of profit likely to be derived from borrowing there under the existing circumstances… We may, therefore, consider this question as turning principally on a

[11] Of course, sometimes the relevant saving horizon is shorter, but (i) the most important saving time horizon is still that determined by the work-life cycle, and (ii) for short horizons, the cumulative effect of the level of the interest rate is less relevant.

[12] There are essentially three main types of operational targets: (i) a short-term interest rate (the dominating type of operating target pre-1914 and post-1990 and, in between, also playing, at least implicitly, an important role), (ii) a quantitative, reserve-related concept – officially in the US the operational target in the period 1920-1983 (in numerous variants), and (iii) a foreign exchange rate, for central banks which peg their own currency strictly to a foreign currency. See Bindseil (2014).

comparison of the rate of interest taken at the bank with the current rate of mercantile profit. The bank is prohibited, by the state of (usury) law, from demanding, even in time of war, an interest of more than five per cent, which is the same rate at which it discounts in a period of profound peace. It might, undoubtedly, at all seasons, sufficiently limit its paper by means of the price at which it lends, if the legislature did not interpose an obstacle to the constant adoption of this principle of restriction."

Thornton's concept of a "rate of mercantile profit" is closely related to the "natural rate" of interest described in 1898 by Wicksell (1898/1936, p. 102) as follows:

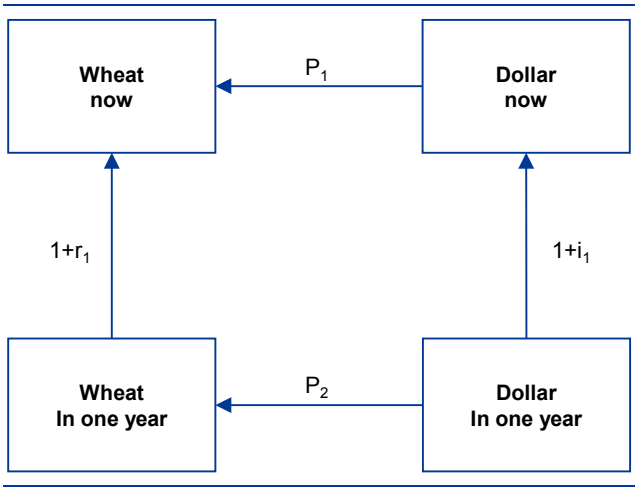
"There is a certain rate of interest on loans which is neutral in respect to commodity prices, and tends neither to raise nor to lower them. This is necessarily the same as the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods. It comes to much the same thing to describe it as the current value of the natural rate of interest on capital."

The following arbitrage diagram (see also Richter, 1990), with two goods (wheat as the unique consumption and capital good, and money) at two points in time ("now" and "in one year") illustrates the concept of the natural rate of interest. The meaning of a price x associated with an arrow is that one needs x units of the good at the origin of the arrow to purchase one unit at the spike of the arrow. Defined for that purpose:

- i_1 = the nominal interest rate on money (i.e. the relative price of one unit of money in one year is $1/(1+i_1)$ units of money today)
- r_1 = the real rate of return on a capital good (i.e. the relative price of one unit of wheat in one year is $1/(1+r_1)$ units of wheat today)
- P_1 is the price of wheat prevailing today, measured in money today
- $E(P_2)$ is the expected spot price of wheat prevailing in one year, i.e. the price of wheat in one year measured in money in one year

The rate of return on capital r is determined by real factors, i.e. factors independent of the monetary sphere, such as inter-temporal productivity and inter-temporal preferences of households. It is plausible that in steady state equilibrium, the real sphere is independent of the money sphere, in the sense that the scarcity of money determines only the purchasing power of money and the money price of various goods, but not relative prices of real goods (i.e. the relative price between wheat and potatoes, or between wheat today and wheat in one year should not be affected by the absolute level of nominal prices or nominal interest rates). This idea is called "classical dichotomy" or the "neutrality of money" in the economic literature (see Patinkin, 1987, or Kandel et al., 1996). In reality, a full dichotomy will not apply, as monetary impulses have temporary effects that do leave some trace in the economic system. Still, it is right to assume the dichotomy to analyse steady state equilibrium, as money cannot structurally manipulate the real sphere of the economy.

Figure 1
Arbitrage diagram between real and nominal interest, and the inflation rate



It is important to note that real rates of return on capital can be positive or negative. In a normal growth environment they should be positive, but in an ageing society with high savings and little growth dynamics, they are more likely to be negative (see Section 4 for more details).

Arbitrage logic allows establishing the basic relationships between prices by moving within the diagram from one good to another via different paths. Indeed, in steady state arbitrage equilibrium, it should be equivalent to move from "Wheat now" to "Wheat in one year" directly, or via the monetary sphere, and therefore the following equation should hold:

$$1+ r_1 = P_1(1+i_1)/E(P_2) \quad (1)$$

Defining $(1+ E(\pi_1))$ as $E(P_2)/P_1$, we also obtain the Fisher equation:

$$(1+ r_1) = (1+i_1) / (1+E(\pi_1)) \quad (2)$$

Equation (2) is approximately equivalent to $i_1=r_1+E(\pi_1)$, i.e. in equilibrium the nominal interest rate should be the sum of the real rate of return on capital and the expected inflation rate.

Starting from an initial state of inflation and stable inflation expectations, $E(\pi_{t+1}) = \pi_t$ the central bank could preserve this state if it always managed to keep the money (nominal) interest rate, i_t, equal to the real rate of return on capital, r_t, plus π_t. Wicksel's above-quoted statement on the natural rate of interest assumes, as a starting point, expectations of zero inflation, so that the **natural interest rate** equals the real rate of return on capital goods r_t. If, however, inflation expectations are $\pi_t>0$, then the relevant concept is the "**non-accelerating interest rate**", which is the rate that is neutral not to the price level, but to the rate of change of the price level, and this rate is equal to $r_t+E(\pi_t)$. The real rate of return on capital goods, r_t will, in fact, vary over time, as its underlying factors (described in more detail in Section 4) will vary. Therefore, the central bank also has to adjust the nominal interest rate across time if it wants to achieve stability of the inflation rate at its target level over time.

The only degree of freedom for monetary policy in the steady state is the choice of inflation rate. For example it could be concluded that $\pi^* = 2\%$ is the optimal inflation rate for reasons outside the stylised equilibrium case described in this section (on models of the optimal rate of steady state inflation, see Schmitt-Grohe and Uribe, 2010, or Coibion et al., 2010; both conclude that low inflation targets such as today's widespread 2% inflation targets are sensible).

An important constraint to the choice of π_t is the **zero lower bound to nominal interest rates**. Nominal interest rates cannot go significantly negative because banknotes cannot normally have negative remuneration – i.e. they always have zero remuneration. Therefore, if the central bank tried to set negative nominal interest

rates, economic agents could undermine this by withdrawing all deposit money and holding it in the form of banknotes. So, the choice of inflation target π^* must respect the constraint that $r_t + \pi^* > 0$. It is important to note (and this will be shown in Section 4), that the real rate of return on capital r_t can be negative, for instance if the economy no longer grows, but shrinks. In this case, a positive target inflation rate can "lift" the non-accelerating rate of interest into positive territory.

The problem created by the zero lower bound to nominal interest rates is that it could be the reason for an economy to fall into a so-called "deflationary trap". Indeed, if the non-accelerating interest rate is negative ($r_t+E(\pi_t)<0$), but the central bank can, as a minimum, set a nominal interest rate (i_t) of zero, then monetary policy will be dis-inflationary. That means that inflation and inflation expectations will fall further, making zero interest rate policies even more dis-inflationary, etc. Some authors (Blanchard et al., 2010) have concluded that in a world of low growth dynamics and low real rates of return, it is preferable to choose a higher inflation target (e.g. 4%) as a buffer against negative shocks that could push the economy into a deflationary trap.

2.2 Generalising and complicating the basic equilibrium relationship

The equilibrium relationship above reflects a number of simplifications. In the real world, one needs to distinguish the ex ante and ex post view, acknowledge exogenous shocks and sticky adjustment, and therefore give up the idea that the dichotomy between the real and money sphere holds in the short-term. At least four issues need to be distinguished.

First, the system will, most of the time, be **outside steady state equilibrium**. Adjustment dynamics are non-trivial and will invoke more challenging economic modelling. Prices and real rates of return on capital are hit constantly by exogenous shocks. This implies that one actually needs to differentiate between the expected (ex ante) and the actual (ex post) real rate of return on capital, $E(r_t)$ and r_t (e.g. the actual rate of return on wheat is affected by weather conditions). Moreover, when non-anticipated price pressures (relative to expected prices) occur, adjustment of prices is typically sticky. Amongst other things, this implies that the **real rate of return on capital** needs to be distinct from the **real rate of return on money investments** – in particular ex post. Indeed, the fact that ex ante $i_t=E(r_t)+E(\pi_t)$ does not imply that ex post $i_t = r_t + \pi_t$. The real rate of return on money investments is equal to (ex post) $i_t - \pi_t$. The real rate of return on capital is (ex post) r_t. There is a third concept that needs to be distinguished, which is the **ex ante real rate of return on money investments** which is $i_t - E(\pi_t)$. This is actually the most frequently meant concept when the term "real interest rates" is used in the media and academic papers (see as one example Kocherlakota, 2013). In an ex ante arbitrage steady state equilibrium, this should be equal to $E(r_t)$. However, in reality, ex ante adjustments to reach an arbitrage equilibrium may be imperfect and slow (e.g. the "time to build" argument of Kydland and Prescott, 1982), so that it is necessary to distinguish between the expected real rate of return on capital ($E(r_t)$) and the

expected real rate of return on money investments (i_t-E(π_t)). The following table summarises the four concepts of real rates that eventually need to be distinguished from each other, as they will, for the reasons mentioned above, not be identical, but in steady state equilibrium. It may be noted that we have assumed that the nominal interest rate on money is identical ex post and ex ante. This holds as long as debtors do not default.

Table 1

Four concepts of the real rate of interest

	Ex ante	Ex post
capital good investment	E(r_t)	r_t
money investment	i_t-E(π_t)	i_t- π_t

The general idea of the dynamics triggered by a perceived arbitrage opportunity is as follows:

- If $i_t > E(r_t) + E(\pi_t)$ => it is profitable to sell real goods and hold more money investments => demand for goods today ↓ => disinflationary pressures => actual inflation will fall below expected inflation: $\pi_t < E(\pi_t)$
- If $i_t < E(r_t) + E(\pi_t)$ => buy more real goods for real investment projects, hold less money investments (or be short in money, i.e. borrow money), => demand for goods today ↑ => inflationary pressures => actual inflation will turn out to be above expected inflation: $\pi_t > E(\pi_t)$

While this intuition is clear, it is not obvious to fully specify this dynamic process in a two-point-in time arbitrage diagram [13]. Modern macroeconomic monetary theory aims at capturing such dynamics (see below).

Second, in reality there is not only one good ("wheat") which is at the same time a consumption and an investment good, but in fact there is a **wide range of goods** with very different properties. Investment goods are supposed to determine the real rate of return on capital, while consumer goods determine inflation. Consumer and investment good prices are eventually linked, but in reality such links will be imperfect and exhibit time lags.

Third, nominal funding costs of the real economy are not identical to the short-term nominal interest rate that the central bank sets. Nominal funding costs of the real economy can be estimated by producing a weighted average of funding rates, the weights reflecting the share of that type of funding in the total funding of the real economy. For example, for the euro area, Table 4.5 of the statistical annex of each ECB Monthly Bulletin contains a detailed breakdown of lending rates for new and outstanding loans to various obligor classes (household consumer credit, household mortgage loans, loans to non-financial corporates, etc.), with volumes obtained from the Monetary Financial Institutions (MFI) statistics. Corporate and sovereign bond

[13] It is interesting to note that a similar issue arises in FX - interest rate parity arbitrage. The main difference is that the exchange rate is a price that reacts immediately (as it is set in the most liquid financial market), while the price level in an economy reacts sluggishly to news.

yields can be collected from information systems such as Reuters and Bloomberg. The weighted average nominal lending rate of the economy can be thought of as reflecting three main factors: (i) the short-term interbank interest rate, which is normally carefully controlled by the central bank, (ii) the slope of the risk-free benchmark yield curve, (iii) the various instrument-specific liquidity and credit risk premia. The challenge for the central bank in a Wicksellian framework is then no longer limited to the estimation of just the real rate of return on capital goods (so as to shift the nominal short-term interest rate across time in parallel to this), but in addition to adjust across time for the varying spread between the weighted average funding costs of the real economy and risk-free rates. If the real rate of return on capital is low (as is probably the case in a crisis) and, in addition, credit and liquidity spreads are high, then it is likely that the central bank will reach the zero lower bound with its operational target, without being able to implement expansionary monetary policy. To express this generalisation formally, the following are defined:

- j as the **term spread** summarising the slope of the risk-free yield curve, i.e. the difference between the risk-free rate at the average duration of real economic projects (e.g. five years) and the short end of the risk-free yield curve.
- k as the spread between the weighted funding costs of the real economy and the risk-free yield with the same duration, i.e. capturing **credit and liquidity premia**.

In Figure 1, j and k have been ignored and the non-accelerating short-term central bank interest rate i* is equal to the real rate plus inflation expectations, i.e. $i_t^*=E(r_t)+E(\pi_t)$. Now, adding j and k, the neutral rate becomes $i_t^*=E(r_t)+E(\pi_t)-j_t-k_t$. This adds to the danger of ending up in a deflationary trap if r_t moves down and k_t moves up. For example, if $E(\pi_t)=2\%$, $E(r_t)=2\%$, $j_t=0$ and $k_t=1\%$, then $i_t^*=3\%$. If a real economic shock now depresses $E(r_t)$ to 0 and the related financial crisis increases k_t to 4, then suddenly the non-accelerating interest rate would move to $i_t^*= -2\%$, which is a problem, as it cannot be implemented for zero-lower-bound reasons, i.e. as long as banknotes are offered as central bank liability with zero remuneration rate. Figure 2 illustrates the developments in the central bank short-term nominal interest rate target (measured here as the EONIA) and the effective weighted funding costs of non-financial corporations (NFCs) in the euro area. The methodology of the ECB's calculation of these effective weighted NFC funding costs (which includes funding through debt instruments, bank loans and equity) has been described in ECB (2005). Of course, any method of calculating effective average funding costs of the real economy will be subject to caveats.

Figure 2a shows the weighted NFC costs, the 5Y OIS rate (which measures the average expected EONIA over the next five years and is therefore quasi risk free), and the EONIA. Figure 2c on that basis shows the term spread (j_t, equal to the difference between the 5Y OIS rate and the EONIA rate) and the credit risk spread (k_t, equal to the difference between weighted NFC funding costs and the 5Y OIS rate). The ECB was successful not only in bringing EONIA down to zero, or slightly below zero, but also in lowering the 5Y OIS towards zero level – meaning that it is expected that interest rate policies will keep EONIA quasi at its current level for a long period of time. On the other hand, the credit risk spread remained high, implying

that actual overall funding costs in 2014 were not particularly low. It should be mentioned, however, that despite the still elevated overall cost of financing, the cost of bank lending and debt securities financing has declined a lot more since 2012 and ECB policy has clearly been successful in bringing down these financing costs. At the same time, the cost of equity has even increased somewhat over recent years and has therefore limited the decline in the overall cost of financing for corporations.

Figure 2a
Weighted NFC funding costs, 5Y OIS and EONIA

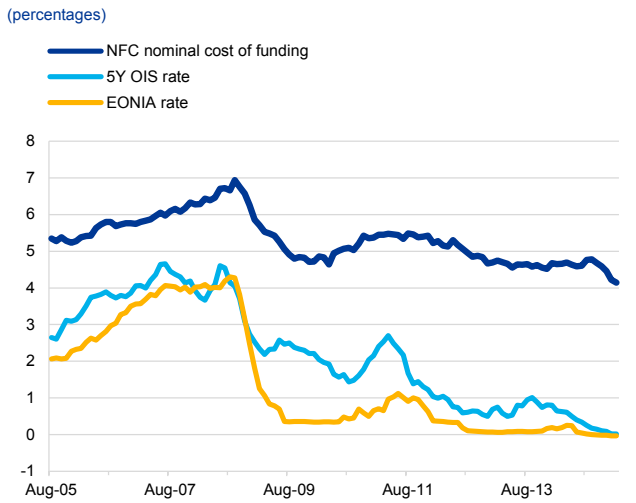


Figure 2b
Nominal versus real ex ante NFC funding costs

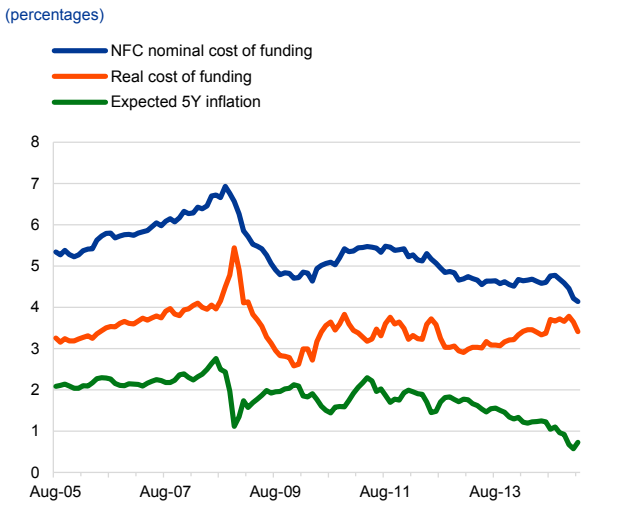


Figure 2c
Implied term and liquidity/credit/risk spread

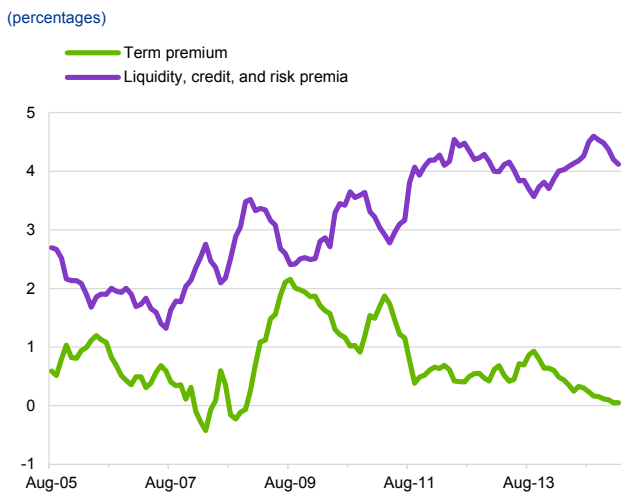


Figure 2b again shows nominal weighted NFC funding costs, but adds the 5Y rate for inflation expectations (the five-year inflation linked swap rate, corresponding to a five-year specification of E(π) in the terminology of Table 1) and the implied real ex ante weighted NFC funding costs (i-E(π)). In view of the recent trend decrease in inflation expectations, real ex ante NFC funding costs have even shown a slightly increasing trend, despite the accommodating measures of the ECB that have been criticised by some as excessive and unnecessary.

Fourth, it should be remembered that the **actual availability of credit to the real economy cannot necessarily be measured by contemplating interest rates alone** (Stiglitz and Weiss, 1981). Indeed, funding markets for some indebted companies can break down completely due to an increase of uncertainty and information asymmetries. The role of quantitative funding constraints has been recognised as a relevant element of monetary conditions by central banks, and therefore central banks have started to systematically collect survey data so as to be able to monitor this element of the transmission mechanism. For example, the ECB collects, on a quarterly basis,

qualitative and quantitative bank lending data (see the "Euro area bank lending survey", European Central Bank 2015) and data on the access of SMEs to funding ("Survey on the access to finance of small and medium-sized enterprises in the euro area", European Central Bank, 2013c).

These four complications are the reason why the theory of optimal short-term central bank interest rate setting is complex, diverse and inconclusive, and also why central banks have large economics departments. Modern New Keynesian economics relies, as a starting point, on Wicksellian ideas, and tries to capture short-term dynamics (Woodford, 2003, Gali, 2008). The Taylor rule is the central ingredient of the New Keynesian model, which stresses frictions linked to sticky prices which are the driver of transitory dynamics. However, the New Keynesian model, particularly in its so-called canonical three equations version, is certainly also too simplistic a prescription for what is relevant in real-world complex environments, not to mention in periods of financial turmoil and ZLB considerations. The New Keynesian agenda has received important extensions, qualifications and in some cases outright criticism from various perspectives (ecb, 2011, Brunnermeier and Sannikov, 2014). For reviews of the concept of the natural rate of interest and the implied relationship between nominal and real interest rates within Neo-Keynesian economics, see also Giammarioli and Valla (2004), D'Amato (2005) and Weber, Lemke and Worms (2008), Barsky et al. (2014).

2.3 Two extreme examples from German history

In retrospect, one can identify episodes in which the central bank was obviously a long way off a reasonable interest rate policy, and so triggered fatal dynamics to the purchasing power of money. German monetary history of the 20th century provides two outstanding illustrations.

Inflationary central bank interest rate policies are best illustrated by the application of the 5% discount rate by the Reichsbank from 1914 to 1922. Applying the arbitrage logic above, this discount rate was clearly far too low as of 1915. Indeed, the rate of inflation had already reached 40% in 1915 (essentially due to the extreme public demand shock associated with war mobilisation), and remained in double digits every year until it completely exploded in the years after the First World War (see Table 2). The approach "(i) borrow money, (ii) buy and hold real assets, (iii) sell real assets in the future" was therefore a consistent profit-making opportunity without interruption for eight years. Actual inflation rates were certainly limited by price controls for basic goods during the war years and would otherwise have exploded even earlier. Stolper (1940/1969) notes about credit provision during this period that (p. 83):

"Persons who were resourceful and had the necessary banking connections to procure a maximum of commercial credit had to do nothing but invest the money without delay in 'physical values' in order to amass a gigantic fortune in no time at all. The most typical example of such practice and, in general, of the trend towards capital accumulation, was Hugo Stinnes…. He began to buy up at random and in

large numbers the most varied businesses, including banks, hotels, paper mills, newspapers and other publishing concerns."

Hugo Stinnes was known as the "King of Inflation" in the Weimar Republic, and at the time of his death in 1924 he was one of the richest and most influential German industrialists, with ownership of more than 4,500 companies. His empire, however, ran into liquidity troubles when the mark was stabilised and fell apart in 1925 (Schacht, 1927).

Table 2

Reichsbank discount rate and consumer price inflation in Germany, 1914-1923

	Discount rates applied by Reichsbank (Range)	Consumer price Inflation
1915	5%	35%
1916	5%	33%
1917	5%	25%
1918	5%	38%
1919	5%	58%
1920	5%	113%
1921	5%	28%
1922	5%-10%	1025%
1923	10%	>10^9 %

Source: Bundesbank, 1976, p. 6.

Deflationary central bank interest rate policies are exemplified by the maintenance of positive nominal interest rates in the deflationary context of Germany in 1930-32. Table 3 summarises the Reichsbank discount rates for these years, and the inflation rates (which were negative, i.e. strong deflation materialised).

Table 3

Reichsbank discount rate and consumer price inflation in Germany, 1929-1932

	Discount rates applied by Reichsbank (Range)	Consumer price Inflation
1929	6.5%-7.5%	0.0%
1930	4%-5%	-5.5%
1931	7%-15%	-9.3%
1932	4%-6%	-10.4%

Of course one may find various reasons as to why the Reichsbank kept discount rates so high in spite of deflation (namely defending the gold standard and the convertibility of the Reichsmark as prescribed according to International Treaties like the Dawes Plan and the Young plan, despite capital flight and a debt overhang due to reparation debt). However, explanations for these interest rate policies do not alter the conclusion that they were highly deflationary, illustrating the Wicksellian cumulative process in the opposite direction to that shown during the First World War.

3 Are central banks overlooking drawbacks of low interest rate policies?

A number of authors ("the critics" below) have argued that central banks' low interest rate policies are ineffective or, at the very least, have major negative side effects that central banks tend to underestimate. These authors also seem to suggest that acknowledging the problem of low interest rate policies could lead to the conclusion that central banks should increase nominal interest rates without delay. The main arguments are set out as follows, and will be discussed one by one in this section. The second and third arguments are partially related.

- Low interest rates weaken the life-time income prospects of savers, and therefore lead to more saving and less consumption, and are actually negative for aggregate demand.
- Low interest rates create bubbles and therefore contribute to creating the next crisis and undermining the efficiency of resource allocation.
- Low interest rates and elastic central bank liquidity supply tend to weaken hard budget constraints because of their supportive effect with regard to funding market access for indebted companies, households and the state.
- Low nominal interest rates weaken bank profitability as they destroy the interest rate margin arising normally from the non-remuneration of sight deposits. With decreasing marginal returns of financial intermediation, this implies that a lowering of central bank rates towards zero necessarily leads to a wider intermediation spread and deleveraging, and therefore only reaches the real economy to a limited extent.

These will be considered one by one in the following sections.

3.1 Low interest rates weaken life-time income of savers and reduce consumption

This argument has been made both in Germany and the US. For example, Thomas Mayer (previously Chief Economist of Deutsche Bank) argues that the low interest rate policy is counterproductive as it will not strengthen demand. The ECB policy will instead "force me to reduce my demand and to save like a world champion" – "zwingen mich meine Nachfrage zu verringern und zu sparen wie ein Weltmeister", Frankfurter Allgemeine Sonntagszeitung, 15 June 2014.

Ford and Vlasenko (2011, 2-3) not only support the expropriation of the saver argument, but also seem to regard quantitative easing policies in general as ineffective (Ford is a former Atlanta Fed President).

"By lowering interest rates to historically unprecedented levels, the Fed's policy deprives savers of interest income they normally would have earned on the interest-sensitive assets they hold. Thus, there is an income channel that no one is talking about, and its negative impact can be powerful… And tens of millions of U.S. savers, largely the elderly, still are facing strained circumstances created by Fed-driven abnormally low interest rates across the entire Treasury yield curve. The negative impacts on output and employment caused by quantitative easing through the interest income effects shown here are large. In fact, they may outweigh the expected, but hard-to-document, positive effects of the QE program."

Geiger, Muellbauer and Rupprecht (2014) reach the conclusion, on the basis of an empirical macro-model for Germany, that low interest rates tend to reduce consumption, also because of effects on house prices (according to their model, high house prices force households to save more as they anticipate higher rents or higher future cash needs if they want to purchase a property).

The conclusions from all of these arguments is that persistently very low interest rates do not stimulate aggregate demand because of their negative effects on the life-time income flows of savers. The negative effects on savers outweigh other, positive effects. Therefore, low interest rates neither support the economy nor help to combat deflationary risks.

However, we believe that these arguments do not sufficiently emphasise that what eventually matters for savers is the medium to long-term real returns on savings – and these cannot, as argued in Section 2, be manipulated upwards by central bank monetary policy. The long-term real rate of interest is determined by real factors: the availability of production factors, the factor productivity over the relevant time horizon, and time preferences of households. *Bad* monetary policy can be a source of disturbance and hence have a negative impact on the use of resources, but *good* monetary policy cannot systematically influence real rates of return artificially to the upside (similarly to Friedman's 1968 distinction between what monetary policy can and cannot achieve). Low interest rates that aim to prevent a deflationary situation contribute to avoiding the monetary sphere becoming a disturbance to the real economy. In this sense, low interest rates contribute to growth and real rates of return, not the opposite.

Therefore, the only way to address saver depression (and the implied consumption strike) is to provide savers once again with a perspective of higher economic growth rates and real interest rates over the relevant long-term horizon. The solution is not to temporarily produce high real interest rates on money investments through an arbitrary high monetary policy interest rate, at the price of subsequent deflation and recession. The only solution to the problem raised by Mayer and Ford, and Vlasenko, is to take "real" measures that revitalise real growth – as explained in more detail in Sections 4 and 5. Monetary policy's contribution to high real growth is a stable monetary environment, which certainly includes preventing deflation.

3.2 Low interest rates contribute to new bubbles and undermine financial stability

This argument has been made extensively by a broad range of policy makers, commentators and academics. For example, as J. Starbatty argued in 2009, when the ECB's main interest rate (the main refinancing operations rate) still stood at 1% (Interview, Manager-Magazin, 27 May 2009):

"I would advise against a zero interest rate policy. It always leads to a loss of the selection function of the interest rate. This was exactly the problem of previous bubbles: the excessively low interest rate has no longer eliminated unprofitable investment projects – for example in the field of real estate. The steering function of interest rates is clearly decisive for a sustainable economic production process."14

Five years later, when the ECB main refinancing rate reached 0.25%, related concerns seem to have become a widespread consensus in Germany. Thomas Straubhaar, the head of the Hamburgischen Weltwirtschaftsinstitut, goes as far as to argue that excessively low and in particular negative rates fundamentally invalidate the allocation function of interest rates, and thus one cornerstone of the market economy (Die Welt, 10 June 2014, "This is the end of capitalism"- "Das ist das Ende des Kapitalismus"):

"By enacting negative interest rate policies, the ECB launches a dirigiste state policy with bitter consequences. It is a declaration of defeat and the end of the capitalist economic system. Capitalism is at an end. What its adversaries did not achieve is now accomplished by the European Central Bank (ECB)… A positive interest rate is – next to money per se – the heart of capitalism, which drives growth and progress. …. According to common understanding, the interest rate should exceed the growth rate. In other words, a negative interest rate means that the economy will not grow, but will shrink. It reflects the expectation that people are running out of ideas, to achieve more output with less effort. Not really an optimistic perspective, but a declaration of defeat and a farewell to the power of innovation of humanity. It is an error that can easily be invalidated empirically, that low interest rates are good interest rates. Negative rates provoke a mentality of indebtedness, which leads to a lack of efficiency-driven investments and thereby to a waste of capital. … The development of stock prices detaches itself completely from changes in the real

14 *"Von einer Nullzinspolitik würde ich abraten. Sie führt stets dazu, dass der Zins keine Selektionsfunktion mehr hat. Das war genau das Problem der vorherigen Blasen: Der zu niedrige Zins hat unrentable Investitionsprojekte nicht mehr ausgesondert - beispielsweise im Immobilienbereich. Die Steuerungsfunktion des Zinses ist ganz entscheidend für einen nachhaltigen volkswirtschaftlichen Produktionsaufbau."*

economy. What happens in financial markets no longer has anything to do with the reality in goods and labour markets." 15

Why exactly would interest rates lose their effectiveness in negative territory, and why should investors become less prudent and more speculative (and hence more supportive of bubbles) when interest rates are low? It is not actually so easy to find obvious arguments in that direction. Three possible arguments are considered in turn.

(i) Asset prices tend to infinity when interest rates approach zero

One intuition could be that for capital goods with no depreciation and hence with relevant net cash flows into the very distant future, asset prices tend to infinity when interest rates converge to zero in a persistent manner. For example Hans-Werner Sinn seems to make this point (Frankfurter Allgemeine Zeitung, 4 December 2014 "Germans lose EUR 300 billion because of low interest rates"): *"The dislocations implied by a permanent zero interest rate would be high. Real estate prices and the national wealth would be infinite".* Indeed, it can be shown that the net present value (NPV) of a perpetual bond is (c = annual cash flow; i = discount rate applying to all cash flows):

$$NPV = \frac{C}{i} \tag{3}$$

If the central bank sets i to zero and commits to keep it there for an extremely long time (or if investors believe that the central bank will *have to* leave the interest rate at zero for an extremely long time), then the net present value of the perpetual bond cash flows is infinite, and hence the value of the bond is infinite. When i approaches zero, the value of the asset explodes, while for changes of i in clearly positive territory, the changes to the asset value are gradual and moderate. This is illustrated by Figure 3a. Of course, the perpetual bond formula is not applicable to real assets, in particular as (i) assets tend to depreciate, as does the cash flow associated with them, and (ii) it is not as if nominal discount rates are fixed for ever. If C_t is the cash flow in period t, i_t the interest rate applicable for discounting a cash flow in period t, then the NPV of the asset is: [16]

$$NPV = \sum_{t=1}^{\infty} \frac{C_t}{(1+i_t)^t} \tag{4}$$

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15 "*Mit dem Einstieg in Negativzinsen startet die EZB eine dirigistische Staatspolitik mit bitteren Folgen. Sie sind eine Kapitulationserklärung und das Ende des kapitalistischen Wirtschaftssystems. Der Kapitalismus ist am Ende. Was seine Gegner nicht vermochten, schafft nun die Europäische Zentralbank (EZB). … Ein positiver Zins ist – neben dem Geld an sich – das Herz des Kapitalismus, das Wachstum und Fortschritt antreibt. … Nach gängiger Erkenntnis sollte der Zinssatz über der Wachstumsrate liegen. Anders formuliert bedeutet ein negativer Zinssatz, dass die Wirtschaft nicht wachsen, sondern schrumpfen wird. Er reflektiert die Erwartung, dass den Menschen die Ideen ausgehen, um mit weniger Aufwand mehr Ertrag zu erwirtschaften. Wahrlich keine optimistische Zukunftsperspektive, sondern eine Kapitulationserklärung und eine Absage an die Innovationskraft der Menschheit. … Es ist und bleibt ein empirisch leicht zu widerlegender Irrtum, dass tiefe Zinsen gute Zinsen seien. Negative Zinsen provozieren eine Verschuldungsmentalität, die zu wenig rentablen Rationalisierungsinvestitionen und damit zu einer Kapitalverschwendung führt. … Die Aktienkursentwicklung löst sich vielmehr völlig von den Veränderungen der realen Wirtschaft. Was auf den Finanzmärkten läuft, hat nichts mehr mit dem Alltag der Güter- und Arbeitsmärkte zu tun."*

16 See Kuttner, 2012, for a short survey of more sophisticated theories of housing prices.

This generalised case is illustrated in figure 3b, where it is assumed that (i) the cash flow generating power of the asset declines, starting from 1 euro, linearly for the next 50 years, and (ii) the yield curve is linear, starting from the one-year rate shown on the x axis, towards a "long-term normal" value of 4% in 50 years.

The trend of the NPV in Figure 3b is far less dramatic than in the case of the perpetual bond with an infinitely constant discount rate in Figure 3a. In fact, the NPV of the asset appears to be almost a linear function of the initial interest rate, with this quasi linear trend continuing in negative interest rate territory. For example, the NPV of this asset is 21 for a negative initial interest rate of -1%, and 22.8 for a negative interest rate of - 2% (under our assumption, an initial negative interest rate of -2% would mean that for the next 16 years, interest rates would remain in negative territory). This suggests that for normal durable investment assets, and under the assumption that interest rates will gradually return to more normal levels over the next 50 years, there is no explosive relationship to approaching (or even undercutting) the zero lower bound of interest rates, and that therefore the assumed creation of asset price bubbles cannot be driven by this logic either. Of course, a lowering of nominal yields, *together with positive real economic expectations*, may jointly trigger asset price dynamics that lead, through subsequent feedback loops, to a bubble. But this issue seems to be independent of the absolute level of interest rates. Moreover, macroprudential tools could be used to address specific bubbles (Claessens, 2014).

Figure 3a

Net present value of a perpetual bond with coupon of 1 euro as a function of the (constant) discount rate.

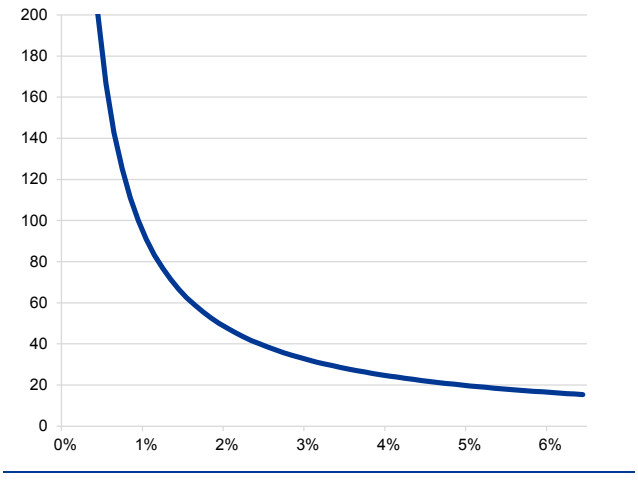
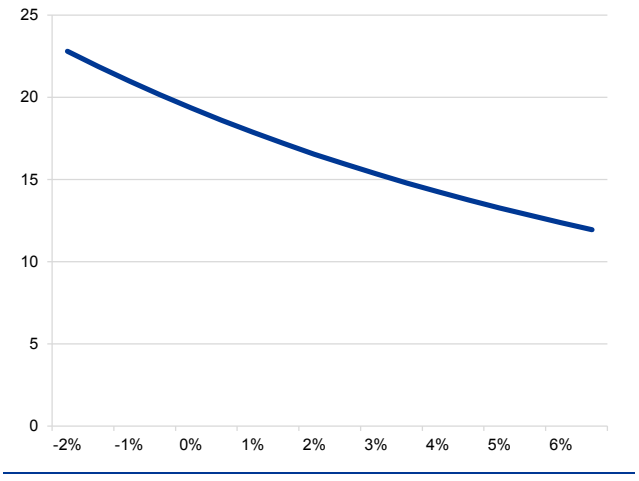


Figure 3b

NPV of an asset assuming (i) cash flow generating power of the asset declines, starting from 1 euro, linearly for the next 50 years, and (ii) linear yield curve, starting from one-year rate shown on the x axis, towards "long-term normal" of 4% in 50 years



(ii) Hunt for yield as a "gamble for resurrection" out of solvency problems caused by low interest rates

Some investors may feel under pressure to generate a positive nominal return rate because of some particular legal or contractual obligation, such as the obligation of life insurers to generate a minimum return rate. Also, life and pension insurers may be forced to value their liabilities using a discount curve that is heavily depressed from low (long-term) interest rate policies of central banks, and if they ran a maturity mismatch they might fear becoming insolvent unless they generated significant positive returns. Banks with structurally low profitability - and this low profitability might also be the result of low interest rates (see Section 3.4) - may also seek to "gamble for resurrection". By taking more risks, financial entities (and any other indebted corporate) in bad shape can increase the probability of their eventually becoming solvent, in the same way as the value of an out-of-the-money option benefits from an increase in the volatility of the underlying asset (Merton, 1974).

While these phenomena may indeed be relevant in some cases, it would be misleading to conclude from them that low interest rates need to be avoided. If legal, regulatory or contractual anomalies are the driver of the stress of institutions in a low interest rate environment, one should seek to eliminate these specific constraints to prevent them leading to distorted investment behaviour. It is not generally established that bank equity and the profitability of banks suffer from low interest rates (see Section 3.4) – in fact many authors have argued that the opposite effects seem to predominate. In any case, there is also an extensive empirical literature that notes that monetary policy "leaning against the wind" of financial risk taking and leverage causes disproportional collateral damage in terms of output and deviation from the goal of price stability (Yellen, 2014, Smets, 2014). Therefore, even if one believed that a low monetary policy interest rate would increase the risk of a hunt for yields and the risk of bubbles, it would still be doubtful to conclude from this that the central bank should deviate from the interest rate level that is necessary from a monetary policy perspective.

(iii) Inflation illusion of investors

The "Hunt for yield" at low interest rates could stem from the fact that investors are unable to look through inflation and thus to real returns, and therefore feel frustrated by low nominal interest rate levels and want to irrationally overcome them through imprudent investment choices.

There is mixed empirical evidence that under low nominal interest rates a hunt for yield and asset price bubbles occur. For example, real estate price bubbles in Japan, the US and several euro area countries did not occur during periods of very low nominal interest rates, and also the run up to the 1929 equity price bubble did not take place in a low-rate environment. In addition, the subsequent low interest rate periods did not seem to restart these bubbles. In fact these bubbles seemed to have materialised essentially due to unsustainable fantasies about "real" developments: e.g. that real growth and the implied relative scarcity of ground and construction costs would grow at high rates for a very long time. When these "real" illusions burst, the asset price bubble also burst. This view is confirmed by a recent study by Kuttner

(2012, 2), who notes that the view that overly expansionary monetary policy is itself the cause of asset price bubbles, and in particular that the Federal Reserve deserves blame for the recent house price bubble, is being forcefully articulated, and often surfaces in the financial press. However, a more careful examination of the data yields little support for the hypothesis that interest rates have an economically significant effect on real estate prices. Surveying recent studies and looking at new evidence, Kuttner (2014, 2) argues that "the impact of interest rates on house prices appears to be quite modest…., and insufficient to account for the rapid house price appreciation experienced in the U.S. and elsewhere". A link between low interest rates and house price bubbles is especially tenuous. Joachim Fels (in Frankfurter Allgemeine Zeitung, 10 November 2014, "EZB Kritik auf dünnem Eis") also stresses that one should look at other data, such as credit growth, to assess if a bubble really is in the making. Indeed, asset bubbles over the last few decades have been typically accompanied by unusual growth rates of bank balance sheets. Fels notes that in the euro area, credit provision of banks has been shrinking, indicating that it is highly implausible that a euro area asset price bubble is currently in the making. Also, Weidmann (2014a) notes that for the time being, one cannot talk about a broad-based residential housing bubble in Germany, although an eye should be kept on this risk. In any case, the literature on the link between financial stability and monetary policy tends to conclude that a forceful "leaning against the wind" strategy of the central bank towards asset price bubbles would have disproportional collateral damage in terms of output losses and deflation risks. Therefore, if anything, macroprudential measures should be applied to address asset price bubbles (Smets, 2014, Yellen, 2014, and the survey by Dokko, Doyle, Kiley, Kim, Sherlund, Sim, and Van den Heuvel, 2011).

In summary, neither theoretically nor empirically is the relationship between low nominal interest rates and asset price bubbles sufficiently clear – despite the fact that it is one of the most often used arguments to express concerns about the low interest rate policy of the European Central Bank. In particular, if low interest rates are a conscious and appropriate reflection of weak inflation and growth dynamics, there is no reason to believe that they are particular contributors to possible bubbles.

3.3 Low interest rates and elastic central bank liquidity undermine hard budget constraints

Some of the critics of accommodative central bank policies have argued that such policies undermine economic efficiency not only through the creation of bubbles, but in a more general way that leads to a decline in growth rates and so also of real rates of return on capital. [17] If true and strong in effect, this could even create a vicious circle: accommodative policies are chosen by the Wicksellian central banker to prevent deflation, but these policies then undermine real rates of return on capital,

[17] Also Diamond and Rajan (2012) and Farhi and Tirole (2012) both model the role of central bank policy interest rates as a "bail out" instrument for banks with high maturity mismatches in a liquidity crisis, and draw conclusions on the optimal use of the interest rate instrument and liquidity regulation.

which, still following the Wicksellian logic, requires an even more accommodating monetary policy, etc.

It could be argued that the choice of addressing the financial crisis through an orderly process, preventing large-scale defaults of financial institutions and corporates was consciously taken (or, to some extent, confirmed) at the G20 Summit in London in April 2009. The "Leaders' statement" inter alia announced:

4. We have today therefore pledged to do whatever is necessary to: […]

- *repair the financial system to restore lending;*
- *strengthen financial regulation to rebuild trust;*
- *fund and reform our international financial institutions … ;*

7. Our central banks have also taken exceptional action. Interest rates have been cut aggressively in most countries, and our central banks have pledged to maintain expansionary policies for as long as needed and to use the full range of monetary policy instruments, including unconventional instruments, consistent with price stability.

8. Our actions to restore growth cannot be effective until we restore domestic lending and international capital flows. We have provided significant and comprehensive support to our banking systems to provide liquidity, recapitalise financial institutions, and address decisively the problem of impaired assets. We are committed to take all necessary actions to restore the normal flow of credit through the financial system and ensure the soundness of systemically important institutions….

9. Taken together, these actions will constitute the largest fiscal and monetary stimulus and the most comprehensive support programme for the financial sector in modern times. …

The leaders' statement does not suggest they believe in, and plan on, letting the repair of the financial and economic system take place through a natural clean-up of the system through defaults, but instead tries to suggest the opposite, with the aim of preventing panic and contagion. In addition to elastic monetary policies, this approach included recapitalising, reforming, and better regulating financial institutions.

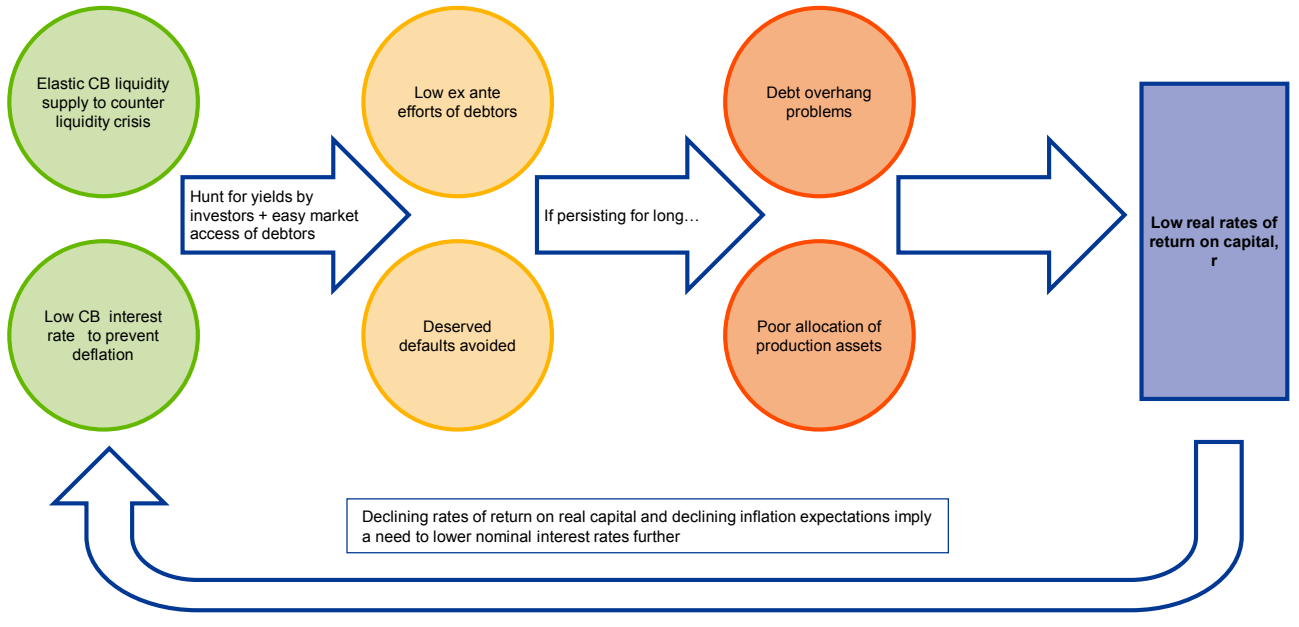
The rest of this section proceeds as follows. (A) First, one needs to distinguish between two accommodative central bank policies, namely (I) low interest rate policies and (II) supportive lending and collateral requirements. (B) Second, these policies, according to the critics, affect economic efficiency through two channels: (I) an ex ante channel, as the policies undermine incentives to reform, and (II) an ex post channel, as the policies prevent default acting as a cleaning mechanism. (C) Third, two distinct problems are the consequence of the policies: (I) inefficient resource allocation and (II) debt overhang.

According to the counter-productivity view, and on the basis of the effects that will be further described in this section, a vicious circle such as that depicted in Figure 4

could materialise under very low interest rates, in which excessively accommodating central bank policies weaken the dynamic forces of capitalism, lead to low growth rates and accordingly low real rates of return on capital which, following Wicksellian monetary policy logic, trigger once again the need to be even more accommodating, etc. According to this view, there could even be two distinct equilibriums: one, good, in which (i) nominal rates are sufficiently high and thus (ii) debtors have the right incentives to make efforts and to show respect towards debt and do not tend towards accumulating it imprudently, and therefore do not end up in a debt overhang, (iii) investors do not need to hunt for yields and therefore can afford to remain prudent and selective in their decisions, (iv) allocation of credit and of resources is done prudently, (v) banks are profitable and therefore contribute to economic development by lending in a non-distorted way, (vi) all this implying that economic dynamics remain intact and the real rate of return on capital remains decent, so that (vii) nominal rates do not need to be lowered to prevent deflation. The second, bad, equilibrium is the opposite: (i) low rates lead to a (ii) lack of respect towards high debt levels on the side of debtors, (iii) a hunt for yield by investors, therefore (iv) credit is channelled more often to unsustainable projects and debt overhangs accumulate, and also (v) banks often lend in a distorted way (they leverage or tend towards excessive risk taking) because their structural profitability is damaged by the loss of the usual negative spread between the deposit rate and short-term market rates. This implies that (vi) real rates of return on capital will remain low and (vii) prevent an exit of the central bank from this trap.

Figure 4

Schematic representation of "counter-productivity hypothesis"



The critics of accommodating central bank policies indeed seem to suggest that central banks could simply discontinue accommodative policies, without this triggering deflationary dynamics. There would be a degree of freedom in the

monetary policy decision of the central bank, which would follow from a sort of causality between nominal interest rates to real interest rates.

Accommodating central bank policies make access to funding of debtors too easy

Two types of accommodating central bank policies can be distinguished, which, according to the critics, have the effect of undermining the efficient use of resources, namely by making funding market access of debtors (both public and private) too easy.

(I) Low interest rate policies. Critics argue that low interest rate policies trigger a hunt for yield by investors who become less selective in their investments, so that lower credit quality debtors more easily preserve their ability to access funding markets. Also, according to this view, low interest rate costs may temporarily hide profitability and solvency issues which again may help to (artificially) support investor confidence.

(II) Very elastic central bank liquidity supply, via a broad collateral framework, and via generous LOLR / emergency liquidity assistance policies. The elastic central bank supply invites investors to be generous and imprudent in lending, as it makes investors believe that in the event of bad news they will always be able to get their money back, as the central bank will step in as a backstop.

Regarding (II), it should be noted that the ECB only lends to banks that it classifies as "financially sound" according to supervisory data, and moreover protects itself against negative surprises by the careful collateralisation of its credit operations. Following this approach, it has so far been able to avoid losing a single euro in its credit operations, despite 15 years of large-scale credit operations and an unprecedented financial crisis. It has, therefore, also been able to consistently avoid a situation where investors socialise losses from bank exposures.

Regarding (I), it should be remembered that the current low nominal interest rates are associated with low inflation, and low rates of return on real capital. Therefore, the solvency of firms is not supported by low nominal interest rates per se, and so investors should not have a clear reason to stop worrying about credit risk in a low interest rate environment. The claim that investors behave in this way may therefore need to assume their irrationality, which does not allow a very convincing argument to be built. Often this argument contains the assumption that investors feel fundamentally frustrated about unusually low rates of return and try, as a consequence, to overcome this situation at almost any price – including unusual risk taking. However, once again, low interest rates do not insure creditors against insolvent debtors and, indeed, the number of insolvencies of firms after the financial crisis broke out in 2007 and the lowering of central bank interest rates was much higher than in the pre-2007 period when interest rates were higher. Also, despite low interest rate policies, in many respects investors have become *more* prudent, and *more* risk management-rule based after 2008 (Lehman) and after 2010 (with regard to the risks associated with the euro area debt crisis). In addition, an increase of

capital charges for banks (Basel III) and insurers (Solvency II), and various additional regulations (e.g. liquidity regulation for banks) are presumed to have encouraged behaviour that is more risk sensitive, and not the opposite. Moreover, as will be emphasised below, the number of defaults has increased overall during the crisis, despite accommodative central bank policies, so that it is hard to believe that investors would not have learned lessons from this and behaved prudently. Also, the number of banks' non-performing loans increased during the crisis, in particular in the euro area crisis countries, again suggesting that despite accommodative policies, credit risks are a reality and there are no reasons to believe that banks and investors would overlook this fact.

Overall, the link between low interest rates, investors' careless hunt for yields, and debtors' implied ease of access to funding does not appear to be compelling enough to build a key argument that would support the hypothesis that low interest rates are counter-productive with regard to their own objective. It would seem at least as convincing to argue that in a high inflation/high interest rate environment, the precision of the allocation of credit to the economy is weakened because of inflation-related noise in relative asset values and corporate balance sheet ratios.

Easy funding market access undermines economic efficiency ex ante (weakening incentives) and ex post (deactivating hard selection and reallocation through default)

Critics have mentioned, in particular, two channels through which the ease of funding market access (that follows from accommodating central bank policies) undermines economic efficiency.

(I) Ex ante, i.e. by undermining agents' efforts to achieve an efficient use of resources. This argument may be articulated both for firms (banks and corporates) and for governments. If we follow the agency theory of the firm as exemplified by Jensen and Meckling (1976), managers (and, by analogy, politicians) benefit from rents associated with their jobs, and therefore have ex ante incentives to manage the firm (the government) successfully to maintain their position and to prevent the default of the company (change of government). If really accommodative central bank policies were to weaken market controls and the threat of default, then the incentives of managers to maintain efficiency would also be weakened. Easier access to funding markets could increase moral hazard and shirking by managers, and thereby contribute to a less efficient use of resources. Hans-Werner Sinn (2013, 18) has applied the argument to euro area sovereigns:

"Because of low interest rates, readiness to respect the debt ceilings of the fiscal compact agreed just last year has again disappeared. The artificial cheapening of interest rates and the associated indebtedness probably tend more to delay necessary reforms to improve competitiveness, than to allow them… This leads to a sclerotic consolidation of the euro crisis with high unemployment, which makes it

difficult to return to healthy economic conditions and which evens out the path to transfer union." [18]

It should, however, be noted that the current low inflation/low real growth/low interest rate environment does not make the life of highly indebted governments particularly easy. Quite the contrary – debt dynamics do not develop favourably in this environment. One might as well argue that a high inflation environment is best for highly indebted governments to escape reform pressure, as this allows debt to be written down over time. In the end, all such statements are simplifications.

What should matter in the end for reform pressure is the dynamics of the debt/GDP ratio over time as this is driven jointly by deficits, growth, inflation and interest rates, and what stance capital markets take on the basis of these facts. Arguing that low nominal interest rates alone are decisive in weakening incentives to reform seems arbitrary.

(II) Ex post, i.e. by undermining the role of defaults as a brute force mechanism to reallocate resources in society from those who managed them poorly to those who are likely to manage them better (even if defaults are costly). The fact that default is an essential element of dynamic capitalism and of economic growth has been stressed, in particular, in evolutionary economics (since evolutionary economics puts little emphasis on ex ante rationality and hence ex ante effort). It follows Schumpeter's (1943/1976, 83) idea of creative destruction according to which "… the same process of industrial mutation [...] that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of creative destruction is the essential fact about capitalism. It is what capitalism consists of and what every capitalist concerned has got to live with." (See also Reinert and Reinert, 2006.)

Bindseil and Jablecki (2013) explicitly model the impact of the propensity of the central bank to provide elastic liquidity on the efficiency of resource allocation, with a trade-off between the cost of corporate defaults on the one side (as estimated for example by Davydenko et al., 2012), and the cost of allowing weak firms ("zombies") to survive on the other side. In terms of Figure 4 above, Bindseil and Jablecki (2013) capture the critics' supposed transmission channel from an elastic central bank liquidity supply, to easy funding access, to a weakening of the hard ex post selection mechanism (default). [19] In the model, investors (or depositors) receive noisy signals about the quality of bank assets and therefore of bank solvency and, depending on the signals, re-allocate their investments. This may trigger bank and corporate defaults, which are both costly as they reduce the value of firm-specific resources (resulting from asset specificity, Williamson, 1985, and from legal uncertainty and frozen production factors). Because of these costs, it is socially inefficient if a bank

[18] *"Wegen der niedrigen Zinsen … ist die Bereitschaft, die Schuldengrenzen des gerade im letzten Jahr beschlossenen Fiskalpaktes einzuhalten, wieder verschwunden. … Die künstliche Zinsverbilligung und die damit einhergehende Verschuldung verschleppen die nötigen Reformen zur Verbesserung der Wettbewerbsfähigkeit aber wohl eher, als dass sie sie ermöglichen. … Es kommt zu einer sklerotischen Verfestigung der Eurokrise mit einer hohen strukturellen Arbeitslosigkeit, die die Rückkehr zu gesunden wirtschaftlichen Verhältnissen erschwert und den Weg zu einer Verstetigung der Hilfen in einer Transferunion ebnet. "*

[19] Bindseil (2014) illustrates the same channel, but with a different model of funding market access.

and its corporates default because of deposit withdrawals based on the wrong signals. On the other hand, if poorly managed banks and corporates (or banks and corporates with a debt overhang), with their assumed persistently poor performance (i.e. zombies), are not eliminated through liquidity induced default, then they block resources that could otherwise be used more efficiently. The central bank, by choosing the elasticity of its credit supply (in the model of Bindseil and Jablecki, 2013, the haircut it applies on collateral), can choose the optimal point in the implied trade-off.

Figure 5

Expected economic performance (growth) as a function of the elasticity of central bank credit provision

(x-axis: collateral haircut applied by central bank; y-axis: expected economic growth)

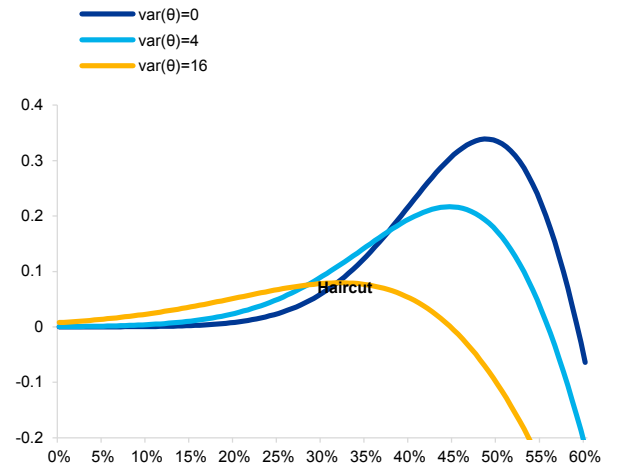


Figure 5 illustrates the Bindseil-Jablecki (2013) model and provides an economic efficiency curve, this being a function of the central bank haircut, for three alternative values of a parameter var(θ) which captures the level of noise in the deposit withdrawals from banks (noise relative to the withdrawals driven by the actual underperformance of the corporate to which the respective bank lends).

As expected, if deposit withdrawals are very noisy (i.e. if var(θ) is large), then the optimal central bank liquidity supply elasticity is high (i.e. haircuts should be relatively low), while if the withdrawals are good indicators of actual performance of banks (i.e. low var(θ)), then the elasticity of central bank credit should be low (haircuts should be high). A corner solution (zero haircuts or 100% haircuts) is suboptimal in any case. The highest point in the curves marks the optimal haircuts, when the increasing marginal costs of socially undesirable defaults from increasing haircuts matches the declining marginal costs of zombification. On the right side of the x-axis there is an excessive number of defaults also of healthy banks and corporates, while on the left side of the x-axis there is an excessive tolerance of the central bank towards zombification.

Empirically, it should be noted that recent years were, despite the “unprecedented” easing measures of central banks, exceptional in terms of rather high default rates. Indeed, 2009 saw the highest corporate default rate in the US ever, according to the default study by Standard & Poors (2012). In that year 5.71% of S&P-rated companies defaulted (against a previous record of 4.51% in 2001; in the period 2005-2007, annual default rates had been below 1% each year). The European corporate default study Creditreform (2014, 2) also shows that, indeed, insolvencies in Europe increased between 2011 and 2013 (from 174 to 192 thousand), despite the significant decrease of the level of interest rates (and other accommodative policies of central banks). Even more importantly, insolvencies developed very unevenly across countries, depending on local economic developments, suggesting that accommodative common monetary policies did not fundamentally undermine relative selection mechanisms. For example, defaults in Italy increased according to Creditreform (2014) in 2013 by 40%, in Spain by 80%, while in Germany, they

declined by 20%. Finally, also the 2011-2012 “private sector involvement” on Greek Government debt, which was the first post WWII haircut applied to an industrialised country, does not seem to provide evidence that, in the recent crisis, hard incentive mechanisms for investors were significantly undermined.

In view of the empirical fact of historically high corporate default rates during the 2008-2010 financial crisis and the 2010-2012 euro area sovereign debt crisis, it seems difficult to argue that accommodative central bank policies systematically undermined the ex ante and the ex post mechanisms of capitalism ensuring the efficient use of economic resources. It seems at least as plausible to argue that the associated central bank lending policies were a correct and well-measured response to the reduced information content of liquidity shocks in a period of financial panic, as argued by Bindseil and Jablecki (2013). A link from low interest rate policies to the weakening of ex ante and ex post incentive mechanisms is even more difficult to construct.

Two resulting problems: inefficient resource allocation and debt overhang

One may distinguish between two problems caused by an absence of ex ante and ex post incentive mechanisms, and which can both be considered elements of zombification:

(I) Inefficient resource allocation and economic organisation: because of weak incentives and the absence of hard selection mechanisms, resources are more and more often allocated to uses that are inferior. The combination of production factors and the organisation of production and trade tends to become less and less efficient.

(II) A debt overhang problem materialises, as projects with poor returns survive for too long through debt accumulation, ending up with equity that is too low or negative. The debt overhang problem further weakens the ability and/or incentives of the relevant firms to solve their problems. The related dynamics have been analysed in more detail by, for instance, Occhino (2010). A variant of this applies to the public sector.

Both problems lead to poor economic dynamics and low growth. For example **Caballero, Hoshi and Kashyap (2008)** identify the problem of zombification of Japanese enterprises since the 1990s, which were artificially kept alive by the Japanese banking system and which were encouraged to continue lending to insolvent firms through political pressure, regulatory treatment, and ample liquidity.

“By keeping these unprofitable borrowers (which we call “zombies”) alive, the banks allowed them to distort competition throughout the rest of the economy. The zombies’ distortions came in many ways, including depressing market prices for their products, raising market wages by hanging on to the workers whose productivity at the current firms declined, and, more generally, congesting the markets where they participated. … Thus, the normal competitive outcome whereby the zombies would shed workers and lose market share was thwarted.” (p. 1944)

Hans-Werner **Sinn** applies (according to "Welt am Sonntag", 10 June 2014, "Unternehmen werden zu Kapitalvernichtern") similar reasoning to the economies of stressed euro area countries, but, in contrast to Caballero et al. (2008) puts particular emphasis on the role of the central bank in allowing the zombification.

"The President of the Munich based IFO institute, Hans Werner Sinn has harshly criticized the ECB's low interest rate policy: "The ECB policy keeps alive companies in crisis countries that are not competitive and that vegetate as capital destroying machines" he told Welt am Sonntag. The money of savers should be channelled to where it generates real returns and creates lasting employment. In the best case the ECB may be able to buy time for the countries. 'In the short term the policy of the ECB may help the crisis countries, but in the long run it is disastrous'".

BIS representatives have also argued that zombification is a major issue. **Jaime Caruana's** (General Manager of the Bank for International Settlements, speech prepared for a lecture at the Harvard Kennedy School in Cambridge, Massachusetts, 9 April 2014) argued that the main requirement for escaping the current growth crisis is a courageous clean-up of impaired and over-indebted balance sheets, which could potentially be undermined by an overly supportive monetary policy.

"The priority is … to establish the basis for a self-sustained and prompt recovery through aggressive balance sheet repair, resolving the legacy of the crisis and limiting the risk of chronic weakness. In this phase, monetary policy should work together with prudential and fiscal policies to address the debt overhang-poor asset quality nexus head-on. It should also give way to structural policy, to reduce other impediments to growth. And in deciding the necessary degree of accommodation, monetary policymakers should consider carefully to what extent disinflationary pressures result from positive supply developments or from a domestic shortfall in demand. The priority is not so much mechanically to fill an output gap through traditional demand management. Rather, it is to establish the basis for a self-sustained and prompt recovery through aggressive balance sheet repair, resolving the legacy of the crisis and limiting the risk of chronic weakness."

Borio and Disyatat, (2014) argue similarly to Caruana (2014), and explicitly spell out the idea of a vicious circle/multiple equilibrium problem with low interest rates, which thus become "self-reinforcing":

"The accumulation of debt and the distortions in production and investment patterns induced by persistently low interest rates hinder the return of those rates to more normal levels. Low rates thus become self-reinforcing. This alternative perspective puts into sharper focus the trade-off inherent in ultra-accommodative monetary policy. Monetary policy cannot overcome structural impediments to growth. But the actions that central banks take today can affect real macroeconomic developments in the long term ... These medium to long-term side effects need to be weighed carefully against the benefits of short-term stimulus…."

Caruana, and Borio and Disyatat seem to have in mind an orderly "top-down" clean-up of inefficiencies and debt overhang problems in the financial system, rather than a clean-up through massive defaults. Indeed, if the necessary institutional frameworks

and expertise are available to manage orderly restructuring, this appears preferable to both a long-term zombification and a destructive clean-up through widespread defaults. Of course, even if an active orderly restructuring approach is possible and is actually implemented, this does not in itself imply that a phase of low interest rates can necessarily be avoided. Low interest rates may still be necessary from a monetary policy perspective, although possibly for a shorter period of time than under the long-term zombification scenario.

We had argued above that the causalities (summarised in Figure 4) on which the theory of the "self-reinforcing" character of low interest rates was built, were in our view *not* sufficiently compelling.

3.4 Low interest rates weaken structural bank profitability

According to this argument, bank profitability suffers when interest rates move to the zero lower bound. This is, in principle, similar to the decline of *central bank* profitability when interest rates move to zero: seignorage of central banks is essentially equal to banknotes in circulation times short-term interest rates. For banks, overnight deposits can be regarded as playing the same role as banknotes do for central banks – a quasi non-remunerated liability which is a key factor for the institutions' structural profitability (regarding the latter, it should however be noted that banks operate in a largely competitive environment, while central banks enjoy a monopoly). Bank deposits are often not remunerated, and are therefore a low-cost source of funding for banks, and part of the core of the business model of retail-oriented banks[20]. For example, overnight deposits of euro area banks in 2014 amounted to EUR 4.6 trillion (See ECB Monthly Bulletin, Statistical Annex). Assuming, as a simplification, that these always have zero remuneration, regardless of whether short-term market rates stand at 4% (as they should in normal times with 4% nominal growth rate) or at 0%. This interest rate differential would imply a structural income differential of the euro area banking system of EUR 184 billion per year. This net interest rate income would be lost if the economy moved from a "normal" interest rate level to a persistent zero level. The order of magnitude of this effect is significant. To provide a comparison, it should be noted that in the ECB's stress test conducted for the Comprehensive Assessment of the euro area banks in the context of the transition to the Single Supervisory Mechanism, the total net interest rate income of banks over the next three years under the baseline scenario is estimated at EUR 760 billion (ECB, 2014, 106). The other large income position is Net Fee and Commission income (EUR 377 billion). On the cost side, Administrative Expenses amount to EUR 865 billion and Loan losses (under the baseline scenario)

[20] For example Krall (2015) argues that both the low short term interest rate, and the flat yield curve, fundamentally harm bank profitability and lead to deleveraging. "The decrease of short term interest to below zero destroys the entire gross profit contribution of the deposit collection business" (p. 4). Moreover, "the erosion of the margin, which is enforced by the artificial flattening of the yield curve, erodes the profitability and thereby risk bearing capacity of the entire system. It therefore leads unavoidably to a further reduction of bank balance sheets, which is nothing else that a reduction of credit and of the monetary aggregate M3. As an unintended consequence (and probably not even one that is understood by the ECB), the aggressive monetary policy of the ECB necessarily contributes to the deflation which it tried to prevent by expanding M1 liquidity". (p. 6).

to EUR 209 billion. These figures suggest that the interest rate level could make an important difference for the profitability of the European banking system.

Flannery and Hutchison (1984) have previously assessed the role of deposits as one source of bank profitability (including the fact that the true average duration of deposits is much longer than their formal duration, implying that their funding costs should be compared to the yield of long-term bonds to obtain their profit contribution). Hutchison and Penacchi (1996) estimate the duration and value of retail deposits on the basis of an interest rate model and data for 200 banks. Sheehan (2013) notes that the quality of the deposit base is crucial for a bank's long-term financial health. Using micro-data from a small sample of banks, he concludes that "core deposits have considerable value to financial institutions, often dramatically more than regulators have allowed". Sheehan (2013, 215) estimates, for five banks, the value of core deposits relative to nominal (on the basis of their duration and low funding costs) and estimates a value premium of deposits at around 25% of nominal. He also notes the market interest rate sensitivity of these values since deposit interest rates react only partially, and with a lag, to changes of market rates. According to Sheehan's (2013, 215) results, the value of deposits increases by around a further 15 percentage points when market rates increase by 300 basis points (relative to the long-term average), while the net value of deposits turns negative when market rates decline by 300 basis points. This is also a result of the fact that checking accounts are typically not remunerated at all. Sheehan also estimates the average actual duration of core deposits for most institutions to be around or above ten years (p. 217). If we assume that sight deposits do indeed have a value premium from the banks' perspective of around 25%, this would mean that moving from a normal yield curve towards structural zero yields for a very long time, this 25% would be largely lost. Again, this appears to be a very significant number in view of the income and expense situation of the euro area banking system, as suggested in ECB (2014, 106).

Two Fed staff notes prepared in 2008 and released in 2014 raise doubts about the argument that a low interest rate is detrimental to bank profitability. Correa and Davies (2008, 58), reviewing the case of Japan, come to the conclusion that "neither the ZIRP [zero interest rate policy] nor the QEP [quantitative easing policies] had much of a direct effect on bank profits." English et al. (2008, 83) start by acknowledging that "conventional wisdom holds that financial firms – especially depository institutions – benefit from a steep yield curve, because their primary function is to intermediate funds across maturities". At the same time, they interpret the empirical literature in the sense that it "offers little consensus regarding the effects of changes in interest rates on the profits of financial institutions." English et al. (2008) then adopt their own empirical approach in which they identify the average effect of unanticipated monetary policy interest rate changes on the equity valuations of financial institutions. Their main finding is that the equity prices of financial institutions increase on average in response to unexpected policy easing (p. 84). This effect is driven mainly by effects on broader economic and financial conditions, while direct effects would be very limited. They admit (page 89) that this result holds on average for listed banks, and does not imply that for some small and retail-oriented banks, the negative effects of monetary easing would not predominate. According to

Smets (2014, pp. 283-284), there is an extensive literature which suggests that "a lower monetary policy rate spurs bank risk taking". This "risk taking channel" of monetary policy is viewed as driven by the fact that low interest rates *increase bank profitability and therefore risk taking capacity* (Adrian and Shin, 2009). Also e.g. Fahri and Tirole (2012) and Diamond and Rajan (2012), as well as numerous other academic economists seem to take for granted that low interest rates are a "bail out" tool of the central bank to rescue banks in the sense that low interest rates would save banks from insolvency or protect them against bank runs. It is assumed that lower short term interest rates lower bank funding costs, while bank assets would typically be subject to longer term fixed rates.

It is interesting to note that the absolute loss of income to the banking system should be the same regardless of whether short-term market rates are cut from 6% to 4% or from 2% to 0%. In this regard, the weakening of the transmission mechanism of interest rate changes because of contrary effects on bank profitability seems to be universal, and even symmetrical. It is wrong to associate it in particular with the reaching of the zero lower bound. Of course, it could be argued that losses of sources of profitability are more dramatic if in any case profitability is already poor. In this sense, the step from 2% to 0% could be felt more painfully than similar steps at higher absolute levels. However, one could argue as well that what matters are the general profitability buffers of the banking system. In explaining the low profitability of today's euro area banking system, some other factors are likely to be at least as relevant as low interest rates, such as (i) the overbanking of the euro area, (ii) the poor economic dynamics and implied high shares of non-performing loans, and (iii) the phasing in of new regulation.

If (despite the ambiguous evidence, and diverging views between bankers and economists) one's conclusion leans towards a possible weakening of the pass-through of central bank interest rate cuts to the funding cost of the real economy, due to the contrarian effects on bank profitability, this would obviously be more relevant for bank-based financial systems such as that of the euro area, than for a capital market based system like that of the US. The central banks of bank-based financial systems should then devote more care to factor in this effect in the design of their monetary policy strategy.

It is also important to remember from this argument that depositors may, in fact, be amongst the winners from low interest rate policies, as the opportunity costs to them of holding unremunerated overnight deposits in the form of foregone interest income declines. What banks tend to lose as seignorage income on sight deposits, depositors tend to save as opportunity costs. This seems to contradict the hypothesis of the expropriation of the saver.

4 Estimating and explaining real interest rate trends

4.1 A primer on the determinants of the real return on capital

Where does the real rate of return on capital come from? In the simple model of Section 2, it is simply a relative price between "wheat in one year" and "wheat today" which, like all relative prices for goods that can be transformed into each other, depends on the production function and on relative preferences (consumption today versus consumption in one year, from today's perspective of course). By assuming some concrete functional forms of the production function and preferences, we can calculate the relative price (in Figure 1, 1+r was the number of units of wheat in one year needed to obtain one unit of wheat today, and r was thus the real rate of return on a one-period wheat investment).

One fundamental difference between real and nominal interest rates is that there is no floor to real rates. The floor for nominal interest rates results from banknotes, which can always be stored at negligible cost, so that attempts to impose a negative rate on deposits trigger circumvention in the form of banknote withdrawals. However, real capital goods cannot necessarily be stored without costs and so nothing prevents real rates of return on capital from falling below zero. For example, if we know that the next harvest will be poor because a water dam broke and will no longer be available to support agriculture (and we also know that simply storing wheat is not an option as it would be eaten by mice), then much less wheat will be available compared with today, and wheat in one year is more valuable to households than wheat today.

Economic growth models provide a formal way of illustrating how economic fundamentals govern the real return on capital. The Solow growth model, one of the workhorse models in economic growth theory, provides several fundamental factors that explain the equilibrium interest rate: population growth, marginal productivity of capital, the savings rate and the rate of labour-augmenting technological change. However, the Solow growth model takes the savings rate as exogenous and provides no explanation as to why it varies over time.

In contrast, the Ramsey-Cass-Koopmans model explicitly endogenizes the rate of savings. In the steady state, economic growth and real interest rates r are positively related. The real interest rate is determined by equation (5):[21]

$$r = \rho + \theta x \tag{5}$$

with ρ being the rate of time preference, θ the elasticity of marginal utility of consumption, and x the rate of labour-augmenting technological change.

[21] For a thorough derivation and treatment of the Ramsey-Caas-Koopmans model, see Blanchard and Fischer (1989) or Barro and Sala-i-Martin (2004).

How do these variables affect the real interest rate? Consider the effects of the variables that are determined by household preferences. A rise in ρ, i.e. a decrease of the value of future consumption relative to that of today implies less willingness to defer consumption. More consumption today – all things being equal – reduces savings. In order to ensure that on an aggregate level savings equal investment, the equilibrium real interest rate has to rise. The same mechanism applies when the attitude of households towards consumption smoothing changes over time (θ). In reality, however, both consumers' "impatience" and their desire to smooth consumption are not directly observable.

Apart from factors that relate to consumer preferences (ρ and θ), technological and demographic changes have an impact on the real interest rate. For instance, a growing population normally leads to an expanding workforce. As these additional workers will need machinery for their work (or more generally, to be equipped with "capital"), demand for investment goods increases. If this additional investment demand is not met by an equal rise in savings, the interest rate is under pressure to rise. Faster productivity growth x implies higher expected future income for households. In anticipation of those higher future earnings, households save less and consume more today. Productivity growth also increases the return on investment, as each additional unit of capital will add more output, inducing firms to increase their capital stock. In combination, savings are expected to fall while investment increases (i.e. supply of capital falls while demand increases), resulting in a rise of the "price" of capital, (i.e. of the real interest rate).

So far, the modelling framework showed that population growth has an effect on economic variables. Our models have assumed that all individuals supply labour. However, children and the elderly are part of the population but not of the labour force. Demographic changes – changes in fertility and mortality – alter the composition of the population and affects aggregate outcomes like savings, investment and growth.

Let us define the support ratio as the ratio of economically active people to elderly people who are economically inactive. A falling support ratio means that more "elderly" people will depend on a given number of workers. On the one hand, the elderly consume more and save less than younger workers, so a shrinking support ratio means a decrease in savings. However, demographic change could also trigger higher precautionary savings since fewer workers have to provide for more consumers. If, for instance, uncertainty about future pension benefits arises, the rise of life expectancy might increase the level of savings for workers. Furthermore, a drop in the support ratio means that fewer workers have to be equipped with capital, resulting in a curb in investment demand, which generally puts downward pressure on the real interest rate.

Consider the scenario where the former effect dominates, i.e. the lower the support ratio, the lower the average savings per household. A decrease in savings puts pressure on the real interest rate to rise. However, in this scenario, output is produced by fewer and fewer workers. Due to demographic changes, a rising real interest rate will not translate directly into higher per capita output. A shrinking labour force lowers the absolute economic growth rates.

The Ramsey-Cass-Koopmans model shows that technological change is driving the real interest rate and economic growth [22]. Indeed, along a balanced growth path, the rate of technological change x is the same as per capita output growth. The empirical equivalent to the concept of technological change is the total factor productivity (TFP) [23]. The growth accounting framework [24] provides a standard approach to deriving TFP and potential output growth (Anderton et al., 2014). This structural approach is based on economic theory and models the supply side of an economy which is then used to estimate the key forces that shape economic growth. The production function approach relates factor inputs, such as capital and labour, and the level of technological progress, to output growth. The functional form of the production function can take on various types. However, many approaches rely on the Cobb-Douglas type, which can be derived from the more general "constant elasticity of substitution" (CES) class of production functions. Consider the case of a Cobb-Douglas production function with constant returns to scale, which links output to exogenous technological change (T) and the two factors of production labour (A) and capital (K) with the following functional form: [25]

$$Y_t = A_t^{\propto} \cdot K_t^{(1-\propto)} \cdot T_t \tag{6}$$

Rearranging to growth *rates* yields:

$$\hat{Y}_t = \propto \cdot \hat{A}_t + (1-\propto) \cdot \hat{K}_t + \hat{T}_t \tag{7}$$

The difference between contributions to growth by the inputs A and K and actual GDP growth Y yields the total factor productivity (the so-called "Solow residual"), which is regarded as an empirical measure for the growth contribution of technological change. After removing the cyclical fluctuations of the time series (generally of labour and TFP, for instance by the Hodrick-Prescott filter), potential output growth is given by:

$$\hat{Y}_t^* = \propto \cdot \hat{A}_t^* + (1-\propto) \cdot \hat{K}_t^* + TFP_t^* \tag{8}$$

Consequently, potential output growth is determined by the trend growth rate of the inputs as well as the trend of TFP. By subtracting the population growth rate n, we approximate potential output growth per capita by:

$$\hat{y}_t^* = \hat{Y}_t^* - n_t. \tag{9}$$

[22] The "New Growth Literature", starting with the seminal work of Romer (1986, 1990) focuses on the importance of innovation as a driver of long-term economic growth.

[23] Many factors improve TFP, for instance better institutional quality, deregulation or higher educational attainment of the workforce. However, technological progress seems to explain the largest part of increases in total factor productivity (Schiersch et al., 2012).

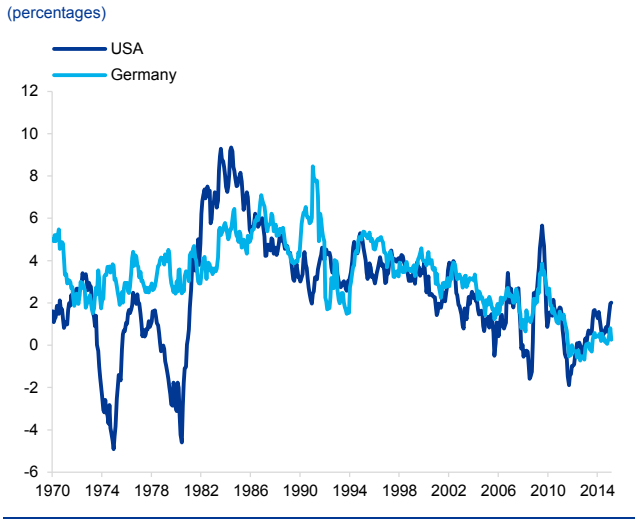
[24] For a general overview of the growth accounting framework, see Hulten (2008).

[25] There are several methods for deriving $\propto$, for instance by regression analysis or by taking the wage share.

4.2 Empirical Estimates of real interest rates (US, euro area)

Figure 6 shows the evolution of long-term real interest rates in Germany and the US since the 1970s, defined as the ex post measured difference between the nominal interest rate on 10Y sovereign bonds and actual inflation. In Section 2.2, Table 1, four concepts of the real rate of interest were differentiated – the ex post real rate on money investments (i_t-π_t) is the one shown here.

Figure 6
Long-term real interest rates in Germany and the United States



Source: Datastream, OECD.

The volatility of real interest rates is remarkable. In Germany, real rates dropped sharply at the start of the 1990s in the wake of the post-reunification recession. Even though they partly recovered their pre-recession levels, real interest rates have been falling constantly since the 1990s, also at a global level (IMF, 2014a).

Real rates as shown above are deducting, from an interest rate at point in time t, an inflation rate that materialised only in t+1. However, as explained in Section 2.2, decisions of economic agents were affected by expectations of this inflation rate, which will not normally be equal to ex post realisations of inflation rates. The natural interest rate as introduced in Section 2 ($E(r_t)$) is, in contrast, a full ex ante concept.

Estimating the natural interest rate remains quite challenging. First, there is no consensual concept of how to measure the natural interest rate. Along with the different definitions of measures of the natural rate, different methodological toolkits are applied. All of the methods used have their caveats, and the resulting estimations contain a rather large degree of uncertainty. As a result, the estimates vary significantly, depending on the model specification, estimation method and parameter choice.

A first simple and intuitive approximation of the natural interest rate is to calculate the long-term sample mean of real interest rates in times when there are no upward or downward inflationary pressures (Reifschneider and Williams, 2000). These averages are adequate if the determinants of the natural rate also remain constant over time. However, if the movements of the underlying determinants are relatively large, the long-run averages provide a poor approximation of the natural rate (Bouis et al., 2013).

In a dynamic analysis, the natural rate of interest can be derived by applying statistical or filtering techniques, such as the Hodrick-Prescott filter, linear de-trending or moving averages, to real rates, to separate the true underlying growth rate from noise. Even though these methods are easy to implement, they have several drawbacks. First, their “atheoretical” nature prevents any economic interpretation as to why the natural rate changes. Second, the methods ignore regime shifts or structural breaks, are sensitive to sample period selection and can be distorted if inflation and/or output are not stable over time (Magud and Tsounta, 2012).

In contrast, “structural” models are deeply rooted in economic theory. One class of these models is the dynamic stochastic general equilibrium model (DSGE)[26]. These so-called “New Keynesian” models feature the optimising of “behaviour” of households and firms. Within these models, the natural interest rate corresponds to the equilibrium real rate of return in an economy where prices are fully flexible (Woodford, 2003). Hence, it is the real short-term rate of interest that equates aggregate demand with potential output at all times (Mésonnier and Renne, 2007). These models focus on short-term developments, also labelled the high-frequency component of the natural interest rate (Laubach and Williams, 2003).

Andres et al. (2009) use a DSGE model to simulate the natural interest rate for the US and the euro area. They find that the natural interest rate in the US has been decreasing since the 1980s. More recently, Barsky et al. (2014) use a DSGE model, based on the workhorse Smets and Wouters (2007) model, to estimate the natural rate for the US. Their estimates show that the natural rate is variable and procyclical. Furthermore, the natural rate turned negative during the last three recessions and has remained severely depressed since 2008. For the euro area, Giammarioli and Valla (2003) find that the natural rate decreased from 1994-2000.

The microfoundation of DSGE models makes them suitable for welfare analysis to assess the degree of optimality of different policies (Giammarioli and Valla, 2004). However, the possibility of identifying the influence of structural shocks on the natural interest rate comes at a price. Different modelling assumptions, such as the propagation channels of economic shocks that influence the real rate, will lead to rather different results. Furthermore, estimates are generally found to be quite volatile (Edge et al., 2008).

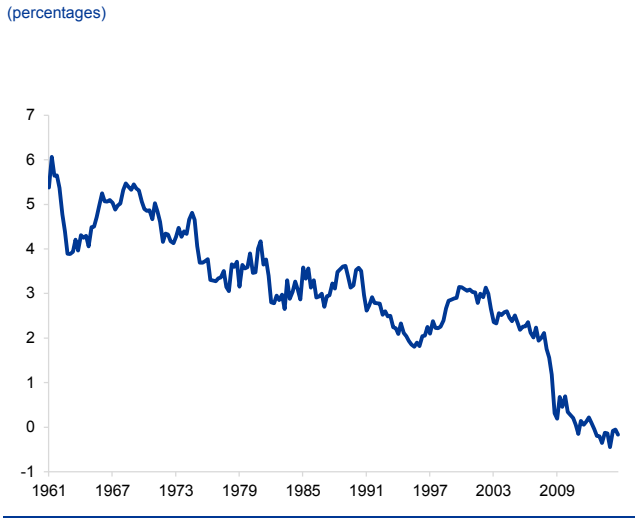
A compromise between the “atheoretical” filtering methods on the one hand, and the fully-fledged New Keynesian models on the other, are the so-called “semi-structural” models. Starting with the contribution of Laubach and Williams (2003), these models combine macroeconomic modelling techniques with econometric tools to estimate the potential level of output and the natural rate of interest, among others, as unobserved variables. In this class of models, the definition of the natural interest rate is different to the one used in the DSGE literature. In the semi-structural models, the natural rate of interest is defined as the real short-term interest rate that is consistent with output at its potential and stable inflation in the medium term. In their benchmark paper, Laubach and Williams (2003) develop a small-scale macroeconometric model and use the Kalman filter. For their US sample, the estimates suggest that the natural interest rate has been falling over time. Recent updates to their model (Figure 7) confirm their previous findings. Indeed, the natural interest rate may potentially even be negative in 2014.

Mesonnier and Renne (2007) use a similar methodology to provide estimates of the natural rate for a synthetic euro area. They conclude that in their sample period, the natural interest rate peaked in 1989 and fell to a low in 2004. Bouis et al. (2013) confirm the declining trend in natural interest rates for a number of OECD countries.

[26] For a discussion of the natural rate in the context of DSGE models, see Woodford (2003) and Edge et al. (2008).

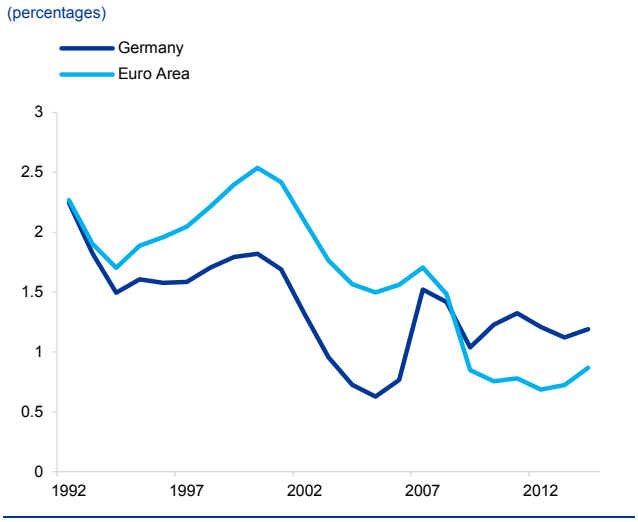
Indeed, the natural interest rate may have fallen to historically low levels in the wake of the current crisis for a sample of OECD countries.

Figure 7
Measuring the natural interest rate for the United States



Source: Williams and Laubach, provided under: http://www.frbsf.org/economic-research/economists/john-williams/Laubach_Williams_updated_estimates.xlsx.

Figure 8
Growth rate of potential output in Germany and the euro area



Source: OECD.

The standard growth model in Section 4.1 suggests that potential output and real interest rates are positively correlated. The empirical literature confirms that the natural rate moves closely with the trend growth rate (Mesonnier and Renne, 2007, Laubach and Williams, 2003). However, potential output is a theoretical concept and is not directly observable in the data. Similarly to the natural interest rate literature, several methods exist to derive potential output, ranging from atheoretical statistical methods, like the Hodrick-Prescott filter, to more theory-guided models. One of the most common structural approaches is the production function approach (see Section 4.1) that is commonly used by international agencies, for instance the OECD (Johansson et al., 2013). Figure (8) plots the development of potential growth in the euro area and Germany, respectively.

Potential growth has decreased in the euro area as well as in Germany since the beginning of the early 2000s. After a short rebound, potential growth started to plummet after the outbreak of the financial crisis, especially in the euro area. Declining potential growth translates into shrinking natural interest rates, a conclusion in line with recent econometric estimations (Bouis et al., 2013).

Anderton et al. (2014) find evidence that the recent crisis reduced growth in potential output in the euro area. Low *nominal* interest rates are therefore consequence of the adverse economic environment in the euro area (Zeuner, 2014). Furthermore, current estimations of the *future* trend growth in the euro area point to a bleak future. Annual potential growth is expected to be around 0.6% in 2015 and 0.7% in 2016, well below the 1.5% between 2005 and 2009 (European Commission, 2014).

4.3 Alternative explanations for the trend decline in real interest rates

Why do central banks currently need to set such low nominal interest rates? Several interpretations have been provided: these range from (i) a structural fall of growth rates in production factors and technological progress, (ii) the evolution of high savings and (iii) issues related to the financial system. The following section discusses each of the potential explanations, with a focus on the euro area and Germany.

(i) Structural fall of growth rates in production factors and technological progress

The growth accounting framework helps to break down the development of potential output growth into technological progress and the inputs capital and labour.

Technological progress and innovation are one of the most decisive factors shaping per capita output growth and the real return on capital. Evidence suggests that the evolution of technological innovation has slowed down in the most important advanced economies, namely the US (Fernald, 2014) and Europe (Anderton et al., 2014). Compared with the US, the slow-down in productivity growth in Europe has been more pronounced. Several factors have contributed to this development, including the slower emergence and exploitation of the potential of information and communications technology (Oulton, 2012) and obstacles resulting from the overly rigid regulation of European labour and product markets (van Ark et al., 2008).

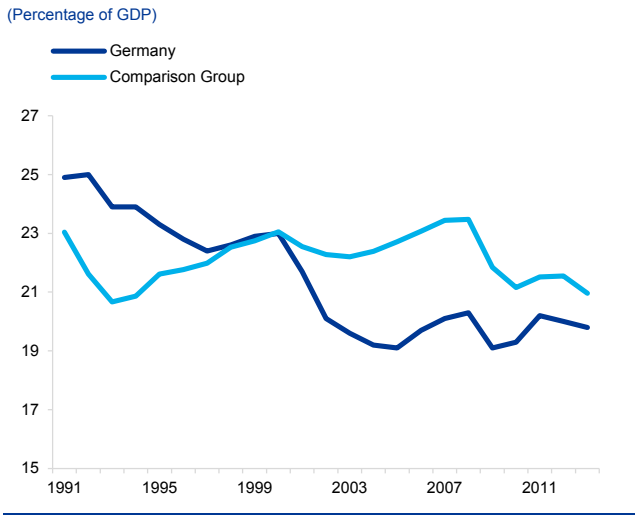
Summers (2014) lists several structural factors that have led to falling capital investment in the US, including (i) the falling relative price of capital goods, (ii) slower population growth, that reduces the need to equip workers with capital and (iii) the IT sector, where prices continue to decline rapidly and where the business models of IT firms generally require less capital investment. These structural factors may also be important for other advanced economies. In Europe, capital investment started to decrease markedly with the onset of the recent financial crisis.

Many advanced economies are currently – or will be in the near future – undergoing a marked aging of their societies. A slow-down in working-age population – i.e. in the labour input– directly lowers potential growth. As for Europe, the ongoing demographic change is projected to be one of the main factors leading to a future slow-down in potential growth (Anderton et al., 2014).

The financial crisis severely affected the growth outlook in major parts of the world. For the period 2008-2013, potential growth in Europe slowed down, primarily due to a drop in the capital and labour component. The fall in potential output is more severe in European countries with stark pre-crisis imbalances (Anderton et al., 2014). Generally, financial crises lead to a significant and long-lasting decline of the investment-to-GDP ratio, suggesting that it will take a long time to recover to pre-crisis levels (IMF, 2014a).

Figure 9

Gross Fixed Capital Formation (as a percentage of GDP) in international comparison [27]



Source: OECD, Eurostat, own calculations.

In Germany, the average rate of total factor productivity has been steadily falling since the 1970s (Borger, 2011). The steady decline of TFP has been accompanied by a decreasing investment rate (as a percentage of GDP). Since 2000, the German investment rate has always remained lower than that for a comparison group of developed economies with a comparable economic environment (Figure 9). This downward trend and the weakness of investment are visible in all institutional sectors of the economy (Zeuner, 2013).

For instance, corporate investment (as a percentage of GDP) in 2013 was around 2 percentage points below its average during the 1990s, and more than 1 percentage point lower than the pre-crisis level of 2007 [28]. German public investment (as a percentage of GDP), meanwhile, is below the European average (Elekdag and Muir, 2014). If depreciation is taken into account, the net public investment rate (as a percentage of GDP) has been predominantly negative since 2003 (except during the period between 2009 and 2011 due to the economic stimulus packages), leading to a deterioration of the public capital stock. As a result, surveys indicate a perceived investment backlog of over EUR 100 billion at the municipal level (Zeuner, 2013).

The simultaneous fall of both total factor productivity and investment rates is not surprising. New technological innovations provide firms with profitable investment opportunities that boost the overall capital stock. However, companies that upgrade their capital stock often use new technological devices that boost innovation and productivity itself (Borger, 2011).

As regards the labour input, estimations suggest that the total population of Germany will decrease markedly, from around 82 million in 2008 to 80 million in 2020. Even with net migration of 100,000 people per year, the population of Germany will have shrunk to just 65 million by 2060 – a drop of 20% of its current population (Destatis, 2009). Rising life expectancy and decreasing fertility will affect the working population, defined as persons aged 15-74 relative to total population: the ratio is set to decrease by 3.1 percentage points by 2030 [29].

As a result, low investment growth, an aging society and falling total factor productivity are tending to lower potential output growth and thus to decrease the real interest rate.

[27] The comparison group consists of Australia, Austria, Denmark, Finland, France, Italy, the Netherlands, Switzerland and the USA.

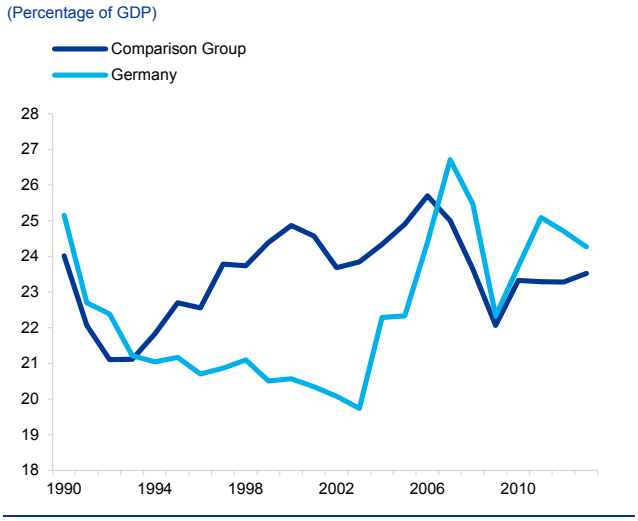
[28] Gerstenberger and Schwartz (2014) provide several explanations for the low investment rate of the corporate sector.

[29] See Borger et al. (2013) for a further discussion. United Nations (2012) provides estimations for the dependency ratios under different mortality and fertility scenarios.

(ii) Savings rate

In 2005, Ben Bernanke observed that global savings were rising and subsequently coined the term "global savings glut" (Bernanke, 2005). While industrial countries were expected to increase their savings due to the aging of their societies, it was especially the strong increase in emerging markets' savings that increased global savings. A rise in global savings – all things being equal – decreases the real interest rate. Indeed, at a global level, savings rose markedly from 2000-2007, and were primarily driven by emerging markets, especially China. These trends suggest that higher emerging markets' savings had a significant influence on driving down real interest rates (IMF, 2014a).

Figure 10
Gross Domestic Savings (as a percentage of GDP) in international comparison [30]



Source: IMF, OECD, own calculations.

Since the beginning of the early 2000s, Germany's gross savings as a percentage of GDP have been markedly on the rise (Figure 10). The difference between the levels of domestic savings and investment defines the current account balance. Parallel to the increase in domestic savings, Germany has accumulated high current account surpluses. In 2013, the surplus was more than 7% of GDP, one of the highest in Europe [31]. The recent rise in the savings rate has been predominantly driven by the corporate sector and reflects low corporate investments.

In many advanced economies the working-age population is expected to decrease. As our analysis in Section 4.1 showed, demographic change will affect private savings behaviour. Under the assumption that retired workers save less, private savings are expected to fall.

However, the projected trend for the working-age population in Europe raises concerns about the sustainability of social security systems. If these systems are not capable of providing pension funds at the current replacement rate, private savings are likely to increase. In the case of Germany, von Weizsäcker (2014) points to several factors of demographic change that will lead to a rise in private savings, which include, among others, rising health-care costs. In this context, Japan provides an interesting case study, since its demographic change is happening earlier than that in other advanced economies. According to the model and estimations of Ikeda and Saito (2014), the natural interest rate in Japan is lowered by a fall in the ratio of workers to total population.

The total amount of savings is jointly determined by private and public savings. The debt-to-GDP level of many advanced economies rose markedly in the wake of the

[30] The comparison group consists of Australia, Austria, Denmark, Finland, France, Italy, the Netherlands, Switzerland and the USA.

[31] From an intertemporal point of view, high savings today allow reaping the returns in the future. Yet, as Klär et al. (2013) point out for the case of Germany, interest rates on foreign held assets were lower than on domestic assets held by foreigners.

financial crisis of 2008. In order to maintain a sound fiscal policy, there is a tendency to decrease debt levels to more sustainable levels. As a result, new fiscal rules in Europe have been implemented to limit public deficits and eventually reduce the debt burden. These consolidation measures are sure to increase public savings and thus the supply of loanable funds, and put downward pressure on the real interest rate.

(iii) Financial system related issues

In modern economies, savings and investments are channelled through the financial system, stressing the importance of well-functioning financial markets and institutions. Disturbances to the financial system, for instance by a financial crisis, influence savings and investment behaviour and intensify the effects described in Section 4.3 (i) and (ii) (Brunnermeier et al, 2012).

Many banks suffered heavy losses during the financial crisis. In order to restore healthy financial conditions and to adjust their risk position, these institutions cut back their lending business. This "credit crunch" naturally affected the financing conditions of businesses. For instance, the credit supply shock of 2008 and 2009 affected capital investment in Europe negatively, as many firms relied on bank credit as their main financing instrument. [32]

However, the financial crisis triggered the repairing of balance sheets not only by financial institutions, but also by private households and non-financial corporations. The period prior to the outbreak of the last financial crisis saw an increase of private debt in many advanced economies. The bursting of the bubbles (i.e. the housing bubble in the United States and more recently those of Spain and Ireland) left the private sector with a debt overhang. In this context, Richard Koo coined the expression of a "balance sheet recession". [33] Koo starts with the observation that in the 1990s, Japan suffered from the bursting of an asset and real estate price bubble. In the wake of the bursting of the debt-financed bubbles, the assets of the private sector decreased while their liabilities remained on their books. Thus, households and businesses were forced to repair their balance sheets by paying down debt or increasing savings. Koo argues that behavioural motivations change: instead of maximising profits, the private sector seeks to minimise debt. This microeconomic change has aggregate implications. Impaired balance sheets increase aggregate savings, dampen investment and therefore put negative pressure on the real interest rate. While higher savings may be sensible from an individual point of view, they may reduce aggregate demand [34], slowing down growth and increasing the risk of so-called debt deflation. Interest rates remain low for an extended period of time given the increased aversion to borrowing by the private sector.

There is evidence that the process of "balance sheet repair" is currently in progress in several European economies (Best and Kraemer, 2014, Koo, 2014). Interestingly,

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[32] For firm-level evidence on the impact of the credit crunch on corporate investment, see for instance Gaiotti (2013) for Italy or Garicano and Steinwender (2013) for Spain. Contrary to some countries in the euro area, companies in Germany currently face no problems in accessing financial resources for investment projects (Schwartz, 2013, CESIfo, 2014).

[33] The argument of balance sheet recessions is explained in more detail in Koo (2008).

[34] This idea relates to the Keynesian concept of the "paradox of thrift".

with regard to the role of the public sector, Koo's policy implications draw heavily on the use of fiscal policy. If the private sector continues to save, even with interest rates stuck at the zero lower bound, public sector spending has to soak up all the private savings to increase aggregate demand, push prices and income, and prevent the economy from falling into Fisherian debt deflation. However, the opposite is currently happening.

In order to soften the macroeconomic implications of the financial crisis, governments worldwide supplied rescue packages and various measures to boost the economy which, in the end, increased public debt significantly. As a result, both the private sector *and* the public sector were forced to fix their balance sheets. This, in turn, has once again strengthened the savings process and put additional pressure on interest rates (see Section 4.3 (ii)).

Financial regulation, for instance concerning reserve holdings or capital requirements, also affects real interest rates. Caballero and Farhi (2014) argue that regulation, among a host of reasons, increased the demand for safe assets, while the supply of safe assets was not able to rise similarly. Ultimately, the demand for safe assets – combined with sluggish supply – put downward pressure on equilibrium real rates, especially in the 2000s (IMF, 2014a). The severity of the financial crisis has set strong incentives for financial regulators to tighten the regulatory rules, thereby increasing the demand for safe assets by financial institutions (Bouis et al., 2014).

All in all, the process of balance sheet repair and financial regulation have a strong impact on private and public sector behaviour and generally lead to a decrease in the real interest rate.

(iv) Outlook: How will real interest rates evolve in the future?

Given the structural challenges faced by the US economy, such as a declining working-age population or a reduction in debt-financed investment, Larry Summers (2013) conjectures that saving and investment patterns in the United States are such that real interest rates (in the sense of the ex ante expected real rate of return on money investments, $i_t - E(\pi_t)$) may have to go into low or even negative territory to restore full employment. The United States might suffer from "secular stagnation", a theory that goes back to a famous speech by Alvin Hansen in 1938.[35] Hamilton et al. (2015) are sceptical of the "secular stagnation" hypothesis. In their view, the US equilibrium interest rate remains significantly positive and will not be stuck at or below zero for the next ten years.

Blanchard et al. (2014) provide a gloomy forecast. As a result of the financial crisis, it will take a long time for the investment-to-GDP ratio to regain pre-crisis levels. Regulatory changes are, most probably, increasing the demand for safe assets. Higher debt levels, both public and private, require higher rates of saving in order to

[35] In a famous speech to the American Economic Association in 1938, Alvin Hansen put forward the hypothesis of "secular stagnation". Hansen argued that the economy needed a strong level of investment in order to achieve full employment. Hanson reasoned that structural factors in the US economy, like declining population growth and lack of new inventions, restricted new available investment opportunities and led to underinvestment and deficient aggregate demand. As a result, the US economy would enter into an era of ongoing unemployment and economic stagnation.

either stabilise or decrease the debt level. The focus on austerity and fiscal rules in many advanced economies points to an increase in public savings. Meanwhile, consolidation may also be relevant for the private sector, where firms and households are deleveraging. Thus, real interest rates may remain as low as, or even lower than, they were before the crisis (Blanchard et al., 2014).

Erfurth and Goodhart (2014) take a different view. The currently low real interest rates are caused by several "statistical artefacts". The new low is not the new normal. In fact, interest rates are expected to *increase* in their view. Their forecast is based on two observations: the support ratio and the number of workers globally. For the last 35 years, the demographic trend has been mostly beneficial for the world, with support ratios rising. This trend is about to reverse for many advanced economies since increasing mortality rates have been followed by decreasing fertility rates. If the support ratios are bound to fall over the next 35 years, so is the overall level of savings, assuming that young workers save and retired workers dissave. Additionally, the absolute number of workers will be lower in many countries in the next 35 years than it was in the past 35 years. Both effects will potentially slow down economic growth. Ex ante investment, meanwhile, is expected to fall, but by less than ex ante savings. The authors expect the real interest rate to *rise* to a value of around 2.5-3%, perhaps even higher by 2050.

5 The case of Germany: how to increase real interest and growth rates?

The analysis showed that real interest rates in the United States, the euro area and Germany have declined over time. Deep structural factors that affect potential growth and the real interest rate, like the rate of technological change, have evolved better in the United States than in Europe (Anderton et al., 2014). Despite its relatively positive performance in recent years, the German economy faces severe headwinds in the future: low business capital formation, a shrinking public capital stock, low productivity growth and unfavourable demographic developments. These trends point to lower *future* potential growth rates and to lower returns on capital. Due to its special role within the euro area, policies that push the real rate of interest in Germany will have positive spillover effects on the whole monetary union (Elekdag and Muir, 2014).

5.1 Applying the growth accounting framework to Germany

Section 4.1 showed theoretically that the production function approach is a valid framework for adequately modelling the supply-side of the economy. Borger et al. (2013) use this growth accounting framework to determine the future path of potential output growth in Germany, with a special focus on the effects of demographic change.

The baseline scenario[36] is based on official population development projections (Destatis, 2009) and net migration of 100,000 people per year. Furthermore, some positive developments are assumed: the participation quota rises from 69.5% (2012) to 72.5% (2030), the unemployment rate drops from 5.3% (2012) to 4.5%, the rate of gross investment increases from 17.4% of GDP (2012) to 20% (2030), but average annual working time drops by 1%.

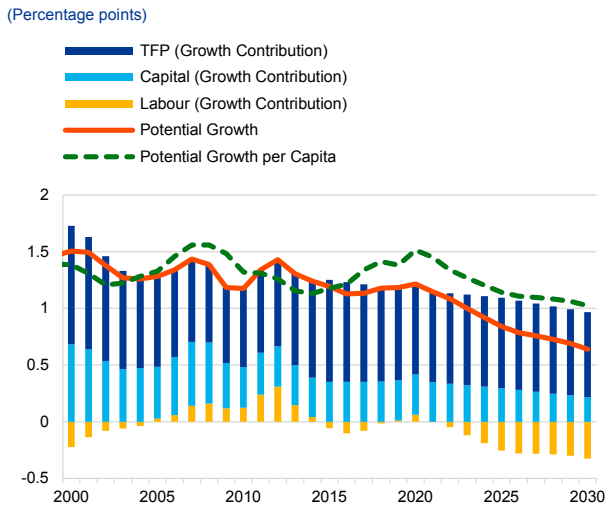
Despite these assumptions, that do not appear particularly pessimistic, potential output growth is expected to fall gradually from around 1.4% in 2012 to around 0.6%

[36] For detailed explanation of the specifics of the simulation, see Borger (2011) and Borger et al. (2013). For their study, Borger et al. (2013) used national accounts data according to the previous ESA1995 standard. Compared to the recently introduced ESA2010 standard, which has been in force since September 2014, gross fixed capital formation was more narrowly defined: under ESA1995 rules expenditure for research and development as well as military weapon systems did not count as capital formation but both categories do so under ESA2010. As a purely arithmetical consequence, the level of the gross investment ratio (gross fixed capital formation as a percentage of GDP) is generally higher over the entire time horizon when computed on the basis of ESA2010 data. However, the negative time trend of the gross investment ratio as well as level and trend of the net investment ratio almost remain the same (Borger, 2014). Hence, the basic findings and conclusions elaborated in Borger et al. (2013) can be regarded as materially still valid notwithstanding the statistical concepts revised since. Although the current level of the total German population is higher than previously projected by Destatis (2009) due to the unexpectedly strong net immigration in the wake of the financial and economic crisis in Europe, the working-age population is still set to decline significantly in absolute terms and in relation to the total population over the next decades. Hence, the basic challenges emanating from the adverse demographic trend and the appropriate policy recommendations remain the same as described in Borger et al. (2013).

in 2030 (Figure 11). The contribution of the factor labour will be a drag on growth, starting in the 2020s when the so-called baby boomer generation will retire. Per capita potential growth is also expected to fall, from 1.3% in 2012 to 1.0% by 2030. The per capita growth trend is less pronounced than the absolute GDP trend due to the shrinking population.

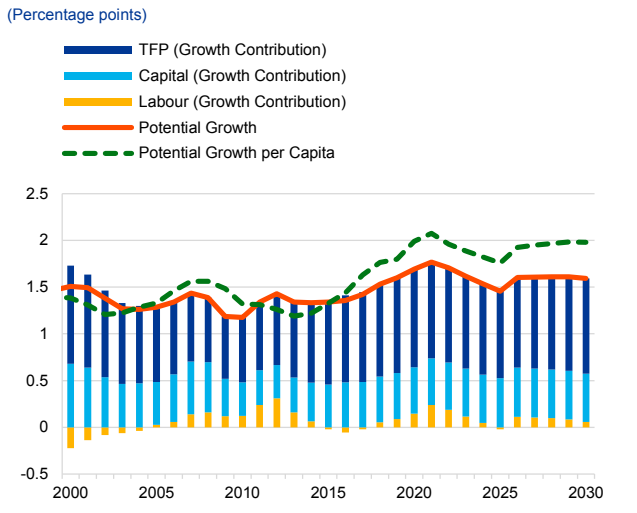
Of course, the decline in real growth rates (and of the real rate of interest) should not be seen as a predetermined fate. Economic policies can lead to different (better or worse) outcomes compared with the scenario above. Borger et al. (2013) analyse what would be necessary to reach a potential real growth rate of 2% per capita, which was Germany's average in the 1980s, and which is in line with the potential growth rates of a number of other advanced economies. Consider first "corner solutions" to the problem of achieving a 2% real growth rate, i.e. solutions that vary only one factor relative to the baseline scenario above. Nine out of ten adults would have to work; the investment quota would have to rise more than 12 percentage points; the goal is unreachable by simply increasing immigration or decreasing the unemployment rate. The unrealistic values that need to be assumed in the corner solutions suggest that Germany requires an orchestrated effort in various policy fields to reach this growth target.

Figure 11
Factor contributions to potential growth, baseline scenario



Source: Borger et al. (2013).

Figure 12
Factor contributions to potential growth, "2% per capita" – scenario



Source: Borger et al. (2013).

There should be special focus on the effects of demographic change. As such, it is crucial to mobilise the existing potential workforce in an optimal manner. A rather more realistic "2% per capita" growth scenario can be developed on the basis of the following assumptions: (i) a gradual rise of the participation quota, from 69.5% to 73.5%, a Scandinavian level, (ii) a reduction of the unemployment rate to 4% in 2030, (iii) average annual working time per employee that remains stable at its current level of 1,400 hours per year, (iv) a rise in net migration to 200,000 persons per year, the upper bound of official population projections (Destatis, 2009), (v) a rate of investment rising gradually from 17.4% (in 2012) to around 23% in 2030, a level

which seems high by current standards but which was common in Germany in the 1990s, and (vi) an increase of total factor productivity by around 0.2 percentage points.

These assumptions change the growth rate of potential output markedly (Figure 12). As opposed to the baseline scenario, the contributions of all factors of production to potential growth are positive, including that of the labour input. The rising absolute growth rate translates into an even higher per capita growth rate.

In summary, the growth accounting framework shows that without any policy change (relative to the not particularly pessimist baseline scenario), potential output will fall markedly until 2030, especially due to the adverse demographic effects. However, an orchestrated intervention in several policy areas could raise potential output per capita to 2% by 2030. The next section discusses policy proposals for achieving this aim.

5.2 Policy Recommendations

With reference to the factors that predominantly shape the real rate of interest in the Ramsey-Cass-Koopmans growth model, the analysis focuses on (i) productivity and (ii) demographics, and makes several concrete policy recommendations.

(i) Productivity Growth

Productivity growth is driven by a host of factors, among which technological progress ranks high, while Research and Development (R&D) is an important driver of innovation. Germany recently achieved the 3% target of R&D spending (as a % of GDP) set by the Lisbon Strategy. However, Germany's R&D expenditure (as a % of GDP) is significantly lower than that of other industrial economies. Furthermore, R&D spending is concentrated in a few industries (including mechanical engineering and the chemical industry) but is lacking in high-growth sectors such as advanced technology "(Spitzentechnologie"). As a result, it remains important not only to increase R&D expenditure, but also to broaden it. Furthermore, an improvement of the interaction between publicly provided research (in universities or research institutes) and private industry would increase innovative activity. Properly working venture capital markets could also alleviate the problem of financing innovation.

Human capital is an important driver of economic growth and innovation. Higher educational attainment increases labour force participation by augmenting the set of accessible jobs. However, increasing the quantity of educational spending is not sufficient. Most importantly, the *quality* of the education provided has to be improved (Hanushek and Woessmann, 2012). This holds especially true for investments in early-childhood care where the returns on education are highest (Heckmann, 2006). While the proportion of children enrolled in day care centres in Germany is above the OECD-average, it still remains below that of countries such as France or Sweden. Additionally, children from migrant backgrounds, or from socially weak families, are significantly less frequently enrolled in public day care centres (Lüdemann, 2014). The proper integration of migrant workers into German labour markets is vital. As

such, language offerings for both migrant children and workers should be readily accessible.

Section 4.3 established the fact that Germany's level of private investment is subdued and falling, resulting in a lower capital stock. A scenario analysis shows that potential growth could be around 0.6 percentage points higher if Germany returned to a higher investment path, compared with the ongoing low investment environment (DIW, 2013). The implementation of new machinery and equipment often entails the use of modern technology, so an increase in the level of investment affects the level of technological change (Haltmaier, 2012). In principle, the context for increased private sector investments should be positive in Germany. First, German companies are generally financially healthy, for instance due to relatively sound equity ratios (Schwartz, 2014). Second, the current low interest rate environment should be favourable for debt-financed investments. At the same time, it seems that a major hindrance to private investment spending by German enterprises is the perceived high level of uncertainty. This implies that policy makers should focus on establishing a positive growth outlook, both in Germany and in Europe, by decreasing crisis-related risks. It seems highly likely that investment by German companies will rise once uncertainty is perceived to have receded and the sales outlook brightens.

An increase in the level of private investment is also conditional on the quality of the public infrastructure available. Modern, high-quality public infrastructure increases Germany's competitive edge. As an input, infrastructure is highly complementary to other inputs such as labour or non-infrastructure capital (IMF, 2014b), ultimately leading to a "bail in" of private investment. The "bail in" principle is important for long-term transitions such as the energy turnaround ("Energiewende") that require significant investments in local distribution infrastructure or energy-efficient refurbishment, among others. Institutional reforms at European (and national) level have led to the implementation of several fiscal rules (for instance, the debt brake) that limit fiscal spending out of fear that the public debt stock might grow to unsustainable levels. However, Germany still has scope within these rules to increase its public investment, since the fiscal limits set by these fiscal rules have not been reached. Two effects could support the argument for increasing the debt level to pay for better infrastructure: First, the use of debt-financed public investments seems superior to the "budget neutral" approach (IMF, 2014b) and second, long-term refinancing costs are at a historical low. As a consequence, Germany should use its available fiscal space to increase debt-financed public infrastructure spending.

(ii) Demographics

Demographic change is a slow and continuous process, but has far-reaching consequences. For Germany, it remains one of the key challenges to be tackled. Given a shrinking work force, the existing supply of the factor labour has to be optimally utilised by increasing the participation rate. Four areas of improvement are highlighted.

First, female participation in the labour force should be increased. The participation rate of women in the workforce is, at 68%, nearly 10 percentage points higher than the OECD average (OECD, 2014). However, around 50% of women work under part-

time contracts and 80% of part-time contracts are taken by women, which can be explained by their objective of balancing work and family (Vogel, 2009). A condition of increasing female full-time participation in the workforce is the provision of better primary care facilities and more all-day schools in order to balance family with working life. Furthermore, an adaption of the tax code might spur the participation rate of spouses, e.g. by giving tax incentives for second earners in a family. Second, the continued participation of elderly people in the labour market remains another viable option, for instance by increasing the effective retirement age. Third, structural unemployment has to be reduced, e.g. by offering targeted training. Fourth, Germany needs a coherent immigration policy to adequately integrate the increased inflow of migrant workers.

As the scenarios show, there is no panacea to solve Germany's structural demographic challenges. On the contrary, policy makers should adopt a targeted mix of economic policies that increase the demographic contribution to the real return on capital and potential growth.

5.3 The case of Europe

The aforementioned *domestic* policies would be a step in the right direction in order to increase potential growth in Germany. Many of the policies appropriate for increasing growth and real returns on capital in Germany are also appropriate for enhancing growth at euro area level.

Generally, policy makers should follow an approach of sustainable government spending. This includes to respect the existing fiscal rules, but also to optimally use the flexibility provided within these rules. Furthermore, there exists some leeway to implement a more growth-friendly composition of fiscal policy, for instance by prioritising productivity-enhancing public investment or reducing the tax-burden in a budget neutral way (Draghi, 2014). These measures should be complemented by structural reforms that decrease rigidities in labour and goods markets and therefore ultimately boost productivity and growth (van Ark et al., 2008, Anderson et al., 2014).

National borders still provide a barrier against the flow of goods and services. Thus, the creation of a true single market, especially in the service sector, should remain high on the political agenda (Monti, 2010). Better integration increases competitive pressure, reduces rent-seeking, and enables the use of scale economies and ultimately the reallocation of resources to the most productive companies. This reallocation could significantly boost productivity in the euro area (CompNet Task Force, 2014). For example, the creation of a Single Digital Market is expected to raise GDP by up to 4% (Copenhagen Economics, 2010).

Policies that drive growth and productivity in Europe ultimately also have an impact on the real return on capital. This is relevant to the German saver in view of the common capital market, and Germany's current account surplus still implies the flow of German capital investments abroad.

6 Conclusions

The aim of this paper was to show that the argument that central banks' low nominal interest rate policies expropriate the saver is flawed. Eventually, real rates of return on savings depend on growth dynamics and the associated real rate of return on capital investments. Monetary policy cannot manipulate this rate of return to the upside in a structural manner. It may be able to do so temporarily, say for one or two years. But this is not a horizon relevant to the saver, and beyond the short-term horizon, any attempt by the central bank to artificially increase real rates of return through monetary policy will backfire and harm, instead of helping, the saver. In any case, the mandate of the ECB is unambiguous, in the sense that it is the ECB's primary objective to maintain price stability. Everything else is to be deduced from this overriding objective which is enshrined in the European Treaty. If the ECB became convinced that short-term real rates of return on money investments were themselves an objective and, for that sake, tolerated excessively low inflation for too long (or even deflation), this would amount to a very problematic deviation from (and in the worst case clear violation of) its primary objective. Price stability is the benchmark against which all other risks and potentially problematic side effects (as discussed) of policies at the ZLB need to be assessed. To adopt a certain wait-and-see attitude, hoping for a benign turnaround of the inflation outlook, may be appropriate for a short period of time (and covered by the medium-term qualification of the ECB's mandate), but certainly not forever. At some point the ECB has to act forcefully to defend its objective. Given the mandate that has been entrusted to the ECB, it is not an option to systematically deviate from the primary objective. The ECB does not have the democratic legitimacy to change, by itself, the mandate it has been assigned in accordance with the EU Treaty. The ordering of the ECB's objectives has to remain lexicographic, with financial stability concerns secondary to monetary policy objectives (Smets, 2014). Financial stability concerns must be addressed primarily through financial regulation, including macro-prudential policies.

Policies in unambiguous support of the primary objective are even more important under the special constraints of a monetary union. The delivery of area-wide inflation outcomes over the medium term in the range of below, but close to, 2% is of overriding importance to the stability of the euro area. Such outcomes are the single most important implicit coordination device the ECB can offer to all other actors populating the euro area in their various domains and jurisdictions. If the ECB gave up on this the euro area would lose its nominal anchor, with devastating consequences not only for monetary policy itself (because of reputational damage), but well beyond monetary policy (because other actors would be without a benchmark for coordinating their policies). It is well known that deflationary spirals, driven by a slowly emerging unanchoring of inflation expectations and a sequence of events where actual inflation outcomes are repeatedly lower than expected inflation outcomes, can become very costly. This is why not acting decisively to preserve price stability is, in the end, also against the interests of savers. Savers' well-being is decided over the typical horizon of the life-cycle – i.e. on average over a horizon of around 20 years.

The only situation in which a central bank should refrain from adopting low interest rate policies despite excessively low inflation rates and despite being close to the zero lower bound, is if low interest rate policies have been proven to be ineffective or even counterproductive with regard to the objective of restoring an inflation rate that is closer to the desired, higher level. The paper therefore also reviewed a number of arguments that critics have put forward to substantiate such a claim.

- The argument that low interest rates are counterproductive because they force savers to save more is mistaken because it confuses nominal and real interest rates, and the fact that real interest rates over the horizon relevant to the saver cannot be manipulated upwards by monetary policy.

- Arguments that the current low interest rate environment undermine economic dynamics, growth rates and therefore eventually real rates of return on capital investment, leading to a vicious circle (in terms of the natural interest rate moving lower and lower) are not sufficiently convincing, either theoretically or empirically. It can more easily be argued that (i) a high interest rate, high inflation environment, and (ii) a long-term deflationary environment, both undermine, even more, economic efficiency and therefore eventually growth and real rates of return on capital. Returning forcefully to an inflation rate close to what is regarded as optimal seems to be by far the best contribution of monetary policy to the efficiency of credit allocation and to the prevention of asset price distortions. Bubbles tend to be triggered when the real prospects of an asset class are assessed too positively, and when nominal interest rates are too low in comparison with their non-accelerating level. Both conditions do not currently seem to be applicable to the euro area. In 2014 it could be argued at least as convincingly that the dangers of a negative bubble predominated, as economic pessimism is widespread in the euro area, and nominal interest rates have reached the zero lower bound.

- Low interest rates (necessary from a monetary policy perspective) should also not be viewed as a reason for the lack of reform dynamics of governments. The pressure to reform remains high and obvious, even with low nominal interest rates. The challenging debt dynamics of some euro area states in recent years confirm this. Neither investors, nor governments should overlook this challenge, and a solution to it obviously will not come from low interest rate policies of central banks, but only from structural reforms that set in motion investments again, and a real growth dynamics.

- It may well be that very low nominal interest rate policies create drawbacks for the business models of some retail-oriented banks (relative to other forms of financial intermediation), weakening their profitability and thereby possibly causing temporarily deleveraging tendencies. However, (i) empirical evidence and theoretical considerations produce a mixed picture, and most of the academic literature actually assumes that lowering interest rates increases bank profitability, (ii) even if it were true that in a retail-bank-based financial system, the transmission of policies that lower interest rates is weakened by this effect, this does not imply that interest rates become an ineffective monetary policy tool, and (iii) the ECB cannot, just for the sake of not affecting competition

between different elements of the financial system, deviate from its primary mandate enshrined in the EU Treaty.

In relation to the last point, it should also be noted that what the retail-oriented banks lose (the profit stream from the spread between short-term market rates and retail deposit rates) must actually benefit the retail depositor in the form of lower opportunity costs of holding bank deposits, relative to capital market investments. Therefore, households that have a strong preference for holding deposits are not among those that may temporarily lose from low interest rate policies. More generally, fixed income savers would appear to benefit from a low inflation environment because of the taxation of interest rate income (as the state typically taxes nominal rates, and not real rates, implying that the inflation component of nominal interest rates is also taxed. For example, if a household has an income tax rate of 50%, then with inflation at 3%, real rates at 2% and nominal rates at 5%, the real net interest rate after taxes is negative. If, instead, inflation rates are 1% and nominal interest rates are 3%, the real net interest rate is positive).

The paper also reviewed the various explanations for the steady decline in the real rate of interest in the last three decades: structural factors like the slow-down in technological innovation and population growth, labour market sclerosis and barriers to competition, fiscal factors like austerity measures that increase loanable funds or the regulation of financial institutions and the resulting increase in the demand for safe assets, and the current age pyramid that forces baby boomers into high rates of saving. The future increase of real interest rates will also depend on changes to these underlying drivers.

The case study of Germany showed that in the absence of any policy changes, potential output and thus the real rate of interest are bound to remain low or even decrease. However, returning to a higher potential output growth is possible. This depends on the willingness of policy makers to adapt an orchestrated mix of targeted polices. These policies should be aimed at increasing the participation rate in the workforce, delivering incentives for business to invest, and providing a sound environment for technological process.

Monetary policy, unfortunately, has no power to artificially boost real growth rates and real interest rates over the horizon most relevant to savers (20 years). Monetary policy has to address its own challenges – those of maintaining price stability. This is the main contribution it can make to growth, i.e. preventing either inflation or deflation from becoming a factor distorting the smooth functioning of the financial system and the real economy. Only in this sense can monetary policy make one specific, necessary but certainly not sufficient, contribution to restoring real growth and higher real rates of return.

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