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Exploring preconditions for a stationary economy: The role of the golden rule and the central bank dilemma

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Abstract

We explore the stability conditions of an eventual zero growth economy, irrespective of the desire from sustainability viewpoints or the likeliness and explanations for this to eventuate. If advanced economies will in fact soon be characterized by the absence of growth, then the question whether they will remain stable, and if not, how they can be adapted to zero growth conditions becomes vital. We briefly review the Golden Rule theorem, in its original form postulating an optimal growth path at an interest rate level equal to the growth rate. We address the question if a low growth or stationary economy can be stable at an interest rate above the growth rate, as proposed by the a modified Golden Rule argument. The normative theorem is then supplemented by the positive concept of the interest-rate-growth-differential which was developed in the context of state debt dynamics. We outline a monetary Keynesian framework of credit, portfolio decision, and a hierarchy of asset over commodity markets with liquidity preference and term structure, which can explain the persistence of a positive differential and leads to our deduction of a central bank dilemma of either provoking stagnation or boom-bust cycles. We find support in the recent literature and experience of discount rate policy at the nominal zero bound. Unlike recent discussions calculating the risk of a deflationary spiral, however, we propose a central bank dilemma of the long run for low growth economies. This dilemma is highly certain to be encountered, and unless surmounted, makes a stable stationary equilibrium impossible.

Keywords: stationary economy, golden rule of capital accumulation, interest-rate-growth-differential, liquidity preference, zero bound on nominal interest rates, central bank dilemma

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1 Introduction

A stationary economy has been normatively claimed occasionally, but low growth rates have also been derived as the most likely trajectory of advanced economies. Although highly speculative, scenarios indicate a low and decreasing growth rate in industrialized countries (Duval & de la Maisonneuve, 2010). Even more fundamental are the considerations by Gordon (2012), suggesting that the rapid growth experienced during the past 250 years may be a unique episode that might likely end. Whether or not a prolonged growth period is over, what the reasons for declining growth rates could be, or if low growth is desirable from sustainability perspectives, is not the core focus of this paper, although the presented framework could certainly yield answers to explaining declining growth. Our contribution aims at exploring the stability of an eventual zero growth economy, and the likely necessary preconditions for such an economy to become stationary.

The question whether our economies and the underlying economic institutions can be stable in a stationary state has received increasing attention recently. Although simulations reveal that economies can be stable without growth (Victor & Rosenbluth, 2007), it is not clear which adaptations enable such transitions, and many questions, especially concerning the role of credit, remain unanswered (Victor, 2010). Already two decades earlier, Binswanger postulated a growth imperative embedded in our economic structure (Binswanger, Faber, & Manstetten, 1990; Binswanger, 1985). The growth imperative is derived from credit creation pre-financing investments, and, as production takes time, the later necessity to serve not only principal payments, but also interest in the form of a risk premium. Paying the interest requires further credit creation elsewhere and leads to spiraling growth, or, if not met by a certain threshold level of growth, to spiraling decline (Binswanger, 2006; Binswanger, 2009). Almost 15 years ago, a workshop at the German Institute for Economic Research (DIW) asked for the requirements of an economy without growth, and concluded that such a system might exhibit highly unstable characteristics (Blazejczak, 1998).

The relevance of these approaches might be supported by the so-called ‘Plan B’ argument. If advanced economies will in fact soon be characterized by the absence of growth, then the question whether they will remain stable, and if not, how they can be adapted to zero growth conditions becomes vital. We take a similar approach, albeit from a different perspective that is recurring throughout the literature on economic growth theory.

We briefly review optimal growth theory and the Golden Rule theorem (Allais, 1947, 1962; Huth, 2001; Phelps, 1961; von Weizsäcker, 1962), in its original form postulating an optimal growth path at an interest rate level equal to the growth rate, thus yielding first indications that a stationary economy might require a zero interest rate level (Bombach, 1966). We address the question if a low growth or stationary economy can be stable at an interest rate above the growth rate, as proposed by a modified Golden Rule argument. The normative theorem is then supplemented by the positive concept of the interest-rate-growth-differential which was developed in the context of state debt dynamics (Domar, 1944). The concept offers an empirically amenable approach, and we provide some observations on the historical development of the differential.

We then derive the postulate of a central bank dilemma for a positive interest rate when converging to a stationary state. We first outline a Keynesian framework of credit, including the reversed causality of investments preceding savings, the income-dependent propensity to consume, the subordinate portfolio decision of how to allocate savings, and the paradox of thrift. More crucially, however, we draw on the Monetary Keynesian hierarchy of asset markets above commodity markets, with liquidity preference determining the term structure of interest rates. Leading to equilibrium of underemployment and underutilized capacities, this setting leaves the central bank with the dilemma of either provoking stagnation or boom-bust cycles. We find support in the recent literature and experience of discount rate policy at the nominal zero bound. We analyze some implications of both quantitative and discount instruments at the zero bound. Unlike recent discussions calculating the risk of a deflationary spiral, however, we propose a central bank dilemma of the long run for low growth economies. This dilemma is highly certain to be encountered, and unless surmounted, makes a stable stationary equilibrium impossible.

The remainder of the paper is structured as follows: Chapter 2 reviews the Golden Rule and the interest-rate-growth-differential, draws implications for a stationary economy, and presents some empirical findings on the differential. Chapter 3 outlines the Keynesian framework, introduces the zero bound problem, and derives a central bank dilemma of the long run which is illustrated with the state of Japan's as well as the U.S.'s economy. Chapter 4 derives some conclusions and implications for further research.

2 Implications of the Golden Rule for a stationary economy

If we take as given from the outset the fundamental macroeconomic identity of investments and savings, then we can derive one important feature of a stationary economy. As a stationary economy is characterized by zero growth, no net investments can occur, although the given capital stock is of course maintained through gross investments and can change its composition. Zero net investments imply zero net savings (Priewe, 1998), and hence require complete consumption of national income, seemingly a strong precondition for a stationary economy. Yet, zero net savings can be composed of positive savings by some part of the economy, and negative savings or dissaving by another part, so the precondition may not be too demanding after all. The question now arises, whether this precondition also requires zero levels of the interest rate. We approach this question by reviewing the Golden Rule and the empirically observable interest-rate-growth-differential. We then present some empirical data, and, after having outlined the central bank dilemma in chapter 3, we focus on the differential and the central bank policy in Japan and the US.

2.1 The Golden Rule of Capital Accumulation

The Golden Rule of Capital Accumulation derives an optimal allocation theorem for consumption and investment, which allows for a maximization of consumption over an infinite time horizon. Assuming that

investment enables further consumption in the future, a trade-off exists at any point in time between both[1]. As long as investment augments consumption in the future, at least a part of national income should be allocated to investing, if consumption is to be maximized. The question is then, how large the share of income allocated to investment should be. The theorem abstracts from any starting point with a given capital stock and productivity, and also abstracts from any end point in time, until which income can be consumed. This theorem has been derived by a number of known economists (Allais, 1947, 1962; Phelps, 1961; von Weizsäcker, 1962).

Total production, or national income *Y*, is the aggregate of consumption *C* and investment *I*, and $C = Y - I$. Investment increases the capital stock *K*, which allows for further consumption. But which capital stock *K* is necessary to maximize consumption? We need to find the optimum for

$$\partial C / \partial K = \partial Y / \partial K - \partial I / \partial K = 0 \quad (1)$$

National income can be derived from the profit of the capital stock and consumption:

$$Y = rK + C \quad (2)$$

The profit of production Y is thus equal to the marginal productivity of capital, which is the real interest rate:

$$\partial Y / \partial K = r \quad (3)$$

Investment I increases the capital stock K with the growth rate g:

$$I = gK \quad (4)$$

The derivative yields

$$\partial I / \partial K = g \quad (5)$$

Substituting (1) with the partial differential equations (3) and (5) yields thus the Golden Rule:

$$r = g \quad (6)$$

Thus consumption is maximized if all interest income is invested, and all labor income is consumed, although certainly some of the labor income may be saved and some of the interest income may be consumed. Important is the average savings and investment rate. Phelps (1965: 793) calls the theorem the 'golden age' and summarizes it as follows:

> "If there exists a golden-age path on which the social net rate of return to investment equals the rate of growth […] or, in market terms, a golden-age path on which the competitive interest rate equals the growth rate and hence gross investment equals the cross competitive earnings of capital – then this golden age produces a path of consumption which is uniformly higher than the consumption path associated with any other golden age."

[1] Despite the inappropriateness of the metaphor in order to explain a modern market economy, for the sake of illustration imagine Robin Crusoe on his island. He can decide between allocating some of his time investing in fish nets, and dedicating the rest of the time to catching fish. How can he maximize his consumption? Reducing investments in nets will leave more time for catching fish, but productive capacity will decline. Assume he allocates four hours to crafting nets, and four hours to catching fish, yielding him 20 fish per day. If he decides to extend the time for fishing by one hour for one day, he might catch 24 fish on this day, but due to reduced investments, he will catch only 19 fish on all following days, certainly reducing maximal consumption on a sufficiently long time horizon (van Suntum 2005). Using the 'Golden Rule of Capital Accumulation', he can thus find an optimal path for crafting and catching, or investment and consumption.

Phelps pointed out that the GR exists in both neoclassical and Harrod-Domar growth models, but was only valid for considering infinitely long time horizons. He generalized the GR to technical progress that is purely labor-augmenting and technical progress that is capital-augmenting, but was criticized for not considering uncertainties (Phelps, 1965). A major objection against the theorem, however, was the assumption, or 'philosophy' (Samuelson, 1965) of maximizing consumption for all generations, all of time, indefinitely, including no time preference and no myopia, which may not be the goal or characteristic of the present society. Phelps noted that "the rate of time preference may make the path different from the GR path" (Phelps, 1965). Three decades earlier, Ramsey (1928) proposed a theory of optimal savings, deriving optimal investments from the relation of utility to marginal utility of consumption. The utility approach then allowed to fix for 'imperfectly altruistic' present generations, with a major finding being the inter-temporal game-theoretic problem of generations playing against each other for who consumes more, ending in a Pareto-inefficient equilibrium (Phelps & Pollak, 1968). Due to time preference, as was argued, the interest rate had to be above the growth rate.

Unlike some of the research on optimal growth where steady state growth rates are assumed to persist, Allais (1962) explicitly highlighted the implications for a stationary state, deriving a stationary optimum at a zero rate of interest, and he found support in the work of Wicksell and Meade for this conclusion. Schumpeter (1939: 248) also took this conclusion for a stationary state. He tried to explain interest through a sequence of temporary quasi-rents through entrepreneurial activity (Spahn 1986: 106), but the theory exihibts similar weaknesses as other explanations of profit derived from technology and exchange (Riese 1983: 139).

A positive time preference might just delay the process of reaching a stationary state due to higher consumption rates, when we assume that the discount rate eventually decreases, but the implications for the stationary state would have to be the same. Apparently, although positive time preference may exist and eventually be empirically observed (Olson & Bailey, 1981), savings are inelastic to interest rate changes, as has been empirically confirmed (Corbo & Schmidt-Hebbel, 1991; Deaton, 1992; Edwards, 1996; Giovannini, 1983, 1985; Masson, Bayoumi, & Samiei, 1995). Savings only indirectly co-determine the interest rate through a change in the marginal productivity of additional investment. Hence the neoclassical discount rate hypothesis to explain interest put forward by Böhm-Bawerk is rejected. If we subscribe to the time preference hypothesis, we cannot find too low consumption in the present generation. Or is the present generation too altruistic, saving for future generations, or even overvaluing the future (Samuelson, 1958)? The alternative proposition that income determines the propensity to consume will be outlined in the subsequent chapter. An eventual time preference has to be weighed against the safety for an uncertain future, but also saving for the pension period (von Weizsäcker, 2011), and is certainly constrained by income. Central, however, is the distinction of deciding for or against consumption, and the determinants of the interest rate and the portfolio decision, outlined in chapter 3.

But a stationary state of zero growth also implies no net investments, and thus no net positive saving rate. All income is fully consumed, and full consumption allows for a stable equilibrium in the stationary state. So there seems to be no reason why the interest rate should be zero in the stationary state (van Suntum, 2005).

As Quesney in the tableau économique has shown, when interest is consumed by capitalists, a stationary economy goes along with full employment, since interest is nothing else than redistribution from labor to capital. Yet, if the interest rate is positive, optimal growth theory would indicate further savings and investments for additional growth. But saving does not automatically imply the realization of investment. Where do investment opportunities emerge, where does growth come from, if the marginal productivity of capital has reached zero? Optimal growth theory can explain why an interest rate below the growth rate leads to sub-optimal, dynamically inefficient outcomes (Phelps, 1965). "If we work in a neoclassical model of the steady state the Golden Rule tells us that any rate of interest below the steady state rate of growth generates "dynamical inefficiency"" (von Weizsäcker, 2011: 14). But the arguments for an interest rate above the growth rate due to time preference or 'impatience' seem less convincing. There are, however, arguments derived from monopoly rents of irreproducible factors such as land (Allais, 1947; Homburg, 1991), and liquidity preference and term structure considerations that could support the explanation of a persisting positive interest rate. The latter will be explained in the subsequent chapter in the context of liquidity preference and the central bank dilemma.

The normative significance and value of optimal growth theory has been questioned, not least due to the aforementioned critics and weaknesses of the approach. The critic of optimal control theory through the development of rational expectations theory then put a major hurdle to this research program, as agents developing rational expectations can adapt their strategies to an optimal plan (Kydland & Prescott, 1977). The limitedness of the approach was also demonstrated through apparently contradictory empirical observations. From the perspective of empirically amenable and tractable theory, optimal growth models expose several weaknesses. Unlike the GR theorem, however, the causes and implications of a differential between growth rate and interest rate can not only be derived theoretically, but, at least to some extent, can also be tested empirically. We have to be aware though that we cannot settle empirically whether a differential at a certain point in time is dynamically inefficient, because the GR takes into account an infinite time horizon, and our forecasting abilities may be limited (Homburg, 1991).

2.2 The interest-rate-growth-differential

The advantage of focusing on the interest-rate-growth-differential (IRGD) derives from the fact that theoretical explanations for deviations from the GR path can be scrutinized. The IRGD has received particular attention in the context of public finance to analyze the dynamics of state debts. Originally proposed by Domar (1944), the concept has since then been applied sparsely (Schulmeister, 1995). It became used only more recently after the financial crisis, especially by the IMF, the World Bank and the ECB, when state debts became a major concern (Coenen, Mohr, & Straub, 2008; Escolano, 2010; Ley, 2010). Several empirical analyses identifying determinants of the IRGD in both industrialized and developing countries have followed (Turner & Spinelli, 2011; Woo, Shabunina, & Escolano, 2011).

In the context of public finance, a simple arithmetic holds: If the IRGD is positive, state debts are more costly than what can be taxed relatively from a growing economy. With a given tax rate, tax income grows

slower than the debt expenses. If the primary balance were zero, and debt service were financed by issuing new debts, the debt-to-GDP ratio would grow at the rate of the IRGD. A positive IRGD requires thus a budget surplus that is relative to the size of the state debt in order to stabilize the debt-to-GDP ratio. Positive IRGDs are observed in most industrialized countries. Negative IRGDs, however, make a balanced budget easier to achieve, and can be observed in most developing economies.

The following formula describes the arithmetic, where the change of government debt-to-GDP ratio *d* for the period *t* is derived from the primary deficit *p* and net interest payments from the period *t-1* derived from the differential of the effective interest rate *i* and the growth rate *g*:

$$\Delta d_t = -p_t + (i_t - g_t)\, d_{t-1} \qquad (7)$$

An often implicit assumption is that the IRGD is negative in developing countries due to the high growth rate (Woo et al., 2011). However, growth can only explain a fraction of the IRGD. Woo et al (2011) start from the theoretical proposition of the modified GR based on impatience quoting Blanchard and Fischer (1989), which is thought to explain a positive IRGD, and then conducted an econometric analysis for 128 advanced and non-advanced countries to derive the causes for a strongly negative IRGD in non-advanced economies, with real interest rate as the endogenous variable. The hypothesized causes were debt-to-GDP, real GDP growth, development of private savings, population aging, and measures of financial repression, including commercial bank lending in relation to central bank claims, private credit in relation to GDP, and inflation. In addition, a financial liberalization index and a capital account openness index were tested. All indicators of financial repression were found to be positively correlated and significant. The commercial bank asset ratio and the private credit ratio were found to have large positive magnitudes. Thus, the higher the share of commercial bank assets and private credits, the more likely will the IRGD become positive. The implications for public finance are severe and can become existential: Global financial integration could potentially raise the IRGD faster to positive levels than GDP could catch up with industrialized economies.

Turner and Spinelli (2011) analyze the determinants of the IRGD and possible future trajectories in the OECD countries, where the IRGD has fallen from around 2.5% in the 80s and 90s to almost zero during the pre-crisis period (see Figure 1). The fall is explained partly by reduced inflation volatility due to more credible inflation targeting and related expectations, with some evidence that the largest effect occurred through increasing independence of central banks. An additional effect is due to the introduction of the European Monetary Union. In the 2000s, deflation risks led to a low policy rate which further decreased the IRGD. The authors conclude that due to increased government indebtedness and the related higher fiscal sovereign risk premia, the IRGD is likely to increase again in the future.

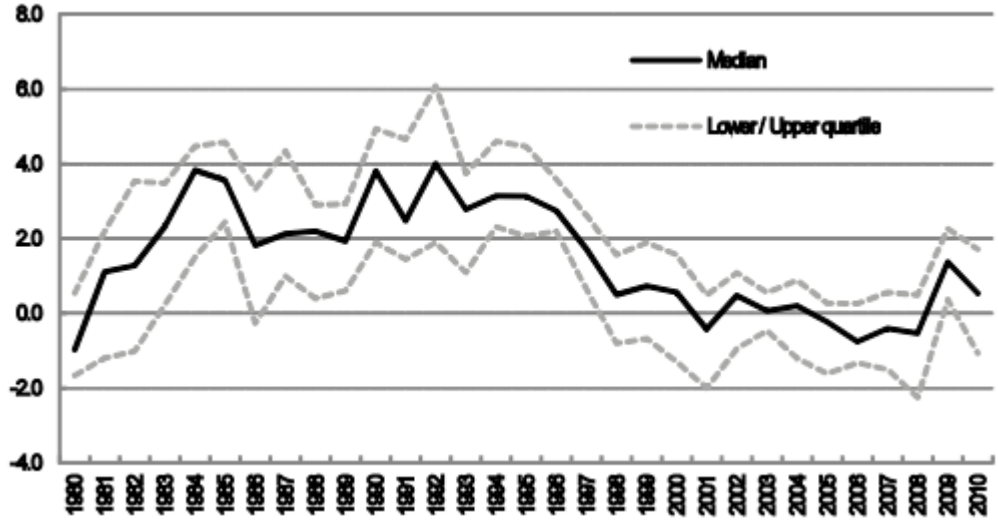

Figure 1: The IRGD for 23 OECD countries

Source: Turner and Spinelli (2011: 9)

Surprisingly or not, the theoretical case for a positive IRGD, the impatience of economic agents, does not enter the empirical equations. Financial liberalization in non-advanced countries and increasing state debts in advanced countries are the main explanatory variables for a positive IRGD[2].

The lesson some Keynesians draw is to allow further public debts and to wait for future growth rates exceeding the interest rate (Helmedag, 2004). Conservative thinkers state that public expenditure has to be reduced in order to lower the debt-to-GDP ratio to a level where interest payments equal additional tax revenues from growth (Feld, 2010). But, as Keynesians would disagree, reducing debts involves a negative impact on effective demand. Even conservatives have to admit the unlikeliness of reaching a zero public debt necessary for a stationary economy with a positive interest rate. Hence, the question what to be done in a stationary setting in the long run is rarely answered.

2.3 The IRGD: Some empirical trends

This section provides observations on the actual patterns of the IRGD since the 1960s, preparing for a special focus on Japan and the US in the empirical part of chapter 3, where the long term trend becomes most visible. We draw on data provided by the macro-economic database of the European Commission's DG ECFIN (AMECO).

We analyze nominal growth and nominal interest rates as these, together with the inflation rate, are determinants of the monetary policy. Inflation rates can be arbitrary, but real growth and interest rates can be derived from the GDP deflator that we provide in addition to the nominal values.

[2] A positive IRGD is sometimes used to argue for private pension instead of pay-as-you-go systems. But this increases the explicit debt, requiring an additional risk premium, thus further increasing the IRGD. If the IRGD remains positive within a zero growth environment, and economic agents do not become impatient so as to consume all income and to reduce the net savings rate to zero, then economies without growth are unlikely to remain stable.

We use the nominal actual GDP growth instead of nominal potential GDP growth, unlike Turner and Spinelli (2011), as we abstract from volatility through a data smoothing method to identify trend growth dynamics. We use the long-term interest rate derived from outstanding public sector bonds of more than 3 years and a central government benchmark bond of 10 year maturity for Germany, federal government bonds of 10 and over 10 years for the US, and benchmark bonds of more than 3 years for Japan (see the explanations for the variable ILN in the AMECO database for further details). This interest rate is not the effective interest rate for government debt that is composed of different maturities. We thus abstract from temporary fluctuations. We also do not consider the interest income of government assets, similar to Turner and Spinelli (2011), as we are not interested in the state debt dynamics per se, but rather the existence and further development of the IRGD. To derive the inflation rate, we use the price deflator (GDP deflator for constant prices).

The following figure provides the exemplary nominal actual growth rate of the EU15 for the last five decades. A declining trend in the growth rates becomes clearly visible.

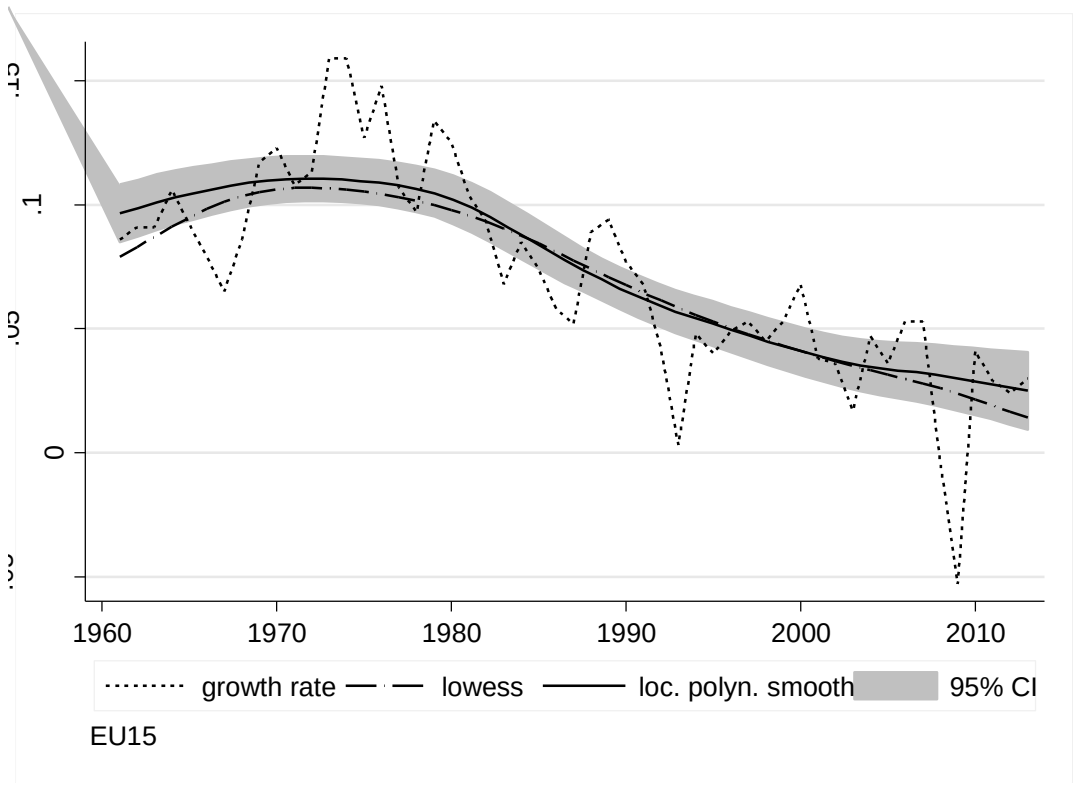

Figure 2: the nominal growth rate of the EU15 in the long run

In addition to the actual growth rate, we provide a local polynomial smooth line and the lowess smooth, which is a least-squares locally weighted regression (Cleveland & Devlin, 1988), to abstract from business cycles. Lowess smooth provides the better fit, so we proceed with this as an explorative method to illustrate the IRGD.

The following graph (Figure 3) depicts the smoothed trend of the growth rate, the long-term interest rate, and the inflation rate for Germany.

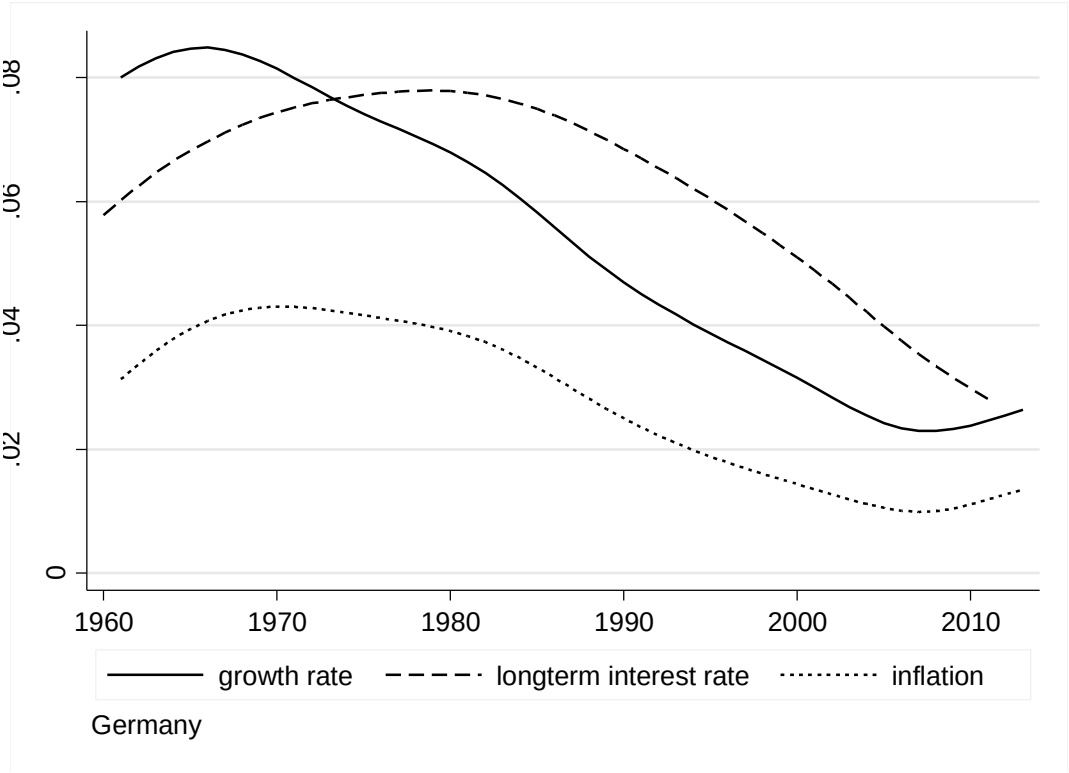

Figure 3: The IRGD trend for Germany

A shift from a negative to a positive IRGD in the mid 70s becomes visible, with a positive differential of 1 to 2% building up thereafter. As will be shown in section 3.4, Japan and the U.S. exhibit some similarities concerning the turn of the IRGD from negative to positive, but also some differences in the more recent trend.

3 Towards a central bank dilemma of the long run

We introduce the discourse on dealing with the lower zero bound on nominal interest rates central banks are facing today. So far, the discourse is decoupled from the analysis of the relationship between growth and interest rates. However, we attempt to use the insights from the literature on the zero bound in order to ask for the preconditions of a stationary economy. While dealing with the zero bound in the literature is mostly considered a temporary or short-term problem, we integrate the zero bound problem into a theory of a systematic dilemma of central bank policy in the long run, where growth rates decline towards a stationary economy. We finish the chapter with an illustration of the theoretical central bank dilemma by analysing Japan's as well as U.S.'s central bank policy under the proposed perspective. In order to understand the zero bound problem as well as the central bank dilemma, we try to clarify our underlying paradigm in the first section.

3.1 A Keynesian diagnosis of low growth and stagnating economies

In this section, we briefly outline our basic understanding of the economic state low growth economies are facing. The considerations to be made serve as a foundation for the postulate of a central bank policy dilemma carried out in the following section.

Most interpreters of Keynes share the attitude, that "Keynes's intellectual revolution was to shift economists from thinking normally in terms of a model of reality in which a dog called *savings* wagged his tail labelled *investment* to thinking in terms of a model in which a dog called *investment* wagged his tail labelled *savings*." (Meade, 1975: 82). While the *reversed causality* is an important cornerstone in understanding macroeconomics, it is by far not the whole essence of the Keynesian revolution. We draw on a Keynesian paradigm, which "must at its heart be understood as a theory of the price of production in which a monetary-determined interest rate steers production, and capital represents a form of the function of liquidity" (Riese, 2004a: 50).

The second cornerstone therefore is a shift from the analysis of exchange on commodity markets to dispositions on asset markets that are located hierarchically above commodity markets. Credit is a necessary precondition for commodity markets to function. The primacy of asset markets results from the concept of liquidity preference explaining the term structure of interest rates, because any form of holding wealth is a form of giving up liquidity. In textbook Keynesianism, the theory of liquidity preference suggests that a higher interest rate lowers the quantity of real balances demanded and a lower interest rate would raise hoards (e.g. Mankiw, 2009). According to our understanding, liquidity preference does not necessarily involve any hoards; rather it can explain why long-term interest rates do not drop to zero.

A third cornerstone is the "analytical distinction between choices affecting the disposition of income and choices affecting the disposition of wealth" (Tobin, 1965: 671)[3]. Contrary to neoclassical economics, the propensity to consume is not a function of the interest rate (see the discussion in section 2.1), but of income. Further, the propensity to consume comes prior to and is independent from liquidity preference. The latter "is a portfolio decision" (Rochon, 1999: 292).

Together, liquidity preference and the declining propensity to consume with rising income enable us to explain the character of developed economies for which Keynes (1936) invented the term underemployment equilibrium. In mainstream economics, adjustment of the interest rate equilibrates savings and investments; whereas unemployment can only be explained by rigidities, frictions, wrong expectations, dysfunctional state intervention and so on. In the Keynesian paradigm, not the interest rate but the income level equilibrates savings and investments. Income determines the ex-ante willingness to save, and the interest rate determines investments, through which the actual ex post savings are realized. If too much income is saved, the level of investments declines in order to meet the lower demand. By this, the level of income is reduced, and at the

[3] "Fisher and Keynes, among others, have drawn the useful and fruitful analytical distinction between choices affecting the disposition of income and choices affecting the disposition of wealth. The first set of choices determines how much is saved rather than consumed and how much wealth is accumulated. The second set determines in what forms savers hold their savings, old as well as new. Considerable economic discussion and controversy have concerned the respective roles of these two kinds of behavior, and their interactions, in determining the rate of interest" (Tobin 1965: 671).

same time savings adjust to lower investments, as savings are always a proportion of the income level – this is the equilibrating mechanism. According to Keynes (1936: 352ff), rising prosperity by expenditure rather than saving already was discussed by Barbon (1690) and Mandeville (1732), later as the fallacy of saving (Robertson, 1892) or the paradox of saving (von Hayek, 1931), today known as Keynes' paradox of thrift.

Liquidity preference establishes a rate of interest which "may fluctuate for decades about a level which is chronically too high for full employment" (Keynes, 1936: 204). Unemployment is involuntary and a result of a macroeconomic constellation characterized by insufficient effective demand due to the declining marginal propensity to consume (Barens, 1987; Mikosch, 1989). The underemployment equilibrium is enforced by a positive interest rate, which is first setting a barrier for the profitability of investments, and second, retroacts on effective demand as labor income remains low in favor of capital income.

Unlike "fundamentalist Keynesianism" rejecting the concept of equilibrium at all (see the discussion of Coddington, 1976; Riese, 1986: 56ff), we present a moderate approach not dismissing the market and equilibrium principle itself, to focus on the long run, although we are aware that out-of equilibrium processes can endure for long periods. We rather argue that, given liquidity preference and the marginal propensity to consume, a developed economy steers into a problematic situation reflected by a positive IRGD. The diagnosis is, that the constellation of liquidity preference and marginal propensity to consume results in a decline of growth, or better: stagnation. The stagnating tendency we term *growth brake*. At the same time, the economy demands growth in order to prevent stagnation. This has been called *growth imperative* (Binswanger, 2012; Binswanger, 2009). This conflicting situation is reflected by the central bank dilemma that we introduce in the following.

3.2 The zero bound problem

An interest rate in units of a commodity could never fall below zero, if the commodity could be stored without costs (Fisher, 1930). Building on Sraffa's (1932) considerations, Keynes (1936) in chapter 17 proposes three components of a commodities interest rate in terms of itself: yield, carry costs and the non-pecuniary liquidity premium. Under this consideration the interest rate on money could not go beyond zero if its carrying costs are negligible and the money value is stable. Hence, price stability conflicts with effective interest policy if an economy requires negative interest rates (Goodfriend, 2000). At the latest since Japan's ongoing fight against deflation it became of practical concern that monetary policy is designed asymmetrically. Overheating and inflation can be easily fought against by raising the discount rate (the target for the interbank rate) – in order to fight recessions or threatening deflations, cutting down the interest discount rate is interrupted by the lower zero bound on nominal interest rates and conventional monetary policy is at its end (Bofinger & Flassbeck, 2002; Buiter, 2009). The problem once an economy is run into a deflation is the *cumulative process* character, unable to be healed itself by the market process but only to be stopped by intervention from the "outside" (Spahn, 2007; Wicksell, 1898). The cumulative character is expressed in the well-known term 'deflationary spiral'.

However, intervention options are limited. The most famous intervention is debt-financed fiscal expenditure known as traditional Keynesianism. However, as has been shown in the discussion of the IRGD, most developed economies reached or exceeded their bearable public debt burden. Since the central bank is at the end of interest policy, unconvential quantitative instruments such as open market operations in long bonds also known as quantitative easing; credit easing or enhanced credit support were developed. For example, van Suntum et al. (2011) propose long term central bank loans with low but non-negative base rates in order to mitigate the zero interest bound. The success of so far implemented quantitative open-market operations in the fight against the current crisis is rather limited. At least it is questionable if central banks are undermining their effectiveness by long-term engagements (Lüken-Klaßen, 1995b) and if the market is disturbed or even in danger of being transformed into a planned economy (Riese, 2004b).[4]

In a non-quantity theoretic approach of money, the explanation for the more or less ineffectiveness of most easing operations can be explained by the liquidity trap based on Hick`s interpretation and formalization of Keynes (1936) in the famous IS-LM model known from textbook economics (e.g. Mankiw, 2009). While the concept has been downplayed as a rather irrelevant academic fingerplay (e.g. Romer, 2001), Krugman among others relaunched the concept explaining the Japanese crisis. It was defined as the "awkward condition in which monetary policy loses its grip because the nominal interest rate is essentially zero, in which the quantity of money becomes irrelevant because money and bonds are essentially perfect substitutes" (Krugman, Dominquez, & Rogoff, 1998: 137). Eggertson and Woodford (2003: 141) define the liquidity trap "when interest rates have fallen to a level below which they cannot be driven by further monetary expansion." The citations support the argument that the monetary authority does not manage to trigger an economic stimulus or that interest rate policy is no longer available for stabilizing the economy.

The message of the literature on the zero bound is that we have a problem if a central bank would need to implement negative interest rates, but is constrained by the zero bound (Buiter & Panigirtzoglou, 2003; Wolman, 2005; Yates, 2002 to cite only few more works). We owe now the explanation why central banks reach that point in the context of low growth rates.

3.3 The postulate of a central bank dilemma

The term "central bank dilemma" is occasionally used for various situations. Weimann (2003: 5) found that in an "arrangement with fixed exchange rates, a central bank dilemma evolves since there will be no monetary policy being optimal for both countries at the same time". Begg et al. (2003) identified a dilemma how to develop fixed parities for accession countries to the Euro without triggering a domestic credit crunch in a crisis. According to Jahjah (2001), another objective trade-off between securing price and financial stability can occur during a crisis. The dilemma is exacerbated by highly indebted countries in a monetary

[4] Riese argues that the interpretation of the central bank as a welfare creating institution (teleological concept) controlling commercial banks is the failure of current monetary theory. According to Riese, the central bank should not be conceptualized as a benevolent dictator opposing commercial banks. It should be perceived as a compenent of a banking system together with commercial banks in order to serve the functional conditions of a market economy (Riese 2004a).

union. Hence, Jahjah is linking central bank policy to the management of fiscal institutions in order to minimize the risk of fiscal crises. Bogdan et al. (2011) identify the same trade-off: "In the long term, the two objectives support and reinforce each other, but in the short term, there may occur certain incompatibilities, thus resulting in the central bank's dilemma of abandoning one in favor of the other".

There are some more authors using the term, but referring to country-specific institutional particularities (Biyun, 2005; Bufman & Leiderman, 2000; Daianu & Vranceanu, 2002; Yali, 2011; Yokoi-Arai, 2001). In the context of the Japanese struggle against the latent crisis in the 90s, Nakaso (2001: 18) identified a central bank dilemma of "actually triggering a financial crisis by openly calling for an improved safety net". Since you warn of a crisis coming, markets respond and it is more likely to happen; instead, it might be cleverer continuing with a piecemeal approach and hoping not to trigger the crisis. Reddy (2008) is pointing to a similar communication dilemma.

The dilemmas in the literature rather refer to specific situations; instead we propose a dilemma monetary policy is facing in a more general situation of low growth. Further, we identify a dilemma already in a closed economy without considering exchange rate policy. Last but not least, the literature rather found trade-offs than real dilemmas. In a trade-off two diverging goals can be balanced by a mixed policy. In the dilemma we postulate, the central bank has two opposing options of monetary policy, but there can be hardly an optimal policy.

Having a foundation how the current economic state of developed economies could be understood as well as a notion of the zero bound problem from the previous sections, we now further elaborate the implications of monetary policy by connecting the short term analysis of the zero bound to the long term low growth rate in stagnating economies.

Our understanding of monetary policy is indebted to Wicksell (1898, 1906) as a forerunner of a non-quantity-theoretic analytical framework (Woodford, 2003). Wicksell found an alternative to the quantity theory of money in order to explain price level fluctuations. Not a fluctuating supply of money due to the gold standard but a false interest policy of the central bank causes inflation and deflation. He argued that inflation occurs if the discount rate of the central bank is below the natural capital interest rate and deflation if the disparity is opposite. While it has been well argued that the assumption of a positive natural rate is not convincing for a stationary state; rather the marginal productivity of capital tends towards zero at least in the long run (Keynes, 1936; Proudhon, 1850), we build on the argument of the new monetary consensus that optimal monetary policy is discount rate policy and that the discount rate has to be adjusted to capital market rates in order to prevent inflation or deflation (Bernanke & Blinder, 1992; Bernanke & Gertler, 1995; Woodford, 2003). The new monetary consensus is challenged by Post-Keynesian authors for taking the monetary transmission channel for granted (Gnos & Rochon, 2007; Palley, 2006). The critique is true for interest policy coming near the zero bound like it was argued in the previous section. But we reject that interest policy is ineffective as a principle and stick to Riese's (2004a) argument, that only interest policy serves the functional conditions of a market economy. Supply-rationed credit by commercial banks during a

crisis does not challenge the new monetary consensus, but rather confirms that interest policy becomes impotent in the liquidity trap.[5]

If the natural rate deduced from demand and offer of capital has no reason to remain above zero, only liquidity preference explains the persistence of Wicksell's natural rate. Hence, in developed economies the natural rate is to be replaced by a monetary rate settled by liquidity preference. Many neo-Ricardian and Post-Keynesian scholars such as Cotrell, Wray or Kaldor see difficulties with liquidity preference explaining the interest rate for an endogenous credit money economy, where credit for investments is autonomous from savings (for a discussion se e.g. Lavoie, 1992; Rochon, 1999).[6] These interpreters of Keynes feel threatened by liquidity preference as it transports a notion of the loanable funds-logic, where savings precede investments. The rejection of liquidity preference as the main determinant for the term structure of interest rates results from an incomplete understanding of maturity transformation. Of course it is imaginable, that investments are only refinanced through central bank credits. But then we would have to explain the existence of capital markets and interest bearing accounts. Hence, monetary Keynesianism (Berlin School established by Hajo Riese) as an alternative interpretation and advancement understood very well how the necessity of maturity transformation brings liquidity preference as a concept of supply of money and endogenous credit money together. Lüken-Klaßen (1995b: 177) argues that holding nominal assets instead of money balances would have no relevance if the concept of the supply of money is neglected: „The economic relevance of holding nominal fixed accounts results from the necessity of maturity transformation through the banking system. [translated by the authors]".Maturity transformation lowers the risk of commercial banks illiquidity because the discount rate is short term and a rise may hit the commercial bank. If liabilities are transformed, interest rates of liabilities and claims can be adjusted slowly. We do not go into a deeper discussion of the concept of liquidity preference at this point. It has been shown in the previous section that there seems to be at least an implicit consensus of liquidity preference functioning as impedance for effective interest policy coming near the zero bound. The task now is to use Wicksell's framework introduced above in order to explain how central banks end up facing a liquidity trap and the impotence of interest policy at the lower zero bound. As this state of the central bank policy reflects a positive IRGD and a zero differential would avoid this to happen, positive growth rates are necessary as long as interest rates are positive. As a reminder, in order to explain declining growth rates and stagnation we draw on the ideas developed in section (3.1), which can be summarized as a *growth brake*. The necessity to have sufficient growth rates in order to keep monetary policy effective (*growth imperative*) leads to the postulate of the central bank

[5] When growth falls short of a threshold level, a low policy rate cannot enable the banks to offer a sufficient difference in the interest rates of highly liquid and less liquid assets to enable maturity transformation. This also explains the ineffectiveness of interest rate policy and the phenomenon of supply-rationed credit below the threshold level, known as the liquidity trap.

[6] "Wray notes that 'there is no room for liquidity preference in the determination of interest rates.' […Kaldor] mentioned that 'if we regard money as an endogenous factor, liquidity preference and the assumption of interest-elasticity of the demand for money ceases to be of any importance'. These statements seem to bring comfort to those neo-Ricardians who have always been reluctant to assign any role of importance to liquidity preference in the denial of full employment equilibrium." Lavoie, 1992:191f. Ebenso Cotrell, vgl. Rochon, 1999:291.

dilemma. We conceptualize the dilemma as two basic monetary policy options in a low growth economy with a positive IRGD: *stagnation policy* and *boom-bust-cycle policy*.

The first option is reflected by a continuous sufficient high discount rate following the Wicksellian rule introduced above. In this scenario, the discount rate encourages banks to perform maturity transformation satisfying existing liquidity preference. Asset markets are kept well-functioning, the quantity of money remains scarce due to incentives of maturity transformation, and hence no danger of inflation or liquidity traps exists. However the social costs are considerable in the form high unemployment rates.

In the boom-bust-scenario, a central bank lowers the discount rate stimulating credits for investments or consumption in order to increase growth and employment rates. Here, the Wicksellian rule is violated but this is not necessarily resulting in inflation. The problem with that policy is not that the price level increases due to excessive demand. This would be only the case in a fully employed economy (Riese, 1986; von Weizsäcker, 2011). Low discount rates rather blow bubbles such as dotcom or housing bubbles and at the same time raise the inflation potential, as the degree of liquidity rises due to insufficient incentives for maturity transformation on the part ofhe banks. Any bubble has any point bursting itself or being bursted by the central bank.

What happens under a longer term policy of a low discount rate? As banks can refinance their credits cheaply through central bank money, they will lower both credit and deposit rates. Lowering credit rates maximizes the credit volume and profit. Banks could not reduce credit rates if the discount rate would remain high enough to encourage maturity transformation. In the low discount rate scenario deposits show a higher degree of liquidity because banks offer lower rates which are less attractive to compensate depositor's liquidity preference. There should be a brought consensus that low discount rates can raise the credit volume for investments and consumption and therewith raise employment and growth rates. This refers to the *boom* in the chosen terminology. The *bust* refers to the empirical evidence and theoretical insight that any bubble has a time being challenged by changing expectations. It lies in the nature of a bubble that it can only grow but not stagnate, for it is a sign for crash. And having reached the lower zero bound, the central bank may not even be able to stimulate a boom-bust cycle anymore.

3.4 Empirical interpretation from a central bank dilemma (CBD) perspective

Last but not least, we attempt to illustrate the postulate of the CBD empirically. As we did not construct a complex model to be fed with data to be tested, we rather interpret what is common knowledge under a new perspective of the CBD.

Most standing to reason to use as an illustration seems to be the case of Japan almost every work on the zero bound problem is referring to. In the narrow diagnosis, we do not go beyond what has been found as the Japanese problem – insufficient demand, liquidity trap, deflationary spiral, high public debt, considerable unemployment and many other details - (Krugman et al., 1998; Nakaso, 2001; Werner, 2005; Werner, 2009).

Not neglecting what has contributed to the Japanese crisis and its persistence, we claim that the crisis could not have occurred to that extent, if growth rates had remained sufficiently high. The Bank of Japan responded by lowering the discount rate almost to zero in the hope of stimulating growth.

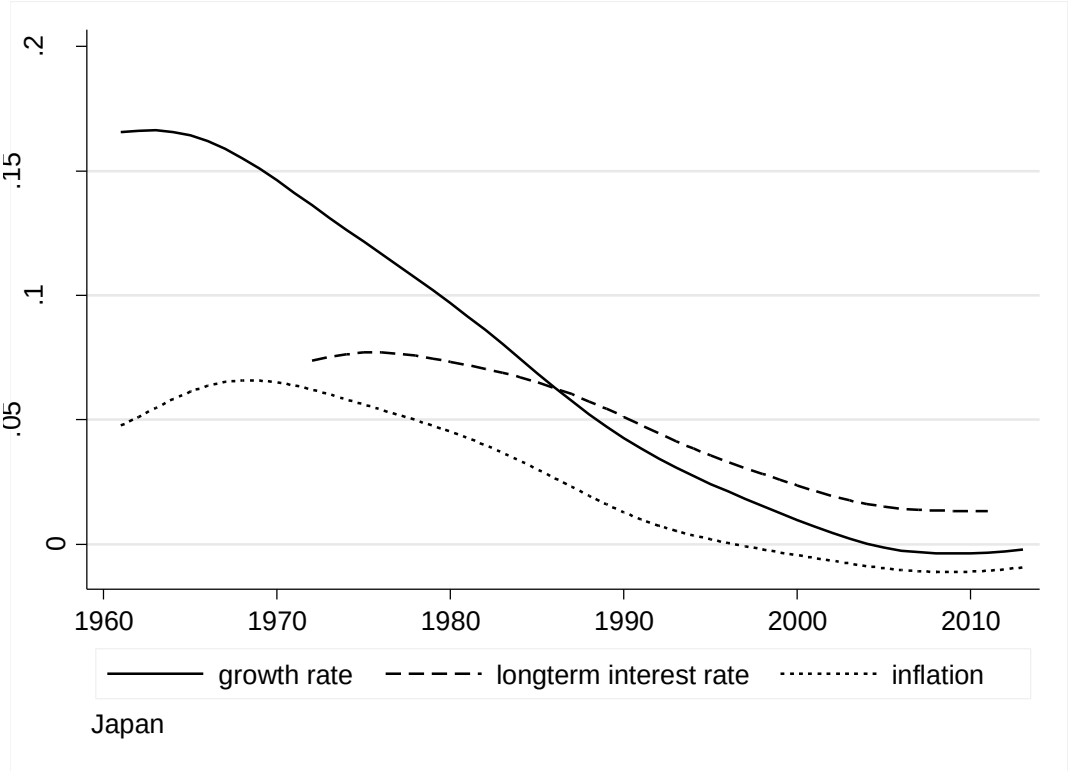

Figure 4: Nominal growth and long-term interest rates for Japan

According to Figure 4, in the late 80s the growth rate fell below the capital market interest rate. The latter as well continued to fall but persisting at a level of around 2%. The persistence of the long-term interest rate can be explained by liquidity preference, whereas the falling growth rate is explained by the insufficient effective demand due to marginal propensity to consume enforced by the income distribution from labor to capital. Hence, it is plausible, that the state of crisis begun with the interest-growth-differential becoming positive. Japans economic state reflects very well, what the GR as well as the CBD predicts.

The liquidity trap helps to explain why the economy didn´t "recover" until today. Only fiscal expenditure helped to stimulate effective demand. Since Japan faced a slight deflation, only fiscal expenditure prevented the deflationary spiral from breaking out. According to the zero bound literature, Japan would need negative nominal interest rates in order to stimulate effective demand with a real negative interest rate. We come back to this point in the conclusion.

In the simplest form, the current crisis with the burst of the U.S. housing bubble as the phenomenal starting point is explained by insufficient regulation and bad banking behavior. Among macroeconomists the hypothesis of the "easy money policy" of the FED allowing the credit volume to rise is very common. We agree with von Weizsäcker (2011: 3) stating: "I am not at all sure that a crisis of similar magnitude could have been avoided, if the Fed would have pursued a more restrictive policy in the early years of the decade."

Critics of the low interest policy have to ask for the counterfactual of what would have happened if these houses were not bought and if the cars wouldn't have been bought with the mortgage loans. With the notion of the Keynesian effective demand we know that not buying houses and cars means not producing them, hence a lower level of income and employment. Therefore, unequal income distribution as an explanation of the crisis (Stockhammer, 2012; van Treeck, 2012) seems to be a fruitful approach if we not only aim at pointing to the phenomena but finding the underlying structure and mechanisms.

In other words, the FED chose the welfare target of high employment and prosperity by allowing the housing bubble to grow. Again, we do not want to neglect the complexity of all what happened before and during that crisis. However, under the perspective developed here, a low open discount window allowed the banks to lend at lower rates. As the FED signaled keeping the discount rate low, banks had an insufficient incentive to transform maturities. The FED could have avoided the bubble to grow by keeping a restrictive monetary policy. But then she would keep the economy in the stagnating scenario. The bubble bursted as the FED raised the discount rate from 1% in summer 2004 to 5.25% in summer 2006. By this operation in order to burst the bubble and to fight threatening inflation, the term structure of interest rates was inverted. If a financial intermediary is well performing maturity transformation, then it can slowly adjust to a higher discount rate. But if it has short-term liabilities and is facing a rate of refinance higher than the rates of their assets, the business model of a financial intermediary is destroyed. Of course most long-term loans are flexibly adjustable to official rates. But if a middle or lower class man calculated with a certain amount of his income in order to serve his credit, then his finance model is destroyed, if his rate doubles.

It is very unlikely for the FED not knowing that raising the discount rate will necessarily crash the housing market. But she might have underestimated the recession following and to find itself at the zero bound where she is today. However, the situation today is consistent with what CBD theory predicts. In her history, the FED very well managed the cycle of booms and busts and to prevent the economy from stagnation.

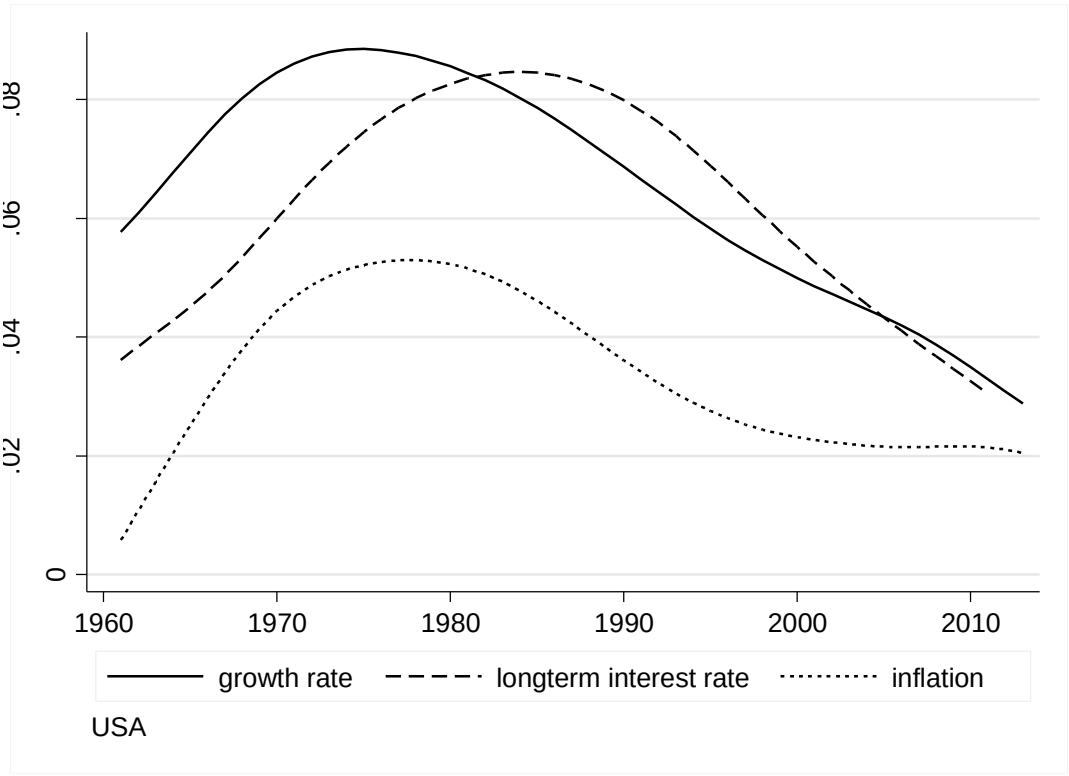

Figure 5: Nominal growth and long-term interest rates for the U.S.

According to Figure 5, the key variables for the U.S. similarly as for Japan decline. The turning point for the IRGD to become positive is a bit earlier in the beginning of the eighties. However, the long-term interest rate does not seem to persist yet as it continues to decline which helped to turn the IRGD slightly negative again in the early 2000s. Compared to the case of Japan, and abstracting from the current financial crisis, the US has still a small safety belt for the growth and interest rate, but both are already approaching the corridor where the risk of reaching the threshold of the liquidity trap and heading towards the zero bound is increasing. The zero bound becomes a matter of time rather than risk.

4 Conclusions and outlook

The Golden Rule theorem provided a basis for a consideration of the long run when economic growth declines. Several theoretical considerations may explain why a positive interest-rate-growth-differential is likely to persist, and can be supported by empirical observations. As long as the differential remains positive, however, the economy can be characterized by stagnating tendencies, with unemployment, increasing state debts, and a rising income spread. The postulate of a central bank dilemma of the long run, derived from monetary Keynesianism and recent publications on the zero bound problem, shows that a non-growing economy is also characterized by distressed monetary policy. We conclude that a stationary economy needs a non-positive nominal interest rate as a precondition.

How would a stationary economy look like? Keynes (1936) defined the demand for investments as the demand for capital income. So would investments continue at a zero or negative real interest rate? Sevensson (2010: 232) points out, that for "investors choosing between investments with varying degrees of liquidity and safeness, only the relative interest rates would matter". Negative interest rates are reasonable if we make a careful distinction between entrepreneurs and investors, while the latter is nobody else than somebody wishing to store purchasing power and the entrepreneur the one offering an opportunity to save by running a business requiring credit. Keynes himself stated that the incentive to save (to store purchasing power) is not the expected return, but the safety against an unsure future. So real interest rates may drop to a point where saving is indeed not attractive anymore and the stationary state is found. However, for this to happen, the zero bound on nominal interest rates needs to be overcome. Ironically, overcoming the zero bound would, by removing the growth brake, lead to a period of additional growth, and create a transition from a stagnating to a stationary economy.

The rich literature on the zero bound problem has proposed various ways in order to establish negative real interest rates (for reviews see e.g. Ilgmann & Menner, 2011; Yates, 2002). In the discussion of the zero bound, we shortly discussed quantitative operations as ineffective for coming out of the liquidity trap. But there are proposals in line with the new macroeconomic consensus of steering the interest rate below zero. The techniques most discussed in this context are an inflation buffer by a higher inflation target (Billi, 2007; Blanchard, Dell'Ariccia, & Mauro, 2010); inducement of expectations of a higher future price level (Svensson, 2003); a time-varying price-level target (Eggertsson & Woodford, 2003); a carry tax on base money holdings (Buiter, 2009; Buiter & Panigirtzoglou, 2003; Goodfriend, 2000; van Suntum, 2009). The state of the art of research is not developed enough yet in order to judge the advantages and disadvantages of the different quantitative operations as well as techniques of lowering the interest rate more directly. The economic complexity is potentiated by psychological and political considerations. Our purpose is not to evaluate the various instruments; rather we want to make a fundamental point:

Interestingly, most researchers from central bank research departments seem to consider these instruments as only temporarily necessary or as necessary for an *occasionally-binding* zero lower bound on nominal interest rates (Billi, 2007; Wolman, 2005). If the crises would be overcome, they assume to go back to monetary policy with positive real interest rates. It is mostly only assumed that there is only a "risk" of hitting the zero bound depending on assumptions about the equilibrium real interest rate (Yates, 2002). As real interest rates calculations result from assumed growth rates, hitting the zero bound with a growth rate of near zero or zero is *not a risk, but a certainty*. If we do not expect considerable growth rates for developed countries, monetary policy has to enable declining real interest rates in the long run. A regime of positive real interest rates is incompatible with a stationary economy.

The analysis provided here reduced complexity to a great extent. In the literature on the zero bound the analysis sometimes is expanded to exchange rates (Portes, 2012) or account imbalances (Chan, 2011). These considerations would definitely have consequences for the postulated central bank dilemma. The weakness of our analysis is strength in another sense: we provided a simple tool explaining stagnation and crisis already in a closed economy. However, the interest-differential on international asset markets (Lüken-

Klaßen, 1993, 1995a, b) becomes of great importance as soon as it comes to the evaluation of the impact of instruments lowering the interest rate. By this, we direct to further research on the central bank dilemma and on preconditions for a stationary economy within an open economy environment.

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