Economic Confidence, Negative Interest Rates, and Liquidity:

Towards Keynesianism 2.0

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by

Ulrich van Suntum
Centrum für angewandte Wirtschaftsforschung
University of Muenster
Am Stadtgraben 9

D-48143 Münster
Germany

Abstract

A model is developed which explains deep recessions like the recent crisis by a lack of economic confidence, going along with a high liquidity preference of both private households and the private banking system. Thus the paper argues for a new form of Keynesian policy, which rests on monetary rather than fiscal policy. In this approach, instead of borrowing in order to create a substitute demand, the state creates additional credit in order to restore private investment. While this might imply temporarily negative central bank interest rates, it does not require direct interventions in the private capital market by either the central bank or the government. It is argued that such an approach is both cheaper and more effective than the traditional deficit spending policy is.

JEL classification E, G

1. Introduction

When John Maynard Keynes (1936) wrote his General Theory , the then Great Depression was an unparalleled phenomenon in economic history. Keynes´ attack on the classical paradigm of efficient market was a direct response to the fact that classical economics was unable to explain both the depth and the length of the ensuing slump. From a classical perspective, economic crises were in fact just 'anomalies' Minsky (1977, p. 6). Keynes theory was decisively different. One of its key elements was confidence, influencing liquidity preference and thereby the rate of interest.[1] In Keynes`s view, the rate of interest determined the productivity of real capital: 'It seems, then, that the *rate of interest on money* plays a peculiar part in setting a limit to the level of employment, since it sets a standard which the marginal efficiency of a capital-asset must attain if it is to be newly produced' (Keynes, 1936, p. 222 [italics in original]).

Thus, in Keynes' framework, an exogenous shock to confidence would raise the rate of interest and thereby decrease both output and employment.[2] Given the existence of multiple equilibriums, Keynes proposed three possible remedies for pushing the economy towards full employment, namely (1) progressive taxation, raising the propensity to consume, (2) lowering money interest rates through expansive monetary policy, and (3) the partial socialisation of investment (Dillard,1948, pp. 327-329).

Nowadays "Keynesianism" is mainly associated with deliberate deficit spending, replacing the heretofore undisputed balanced budget rule in times of crises. This political Keynesianism was nearly universally accepted by both economists and politicians during the postwar period, although it was not at all the essence of Keynes' original idea. In contrast, the so called neoclassical synthesis buried much his original ingenuity.[3] According to some heterodox authors, there has even never been such a thing as a true 'Keynesian Revolution' (Davidson, 2005, pp. 451-452).

The current crisis is the first one which resembles the Great Depression in scope and magnitude (Eichengreen and O'Rourke, 2009). Thus it is only the second time in history that the 'Keynesian' deficit spending is really tested in a world-wide recession of dramatic extent. Their ultimate effects on general demand and employment are quite controversial (Farmer, 2009a) and, presumably, relatively small (Barro 2009, Cogan et. al. 2009). Moreover, while the central bank`s have brought

[1] See Keynes (1937, pp. 216-217). Even before the General Theory was published, Keynes had made his criticism of the classical theory quite clear: 'There is, I am convinced, a fatal flaw in that part of orthodox reasoning […] due to the failure of the classical doctrine to develop a satisfactory and realistic theory of interest' (Keynes, 1935, p. 36). Consequently, his decisive invention was a theory of interest that differed from the classical notion of interest being given by the productivity of real capital (see Keynes, 1937, p. 223).

[2] 'A monetary economy, we shall find, is essentially one in which changing views about the future are capable of influencing the quantity of employment and not merely its direction. [….] We are thus led to a more general theory, which includes the classical theory with which we are familiar, as a special case' (Keynes, 1936, preface).

[3] The subsequent adaption of Keynes' theory by the classical school was labeled 'bastard' Keynesianism by Joan Robinson (1965, pp. 100-101).

their interest rates down to zero, instead of increasing credits for the private sector the commercial banks treasure up liquidity (IMF 2009). Despite the application of unconventional monetary policy (Cecchetti 2008) the commercial sector still complains about a credit crunch.). At the same time, the vast increase in public debt does not only place a high burden on future taxpayers, but also rivals corporate bonds at the capital market.

These are quite unsatisfactory observations. They give us enough reason to see the current financial crisis as an opportunity for reconsidering the whole issue from scratch again, like Keynes himself did in a comparable situation 80 years ago. In particular, we have to ask if there could not be a strategy which tackles the very heart of the problem more than does the standard Keynesian strategy of replacing private demand by public expenditures.

In what follows, I argue that the core of the current problem is a severe lack of both confidence and liquidity in the private sector. Therefore, it might be worthwhile to consider potential measures which restart private investment in a more direct way than the old strategy of public surrogate demand does. Recently, direct central bank interventions in the capital market have been proposed by Farmer (2009b), while other authors brought into play the idea of negative (nominal) interest rates (Buiter 2009, Mankiw 2009). Although the latter idea is not entirely new (Buiter and Panigirtzoglou 1999 and 2003, Goodfriend 2000), its theoretical implications are not yet clear (Yates, 2004). Anyway, if it is true that the Keynesian liquidity trap is caused by the zero bound to nominal interest rates, removing that constraint could help to stimulate investment. On the other hand, Keynes (1936, p. 358) himself stated that negative interest rates might not be feasible since they would give rise to money substitutes, e. g. gold or other precious metals. It is also an open question if negative interest rates are restricted to the (short term) money market interest rate or if they are also conceivable in the (long term) capital market.

In this paper I propose to make a contribution to both this theoretical debate and practical monetary policy in a recession. In particular, I propose a combined monetary and public credit program which links the interest rate for private investments to the economy`s state, making it zero as long as the recession prevails, but equal to the normal market rate on average. The main idea is to relieve firms from getting illiquid only because of the macroeconomic risks caused by the crisis, but at the same time leave with them the normal market risk of their investments. This in turn is expected to promote propensity to invest, thereby reestablishing confidence and overall demand.

In short, I suggest that the state should act like a creditor rather than like a borrower in the depression, what may be called Keynesianism 2.0. This would not only prevent excessive public debt, but should also squeeze down the capital market interest rates instead of keeping them up by crowding out effects. Moreover, a general public credit program is less contingent for competitive distortions and misallocations than public expenditure programs are. Therefore, Keynesianism 2.0 might be a more appropriate answer to modern crises than the conventional version is.

In the following, I proceed as follows. Section 2 briefly sketches the main shortcomings of conventional Keynesianism, both in theory and in practice. In Section 3, I outline the theoretical background of my argument, using model which is simple, but complex enough to cover some important features of the recent crisis which cannot be explained by conventional textbook Keynesianism. Section 4 outlines the idea of a new kind of Keynesian policy in more detail and shows

how it could work in practice. Section 5 summarizes the main results, comments on possible objections and discusses open questions.

2. Shortcomings of conventional Keynesianism

Monetary Macroeconomics has developed remarkably in recent years, or so we thought (Bernanke 2004). Nevertheless, we still lack a macroeconomic model which can explain what happened in the recent financial crisis. For example, most macroeconomic models do not even have a private banking sector, and some do not even explicitly have money in what they call a money market (e.g. Romer 2006, 314; Woodford 2003). Moreover, there is mostly only one interest rate, although in reality we have to distinguish between the central bank`s prime rate and the long term investment rate at least. This distinction was of particular importance in the financial crisis, where we had a zero prime rate and a credit crunch at the same time. There is also a problem with the idea of a liquidity trap in this context, which in reality is more likely to go along with high rather than low capital market interest rates, as the flight to liquidity begins, despite the fact that money market interest rate may be low at the same time. In the sections below I will argue that an exceptionally high liquidity preference is better explained as the result of declined economic confidence and, therefore, as the *reason* for low money market interest rates rather than being the latter´s result.

Concerning the propensity to consume, the traditional approach of a constant marginal saving rate is of course unrewarding. Moreover, it is questionable if savings and consumption can be sufficiently explained by a mere current income approach as in the famous interpretation of Keynes by Hicks (1937) and in modern adoptions using, the MP curve instead of the LM curve (e.g. Romer 2006, 227, Farmer 2009, 19). First, changes in wealth play an important role in determining consumption, as the current crisis has shown. Second, a changing liquidity preference can also lead to changes in both savings and consumption in the respective period, liquidity is saved but not invested. Third, the injection of additional money will normally increase both demand for commodities and capital supply, at least in nominal terms. Therefore, both nominal income and expenditures should be explained by an approach which explicitly takes account of these relationships. Inevitably, a suitable model must not only have a monetary sector, but also neatly distinguish between nominal and real terms.

Concerning the political shortcomings of conventional deficit spending, and besides the contested magnitude of multiplier effects, the resulting public debt has constantly grown, especially in times of crisis (Reinhart & Rogoff, 2008, pp. 43-45). Even when the non-'Keynesian' causes of rising state indebtedness (Barro 1974) are neglected, the conventional deficit spending appears to be extremely costly in contrast to its apparently low effectiveness. From a more fundamental point of view, one can also ask if it is really sensible to create a kind of surrogate demand by the government rather than trying to get private demand going again.

In short, there is reason enough to think about new ways of tackling economic crises. In what follows I offer an approach which is originally Keynesian, as it does not merely trust the market forces in a recession but calls for political action. Nevertheless, it also contains some elements which are borrowed from monetarism, as saving and consumption are explained from a wealth approach rather by a current income approach, similar to the approach of Metzler (1951). In contrast to monetarism, however, the quantity of money in the model is only partly controlled by the central bank, and the velocity of money circulation is endogenous, subject to various states of confidence I

also use some ideas of the Austrian school (Huerta de Soto 2006), in particular the central role of the capital market interest rate, which is in a way manipulated by monetary policy.

3. Theoretical background: A model on confidence and liquidity in the business cycle

3.1. General features

In this section I provide a model which can, to some extent, heal the shortcomings of 'bastard' Keynesian cycle models referred to above. The main idea is to formally incorporate economic confidence as a variable which influences both liquidity preference in the private sector and the willingness to take risks of the private banking system, and which is in turn dependent on aggregate demand. Confidence as a key for the explanation of recessions has recently been stressed by some authors (Akerlof and Shiller 2009, Farmer 2009a, Krugman 2009), but it is not even mentioned in relevant textbooks like Romer (2006) or Snowdown and Vane (2005). The second key variable in my model is the capital market interest rate, which is dependent on economic confidence and which is also influenced by both public debt taking and monetary policy. The model includes not only productive firms, private households and the government, but also a central bank and a private banking sector. There are two different interest rates in the model, one in the money market and the other in the capital market. They can be different and are so normally, because money deposits are assumed to be less risky and more liquid than real investments are.

I provide both a consideration of different steady state equilibriums and some simulations of the dynamic behavior with reasonable assumptions. However, due to the complexity of the model, I cannot give rigorous proofs for the dynamics. In so far, the model is mainly meant as an illustration of my theoretical approach rather than as base for an immediate econometric application.

The model is non-standard in several respects:

(i) On the supply side, I use a production function with a degree of homogeneity less than unity. The reason for this is threefold: First, this assumption takes account of scarce factors such as land or entrepreneurship, which are normally "hidden", although they are both important and absolutely limited. Second, a less than linear homogenous production function allows for multiple equilibriums, with small profits in a recession and high profits in a boom. Third, with this assumption, there are some helpful strong relations between output and factor prices which spare artificial assumptions on firm behavior in dynamic modeling. [4]

(ii) On the demand side, I derive private savings from a reduced wealth optimization approach, rather than operating with a constant savings rate. Moreover, I allow for both real and financial assets as a means of private saving. With this approach, I can distinguish between real savings and hoarding, thereby linking the real economy to the monetary sector.

(iii) In addition to fiat money, I introduce both credit money and a private banking system, which makes it possible to distinguish between a money market interest rate and a capital market interest rate. As a consequence, the money base is not entirely controlled by the central bank, but also a result of liquidity demand.

[4] In case of linear homogeneity, with a given real wage, there is only one equilibrium interest rate which ensures zero profits. Thus, with any other interest rate, total commodity supply is indefinite, which is both unrealistic and cumbersome with respect to modeling.

(iv) Last not least, I introduce economic confidence as an explicit variable in the model which has an impact on several endogenous variables such as liquidity preference, the demand on total wealth, and the propensity of both banks and private households to give credits to firms.

With these assumptions, the model generates a lot of syndromes that have been observed in the current crisis but cannot be satisfactorily explained by conventional Keynesianism. In particular, a high capital market interest rate may occur along with a low or even negative money market interest rate. As a consequence, high liquidity and a credit crunch may coexist. The model can also distinguish between different ways of injecting money into the economy, with different consequences for total output, the capital market interest rate, and the price level.

3.2. Formal structure

The production function is Cobb Douglas type, although with a degree of homogeneity less than unity. Therefore, when capital and labor are paid their marginal product respectively, there remains a total profit to the firms. With lower total demand and a given real wage rate, both employment and total profits decline. This feature of the model reflects the fact that, in a recession, the least efficient firms will have to leave the market, while the more efficient firms still earn some money.

In particular, for the supply side I assume

$$(1) Y = (AN)^{\alpha} K_F^{\beta} \qquad \alpha + \beta < 1$$

N is physical labor input, A is a factor of labour saving technical progress, K_F is real capital input of productive firms, and Y is real production. I assume a depreciation rate $d \leq 1$. Thus, if labor and capital are paid their marginal product, $\partial Y / \delta N = w / p$ and $\partial Y / \delta K_F = (d + i)$ respectively. Hence, the firm`s demand of factor inputs is

$$(2) K_F = \left(\frac{\beta}{d+i} \right)^{\frac{1}{1-\beta}} (AN)^{\frac{\alpha}{1-\beta}}$$

and

$$(3) N_F = \left(\frac{\alpha}{w/p} \right)^{\frac{1}{1-\alpha}} K_F^{\frac{\beta}{1-\alpha}} \, \mathrm{A}^{\frac{\alpha}{1-\alpha}}$$

where p is the price level and w/p is the real wage rate which is assumed to be exogenously given throughout. From (1), (2) and (3) the firm`s demand of labor can be calculated as

$$(4) N_F = \left(\frac{\beta}{d+i} \right)^{\frac{-\beta}{\alpha+\beta-1}} \left(\frac{w/p}{\alpha} \right)^{\frac{1-\beta}{\alpha+\beta-1}} A^{\frac{-\alpha}{\alpha+\beta-1}}$$

and commodity supply as

$$(5) Y_s = \left(\frac{w/p}{\alpha} \right) N_F = \left(\frac{d+i}{\beta} \right) K_F$$

Note that, according to (4) and (2), total factor inputs and hence total output are definitely determined with given factor prices. In reverse, with a given commodity demand and a given real wage rate, the equilibrium interest rate is definitely determined.

Concerning the demand side, I assume that people wish to hold a certain fraction v of total income Y as wealth, of which lvY is held as (real) cash and (1-l)vY is held in the form of other assets, with l as a measure of liquidity preference. The parameters v and l are functions of both the capital market interest rate i and the level of economic confidence q. In particular, I assume that liquidity preference l declines in both i and q, while wealth preference v rises in i, but declines in q. The intuition is that, in uncertain times, people wish to hold more wealth as a precaution, and also a higher fraction of cash for the same reason. On the other hand, a rising capital market interest rate makes it attractive to shift some wealth from cash to real assets. This is in accordance with both the neoclassical lemma that savings increase in interest i and the Keynesian view that liquidity preference is negatively related to the opportunity costs of foregone interest.

I also introduce a private banking sector with total bank deposits D which are held partly by the central bank and partly by private households. These deposits yield a money market interest rate i_d which is determined by the central bank as the dominating market maker. From the private household`s point of view, their deposits D_H are one of two interest yielding assets, the other being real capital. I assume that, from their total non liquid assets v(1-l)Y, a fraction r is held as real capital K_H and the remaining part (1-r) in the form of deposits D_H, where r increases in economic confidence q and decreases in the money interest rate i_M. In other words, the higher is economic confidence and the lower is the money interest rate, the more are people willing to invest in the real economy.

I assume that cash is only held by private households. Thus, when M is the amount of fiat money, real liquidity L=lvY must equal real cash M/p in equilibrium.

In summary, we have for equilibrium private wealth

$$(6) V^* = K_H + \frac{D_H}{p} + \frac{M}{p} = v(1-l)rY + v(1-l)(1-r)Y + vlY$$

with $v = v(\underset{+}{i}, \underset{-}{q})$, $l = l(\underset{-}{i}, \underset{-}{q})$ and $r = r(\underset{-}{i_M}, \underset{+}{q})$.

I assume that the absolute elasticity of l with respect to q exceeds that of v, so a decline in economic confidence q effectively decreases private supply of real capital K_H. Hence, $K_H = K_H(\underset{+}{i}, \underset{-}{i_d}, \underset{-}{q})$. Note that a rising money interest rate i_M also tends to increase the capital market interest rate i, because the investment in deposits is then more attractive than are investments in the real economy.

Apart from K_H, there are two more sources of capital supply in the model, coming from private banks (K_B) and from the central bank (K_M) respectively. The former provide real capital by lending their deposits to firms, which is the more profitable, the more i exceeds i_M. Therefore, the bank`s total demand for deposits D increases in i and decreases in i_M. Moreover, it is reasonable to assume that D increases in economic confidence q, as a higher q means less risk of lending to private firms. With $D_H > 0$, part of total deposits is already provided by the private households, so only the excess demand $D_M = D - D_H$ must come from the central bank. Neglecting reserves, bank deposits are in total transformed in real investments K_B by private banks, so $D/p = K_B$. Hence we have in real terms

$$(7) K_B = \frac{D}{p} = \frac{D_H}{p} + \frac{D_M}{p} = xY$$

where $x = x(\underset{+}{i}, \underset{-}{i_M}, \underset{+}{q})$ denotes the private bank`s demand for deposits as a fraction of real income Y.

So far, private household`s deposits $D_H$ are merely a transit item, because they reduce $K_H$ by the same amount as they increase $K_B$. On the other hand, total bank deposits D and, hence, the private bank`s supply of real capital K_B decreases in both the money interest rate i_M and in economic confidence q. Therefore, the same applies to total capital supply, as far as the private sector is concerned.

In addition to holding deposits D_M, the central bank can also directly engage in supplying real capital $K_M = mY$ to firms by purchasing stocks or other financial assets. In this case, part of the firm´s interest expenses $(1+i)K_F$ accrue to the central bank rather than to the private sector.

In addition, I assume that there is a government that can borrow from the capital market at the interest rate i. The government`s demand of capital is $K_G = gY$, with g as a parameter which is voluntarily chosen by the government.

Employing (5) and (6), equilibrium at the capital market implies

$$(8) K_F + K_G = \left(\frac{\beta}{d+i}\right)Y + gY \overset{!}{=} K_H + K_B + K_M = v(1-l)rY + xY + mY$$

The monetary base M is given by a fixed amount of fiat money $\overline{M}$ plus the flows of cash caused by the central bank`s interventions on both the money market and the capital market:

$$(9) M = \overline{M} + z(D_M + pK_M)$$

The parameter z indicates the percentage of total money inflow (or outflow) which is in the form of cash rather than in the form of pure book money. Because there is no book money in the model, z is unity. Regarding that $K_m = mY$ and $M = vlYp$, by employing (7) both the equilibrium nominal income and the equilibrium monetary base can be calculated:

$$(10) Y^*_{nom} = (Yp)^* = \frac{\overline{M}}{vl + zv(1-l)(1-r) - zx - zm} = \frac{\overline{M}}{vl + v(1-l)(1-r) - x - m}$$

$$(11) M^* = \frac{vl\overline{M}}{vl + zv(1-l)(1-r) - zx - zm} = \frac{vl\overline{M}}{vl + v(1-l)(1-r) - x - m}$$

Note that, according to (11), the monetary base is determined partly by the central bank (which controls m and i_M) and partly by the demand of money (which results from the remaining determinants of v, l, r, and x respectively). Both M^* and Y^*_{nom} decline in the money market interest rate i_M and increase in the share of direct central bank credits m, which is in accordance with intuition.

For simplicity, I assume that not only private bank profits, but also central bank profits accrue to private households. The rationale could be that, with a given amount of central bank profits, the private sector is taxed less accordingly.

In order to derive the budget restrictions, financial investments are assumed to be refunded at the end of each period and either consumed or reinvested at the beginning of the following period. The same does apply to depreciation dK. Then, writing receipts on the left hand side and expenses on the right hand side respectively, the budget equations of private households, private banks, the government, and the central bank are (in the respective order) given by[5]

$$(12)\Pi_M + \Pi_B + \Pi_F + wN + (d+i)\,p_{t-1}K_{H;t-1} + (1+i_M)D_{H;t-1} + M_{t-1} = C_H + pK_H + D_H + T + M$$

$$(13)(d+i)\,p_{t-1}K_{B;t-1} + D_H + D_M = \Pi_B + (1+i_M)(D_{H;t-1} + D_{M;t-1}) + pK_B$$

$$(14)T - (d+i)\,p_{t-1}K_{G;t-1} = C_G + pK_G$$

$$(15)(1+i_M)D_{M;t-1} + (d+i)\,p_{t-1}K_{M_{t-1}} + M = \Pi_M + D_M + pK_M + M_{t-1}$$

C_H is (nominal) private consumption, C_G is public consumption, and T denotes total taxes. Total nominal savings S are given by the sum of net investments $S_j = (pK_j - p_{j;t-1}K_{j;t-1} + D_j - D_{j;t-1})$ of the four sectors. As financial investments D_j cancel out by summing up the sectors, total net savings S are identical with total investment in the real economy. Net savings of the central bank are identical with the creation of new money in the respective period. Obviously, in a stationary steady state, both total net savings $S - S_{t-1}$ and total real investment $K - K_{t-1}$ are zero.

The sum of (12) to (15) reduces to the productive firms` budget restriction

$$(16)\Pi_F + wN + (d+i)\,p_{t-1}K_{F;t-1} = C_H + C_G + pdK_F = pY$$

According to (8), K_F is total capital supply minus capital demand of the government, and Y is real GDP.

It is important to note that, in contrast to simple textbook Keynesianism, total demand of Period t is *not* given or even determined by total factor incomes of the previous period. On the one hand, the central bank can at any time increase or decrease their deposits D_M, thereby creating new demand or reducing it. On the other hand, a similar effect can come from private hoarding or dishoarding. When private households, for example, choose to increase their liquidity reserves M or their bank deposits D_H in one period, from their perspective this is saving. However, from the whole economy`s view, no saving occurs, unless the respective resources are transformed into real capital by one way or the other. Hence, private hoarding or dishoarding can also create or wipeout total demand. I will make further use of these considerations when I discuss the dynamics of the model in the following section.

[5] For simplicity, I have skipped the subscript t for the respective period in question in my notation unless it is absolutely needed.

3.3. Steady state implications

I consider first the implications of the model in steady (stationary) states.

Change in economic confidence q

From the assumptions above it follows that a decline in economic confidence q increases the capital market interest rate i and, according to (4) and (5), thereby decreases both total income and employment. According to (6) and (7), both liquidity $L = M / p$ and bank deposits D_H of private households tend to increase as well, implying a decreasing price level with a given amount of money M. At the same time, private banks reduce their real capital supply to firms, because a smaller q means an increase in risks and, therefore, a decline of x. The result is a situation which was actually observed in the current financial crisis: Although the market interest is high, both private households and private banks reduce their credits to firms and engage in more liquid assets.

There are some more implications of a declining confidence in the model which are in full accordance with reality. In particular, total bank deposits D decline, and central bank deposits D_M can easily get negative, i.e. private bank hold net reserves instead of lending money from the central bank. As a consequence, both high powered money M and monetary aggregate M1 (= M + D_H) decrease. The latter occurs because, according to (9), M increases in both D_M and p, which are in turn negatively affected by q respectively.

If economic confidence is treated as an exogenous variable, the model allows for invariably many steady states, depending on the prevailing economic mood respectively. However, it makes sense to assume that confidence depends in turn on economic conditions as well. Even then different stable equilibriums are conceivable in principle, with the respective equilibrium being a path dependent result of economic policy. In the section below, I will assume that q is dependent on the degree of unemployment of the respective previous period. In this case, with given exogenous parameters, there is ordinarily only one steady state in the model, to which the economy tends to return following any shock in q. There may be other specifications of q which allow for path dependent, multiple equilibriums.

Public deficit spending

Conventional fiscal policy is not only ineffective, but even counterproductive in this model, at least in the long run. I consider first an increase in public consumption C_G which is financed by a respective rise in taxes T. In this model, there is no effect on total income of such a policy at all, because I have assumed in (6) that private saving depends on total income rather than on disposable private income. Thus the traditional Keynesian argument for a positive multiplier of tax-financed public expenditure, namely a thereby caused decrease in total savings, does not hold here. Even if a decreasing saving rate should result, it would *lower* total income rather than increase it in this model, because of the negative impact on real capital supply. Thus taxed financed public expenditure could foster total income only if it was spend for investments rather than for public consumption.

Concerning public debt, in a stationary state we have $K_G = K_{G;t-1}$. Hence, with a given amount of taxes T, public consumption C_G *decreases* in public debt K_G because of the payment of interest, as can be seen from the government´s budget restriction (14). Moreover, and more important in this model, a permanent government debt $K_G > 0$ reduces total net capital supply which is available to firms and

therefore results in a decline rather than an increase of real output in the long run. Hence, while there may be some short term merits of deficit spending, the steady state implications are clearly negative.

Two qualifications need to be made concerning this verdict: First, analogously to tax financed expenditure, long term public debt may be in order when it is used for public investment rather than for public consumption. Formally, total capital supply in (8) would the not suffer from a rising K_G, nor would total output according to (5), provided public investments are equally efficient as private investments are. This confirms the classical view, of course. Second, public debt could also be used to give public credits to firms in the crisis in order to overcome a credit crunch. In this case the consequences for total output and investment could be even positive, at least when the measure is restricted to periods of recession. In fact, my proposal for a new Keynesian policy points somewhat into the latter direction. However, as I will argue below, an appropriate monetary policy would do the job better than fiscal policy, being both less expensive and bearing less risk of inefficiencies.

Moreover, even if the monetary base is constant, public deficit spending tends to raise the price level because of the decline in total output which is caused by the increased interest rate.

Increase in fiat money

The effectiveness of monetary policy in this model depends on the particular measure which is taken by the central bank. In contrast to conventional Keynesian views, a mere increase of fiat money – e.g. by simply consuming the respective seignorage – has no impact on the interest rate i at all, but increases merely the price level. This can be seen from the capital market equilibrium equation (8), which determines the equilibrium interest rate irrespective from $\overline{M}$. Note that this "monetarist" result follows from the model, although neither the quantity equation has been explicitly employed nor a constant velocity of money circulation is assumed.

Again, in the short run, the Keynesian results may occur (and actually do in the dynamic version of the model, see below). For with more cash money M, according to (6), people wish to reduce their liquidity for a higher share of real assets, thereby initially reducing the capital market interest rate. At the same time, however, an increased amount of M also causes an excess in total wealth. This excess wealth – which is normally not taken into account in conventional Keynesian models - is even increased with a declining capital market interest rate, and therefore the latter case is inconsistent with long run equilibrium. In contrast, people will lastly have to increase consumption in order to reduce their undesired high liquidity. With an ultimately unchanged equilibrium interest rate according to (8), real production must lastly also remain unaltered because of (5). Therefore, eventually just the price level rises as a consequence of the increased $\overline{M}$, thereby reducing real liquidity and leading to the original real values of all variables in the model again.

Direct central bank credit

When the central bank injects money by giving direct credit to the firms, things are more complicated. According to (8), a rise in K_M c.p. increases total capital supply and thereby tends to reduce the capital market interest rate. At the same time, additional money M flows in the economy, the ultimate amount of which can be calculated from (9). Even if this additional money supply were immediately sterilized by reducing $\overline{M}$ accordingly, this would not alter the lowering effect upon the

interest rate. This follows immediately from the argument concerning a rise in $\overline{M}$ given above. The reason is quite simple: Not the additional money, but the intervention in the capital market makes the difference. When the central bank gives additional credit to a firm, the effect is the same as if a private household would do so. Therefore the interest rate is reduced in tendency. This result confirms the theoretical findings of Metzler in his famous 1951 contribution (Metzler 1951, 97,Niehans 1978, 87, Claasen 1980, 202).

Only if the private households should regard the central bank`s assets as part of their own wealth, there might be a counter effect which could, in the extreme, make also this kind of monetary policy ineffective. If this sort of Ricardian effect is or is not relevant in practice, is not my issue here. However, there is another limiting effect on the central bank`s power to reduce the capital market interest rate, because with a rising relation $M / \overline{M}$, i is reduced less and less by the injection of additional money in the markets. Eventually the sum of credit money $pK_M + D_M$ increases at the same rate as total money M does, thereby leaving all relevant relations at the capital market unchanged. As a consequence, with given factor productivity, additional money results merely in respective price increases without having any relevant impact on both the interest rate and real output any more.[6]

Decreasing the money market interest rate

When the central bank lowers the money market interest rate, the consequences are principally the same as with direct credits to private firms. Due to the dependence on i_M of the left hand side of (6), there may again result a positive impact on both steady state production and employment as long as $M / \overline{M}$ is sufficiently low. The reason is the same as before: By lending more money to the private sector, the central bank virtually disturbs both the private household`s and the private bank`s optimum wealth allocation given by (6) and (7) respectively. In contrast to a mere supply of fiat money, thereby also the capital market equilibrium (8) is affected. However, the same qualifications must be made as above: First, the effect implies that the private sector does not take into consideration the central bank`s real capital supply as part of private wealth. Second, when $M / \overline{M}$ approaches unity, the central bank`s power on the capital market interest rate vanishes and only an inflationary effect remains.

Technical progress

With a (one-time) incline in labor productivity A by the factor $1+ g_A$, it is easily derived from (3) that an unchanged labor demand N requires c.p. an incline in the real wage rate by $(1+ g_A)^{\alpha/(1-\beta)}$. If the central bank takes no further action, and if the nominal wage rate is unchanged, this is automatically accomplished by a respective decline in p, because it follows from (5) that real output increases at the same rate as the real wage rate does. Hence, with nominal income being constant, the deflation rate is $(1+ g_A)^{\alpha/(\beta-1)}$. However, in order to avoid deflation, the central bank can also increase money supply, either by reducing the base rate i_M or by increasing the ratio of direct credits m. [7] With

[6] This is at least the result of all simulations with the model I have run. Although the proposition fits quite well both economic intuition and practical experience, I have not yet found a more general proof.

[7] Again, the following is the unique result of numerous simulations, but I cannot yet provide a more rigorous proof.

$M >> \overline{M}$ this is already achieved by a marginal decrease of the base rate, or alternatively by a just marginal increase in m. Thus, in an advanced economy with the main part of money being credit money, the liquidity needs of a growing economy can be satisfied by the central bank with both a stable price level and a stable capital market interest rate.

Interim summary

Concerning steady state equilibrium, the model produces quite clear results:

- Fiscal deficit spending is not only ineffective, but even noxious concerning total output and employment, at least in the middle and long term. Moreover, it causes a long term burden on the tax payer who must pay for the interest. Only a tax-financed public expenditure which is spend for investment rather than for consumption may have a positive long term impact on total output and employment.
- Monetary policy is also ineffective in the long run, as far as the mere inflow of additional money is concerned. However, by raising capital supply and thus decreasing the capital market interest rate, both direct central bank credits and lowered base rates may have a positive impact on real output, depending on the ratio of credit money to total money supply. When the latter is high, as it is normally the case in developed economies, there is only a marginal impact of monetary policy on the capital market interest rate and, thus, on total output.

As will be shown in the next section, these results are widely confirmed by the dynamic behavior of the model in the long run. However, as I will demonstrate in the next section, things are quite different in the short run. In particular, due to sticky expectations on prices, employment and interest rates, both direct central bank credits and decreasing money interest rates can then thoroughly spur output and employment. Therefore, while the model generates "monetaristic" results in the long run, it also supports a Keynesian policy in the short run. However, it suggests that Keynesian policy should rest on monetary rather than fiscal incentives, and that it should focus on spurring private rather than public demand.

While a change in the base rate and open market policy are equivalent monetary measures in the theoretical framework, there are some important differences from a more practical point of view. On the one hand, direct central bank credits are likely to cause severe problems with respect to competitive neutrality and efficiency. Hence, as a rule, the decision on lending to private firms should better be left with the private bank system. On the other hand, in case of a deep crisis like the current one, even a zero money interest rate i_M might be insufficient to spur private investment fast enough to overcome the crisis in reasonable time. This is where the idea of a negative money interest rate comes into play.

In the light of the present model, there is nothing odd with negative money market interest, at least as a temporary option.[8] Because of their relatively high degree of liquidity, bank deposits are likely to be still held by private households even when they are costly rather than earning money. In fact, customary account charges can readily be viewed as a sort of negative interest. Moreover, even with a negative money market interest rate, the private bank`s demand of central bank credit is limited.

[8] There would be a problem with a permanent negative interest rate in a stationary state, because this would mean that Ponzi-games could be played that must inevitably drive the interest rate above the growth rate again.

According to (7) their total demand of deposits D is limited to the volume of capital which they are prepared to hold. Hence, with a low q and high risks of lending, their demand on central bank deposits D_M is also limited.

Admittedly, in contrast to our assumptions, it is also possible that the banks lend money from the central bank at a negative interest rate just to hold it in cash. But this is not very likely to occur to a relevant extent, as long as the capital market interest rate covers at least the expected failure rates. In case of need, the use of negative-interest-borrowing could be restricted to refinance firm credits, possibly at a preference interest rate. Anyway, a negative market interest rate prevents the banks from hoarding liquidity with the central bank, as they did at the zenith of the current financial crisis.

3.4. The dynamics of the model: an example

The dynamics of the model depend of course on the particular specification of both the functions and their parameters. I will now show that the model can produce plausible results which fit quite well to the stylized facts of the recent crisis.

To begin with, I specify the relevant fractions of wealth allocation referred to above as follows:[9]

$$(17) v(\underset{+}{i},\underset{-}{q}) \equiv \frac{V}{Y} = \frac{a_1(d+i)}{(1+q)^{\gamma}}$$

$$(18) l(\underset{-}{i},\underset{-}{q}) \equiv \frac{L}{V} = \frac{a_2}{(d+i)(1+q)^{\psi}}$$

$$(19) r(\underset{-}{i_M},\underset{+}{q}) \equiv \frac{K_H}{V-L} = \frac{a_4 q}{1+i_M}$$

$$(20) x(\underset{+}{i},\underset{-}{i_M},\underset{+}{q}) \equiv \frac{D}{Yp} = \frac{a_3 q(d+i)}{(1+i_M)}$$

By inserting (17) to (20), the equilibrium capital market interest rate can be calculated from (8):

$$(21) i^* = -\frac{0{,}5B}{A} + \sqrt{\left(\left(\frac{0{,}5B}{A}\right)^2 + \frac{\beta}{A}\right)} - d$$

In (21), A and B are auxiliary variables defined as follows:

$$(22) A \equiv \frac{a_1 a_4 q}{(1+q)^{\gamma}(1+i_M)} + \frac{a_3 q}{(1+i_M)}$$

$$(23) B \equiv m - g - \frac{a_1 a_2 a_4 q}{(1+q)^{\psi+\gamma}(1+i_M)}$$

Because of the complexity of the model, I do not derive general stability conditions but confine myself to a dynamic simulation with reasonable parameter values. Concerning the dynamic structure, I have made the following assumptions:

[9] There is, of course, no reason why the depreciation rate should enter the wealth parameters, as it does in my example. However, while this specification is innocuous with respect to my general results, it greatly facilitates the mathematics.

1. Parameters v, l, r, and x are dependent of the respective capital market interest rate of the previous period i_{t-1}.
2. All parameter values are chosen such that $0 < v, l, r, x < 1$ is ensured in every period.
3. By appropriate choice of parameter values, I avoid exploding or imploding paths of Y.
4. Both the capital market (equation 8) and optimal wealth distribution (equation 6) are in equilibrium in every period.
5. The monetary sector (equations 7 to 10) is also in equilibrium in every period.

The latter two assumptions suggest that each "period" must be interpreted as middle term, i.e. I do not model explicitly the short term adjustments to monetary equilibrium. However, both the capital market interest rate and the price level at the end of each period differ from the respective expectations at the beginning of that period, unless the overall steady state equilibrium is achieved again, thereby driving the dynamics of the model.

Because of assumption 1, total capital supply is independent of the interest rate of the respective period. I assume that real wages are constant, but the capital market interest rate results from capital market equilibrium according to (8). Then factor inputs L and K and, hence, total real output Y can be immediately calculated from the profit maximization assumption: From (2) it is known that

$$(24) i = \beta N^{\alpha} K^{\beta-1} - d$$

and from (1) it follows that

$$(25) N = \left(\frac{Y}{K^{\beta}} \right)^{\frac{1}{\alpha}}$$

Inserting (25) in (24) yields

$$(26) i = \beta N^{\alpha} K^{\beta-1} - d$$

From (3) it follows that

$$(27) N = \left(\frac{w/p}{\alpha K^{\beta}} \right)^{\frac{1}{\alpha-1}}$$

Finally, inserting (27) in (26) yields the (middle term) equilibrium interest rate with a given capital supply

$$(28) i^{*} = \beta \left(\frac{w/p}{\alpha K^{\beta}} \right)^{\frac{\alpha}{\alpha-1}} K^{\beta-1} - d$$

Capital supply K is found as follows: From (10) we know nominal income Y_{nom} of the respective period, which is independent from the capital market interest rate of the same period due to assumption 1. The respective real income Y depends on the price level $p^{\exp}$, which is not yet known. I assume adaptive price level expectations:

$$(29)\, p_t^{\exp} = p_{t-1}^{\exp} + \phi(p_{t-1} - p_{t-1}^{\exp}) \qquad 0 \le \phi \le 1$$

Then the expected real income is

$$(30) Y^{\exp} = \frac{Y_{nom}}{p^{\exp}}$$

Inserting (30) in (6) yields the middle term equilibrium wealth V^* and also the middle term equilibrium values of its components K_H, D_H, and L_H (= M). When the private bank sector and the central bank have the same price expectations, their respective capital supply is easily found from $K_B = xY^{\exp}$ and $K_M = mY^{\exp}$ respectively. Hence, total capital supply is $K_s = K_H + K_B + K_M$,which increases in Y_{nom} and decreases in $p^{\exp}$.

Note that, because of assumption 5, nominal income in this model is *not* determined by the factor incomes of the previous period. In contrast, according to (10), Y_{nom} follows from the amount of high powered money and the velocity of money circulation, which is implicitly determined by parameters v, l, x, and r. Therefore, possible multiplier effects which could arise in the "very short run" (i.e. before monetary equilibrium is realized) do not explicitly appear.

Economic confidence is assumed to depend on the expected change in labor utilization in the respective period, with ε as a distortion term (which serves to create a possible confidence shock in the model). Analogously to (29), I assume adaptive expectations:

$$(31) q_t = \left(\frac{N_t}{N_{t-1}}\right)_t^{\exp} = \left(\frac{N_{t-1}}{N_{t-2}}\right)_{t-1}^{\exp} + \sigma\left[\left(\frac{N_{t-1}}{N_{t-2}}\right)_{t-1} - \left(\frac{N_{t-1}}{N_{t-2}}\right)_{t-1}^{\exp}\right] + \varepsilon$$

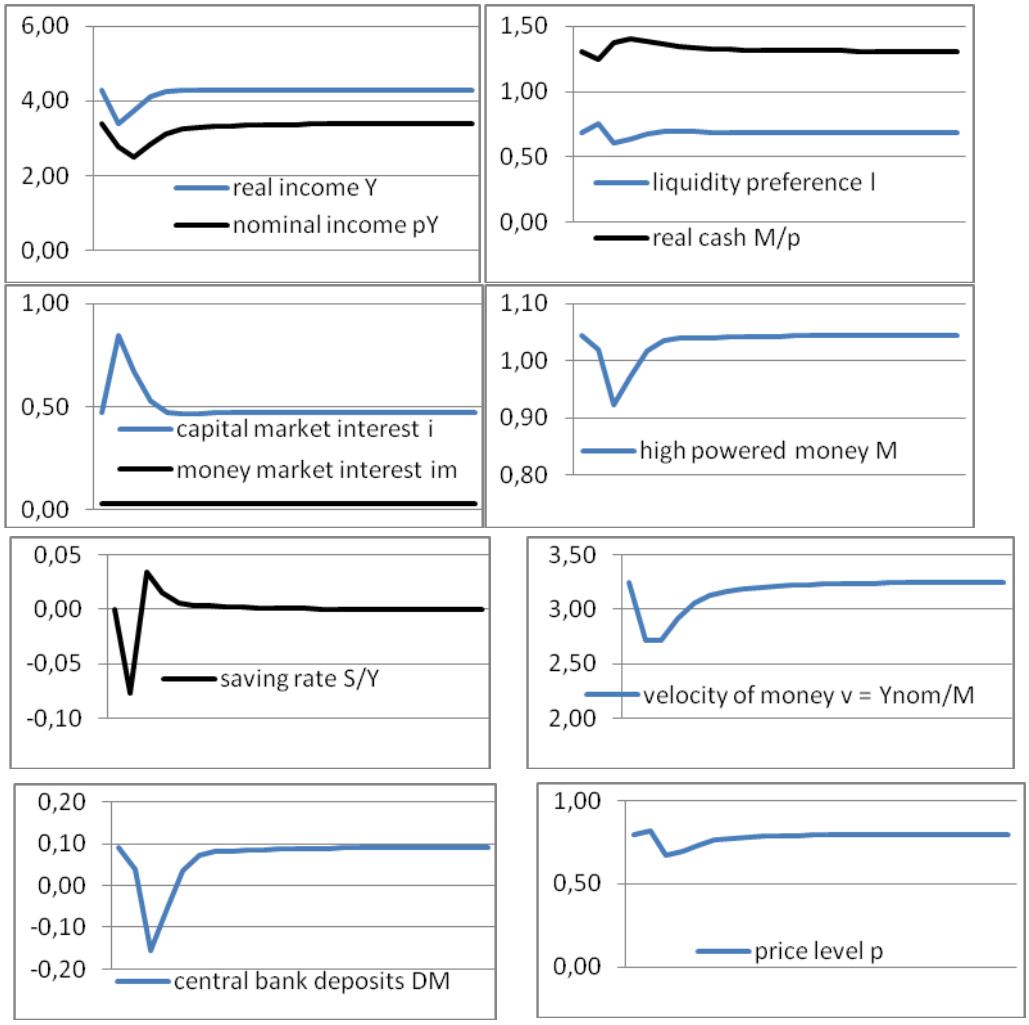
With respect to assumption 3, I choose the following parameters as starting point for the dynamic simulations:

description	symbol	See equation	value
Employment change expectations parameter	σ	(31)	0.25
Fiat Money	$\overline{M}$	(9)	1
Money market interest rate	i_M	(19), (20)	0.03
Central bank credit parameter	m	(8)	0
High powered money parameter	z	(9)	1
Fiscal debt parameter	g	(8)	0
Total Taxes	T	(12), (14)	0.2
Wealth parameter	a_1	(17)	0.5
Liquidity parameter	a_2	(18)	2.0
Real investment parameter	a_3	(19)	0.1
Private bank`s debt parameter	a_4	(20)	0.2
Real wage rate	w/p	(3), (5)	0.1
Depreciation rate	d	troughout	1
Labor productivity term	A	(1) to (4)	1
Production elasticity of labor	α	(1)	0.5

Production elasticity of capital	β	(1)	0.25
Confidence elasticity of wealth	γ	(17)	0.7
Confidence elasticity of real investments	ψ	(18)	1
Price level expectations parameter	ϕ	(29)	0.5

The following figures show the model`s response to selected impulses for a total interval of 26 periods respectively.

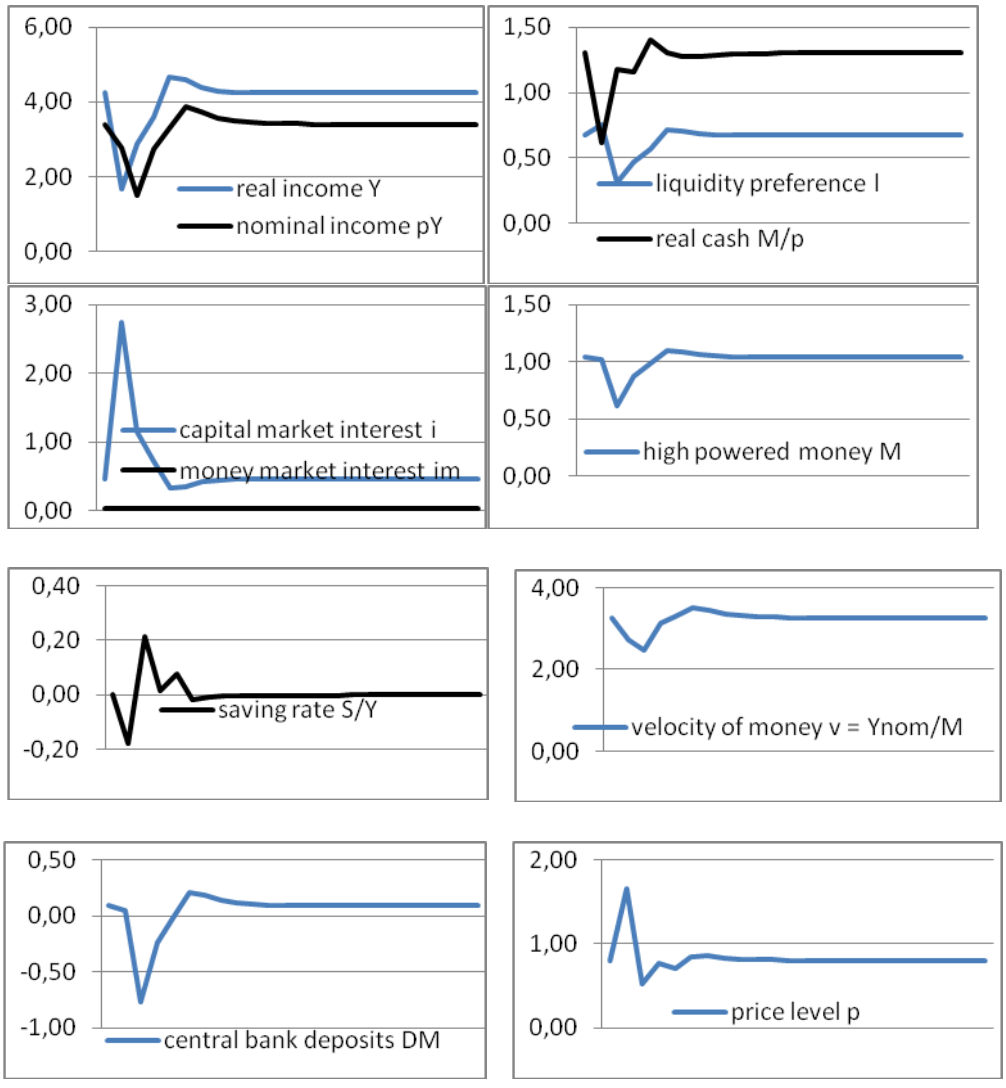
Simulation (i): negative confidence shock



In simulation (i), a negative confidence shock $\varepsilon = -0.2$ is assumed in Period 1. Because of an increasing liquidity preference, private supply of real capital decreases, thereby raising the interest rate and reducing both productive capital K and real income Y. This effect is even strengthened by the private banks, who reduce their supply of real capital as well and at the same time also cut borrowing from the central bank. In the current example, D_M becomes even negative, i.e. the private banks park money at the central bank instead of investing it in the real economy. As a consequence, both the monetary base M and the velocity of high powered money decrease. Note that total savings are negative at the beginning of the recession, although private households try to increase their savings. This happens because they do so by hoarding money instead of investing in real capital. For

the same reason, the price level is reduced (with a time lag of one period). In this example, economic recovery starts in the second period. The increased interest rate lowers liquidity preference and thereby induces both private households and private banks to increase their supply of real capital again. This in turn raises both real income and employment, so economic confidence begins to recover. After some (slight) fluctuations, the initial steady state is eventually reestablished.

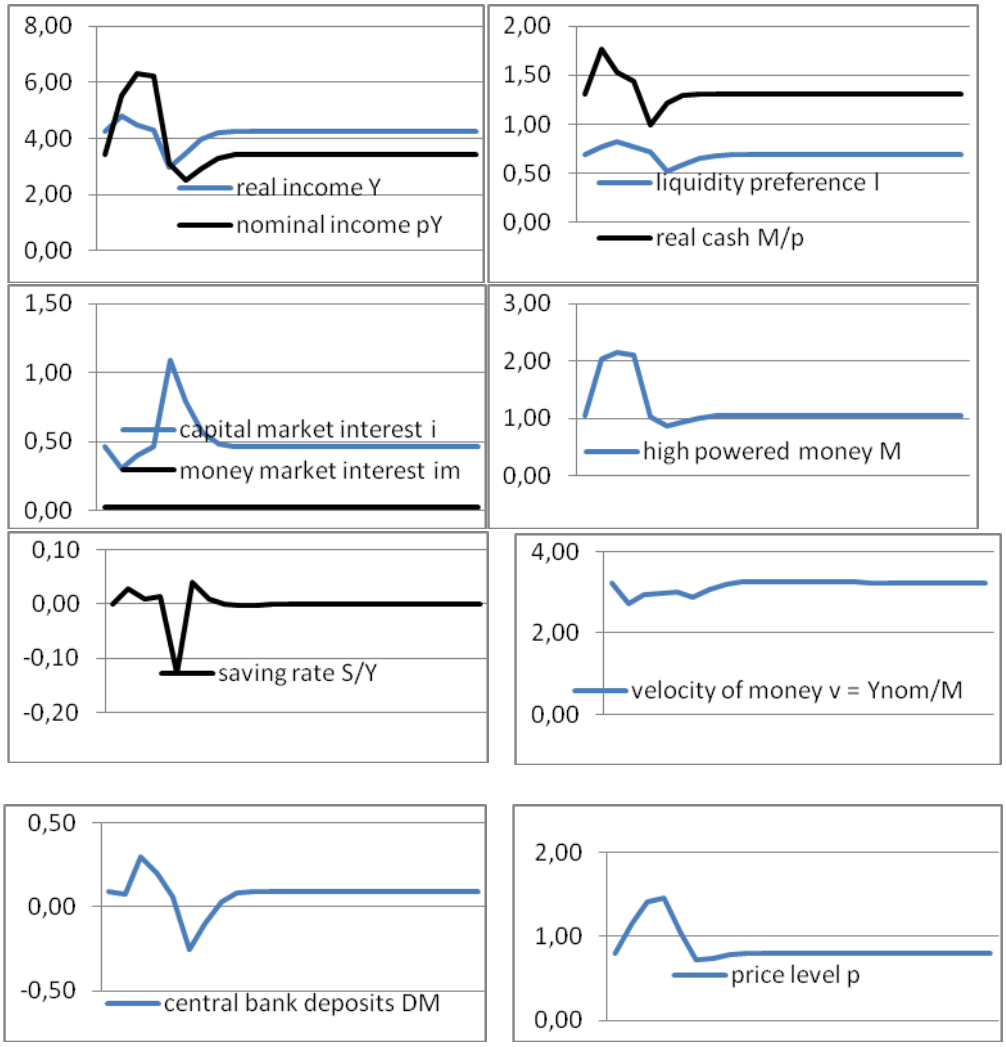
Simulation (ii): temporary deficit spending, following a negative confidence shock



In simulation (ii) it is assumed that, in order to fight the recession, the government raises public debt from zero to 10% of nominal income Y (i.e. g = 0.1) in periods 1 to 3 respectively, and then reduces g to zero again as from period 4. The result is negative, because the interest rate is raised even further by the increased total capital demand, so the recession gets worse rather than being mitigated. For the rest, all effects remain the same, except that they are fortified in extent. Would the government maintain the debt ratio g, there would be even a permanent reduction of total income.

This discouraging result is in sharp contrast to the expectations of mainstream Keynesianism. Hence it seems appropriate to recapitulate the reasons for the divergence. First, remember that the "period" is defined as middle term in this model, so possible short run effects from extended government consumption are not captured. Second, public expenditure is assumed to be mere consumption, with no public investments. Third, in contrast to most cases in the real world, public deficit spending is not accompanied by an expansive monetary policy in this simulation, but studied in isolation. However, the negative impact on real income confirms the respective steady state result.

Simulation (iii): temporary increase of monetary base, following a negative confidence shock



In simulation (iii) I have assumed that the central bank raises the amount of fiat money $\overline{M}$ by 20% in Periods 1 to 3 and then reduces it to the initial level again. In contrast to the long run steady state consideration, there is now a positive effect on real income, namely because of a real balance effect: The increased liquidity demand of private households is at least partly satisfied by additional cash, so their capital supply is less reduced and the interest rate is less increased than without the monetary expansion. When the volume of money injection is high enough, there even results an initial decrease in the capital market interest rate and, hence, an increase in real income. However, irrespective of the monetary expansion is temporary or permanent, after some fluctuations, the initial steady state is eventually restored. The only difference, in case of a permanent increase of $\overline{M}$,

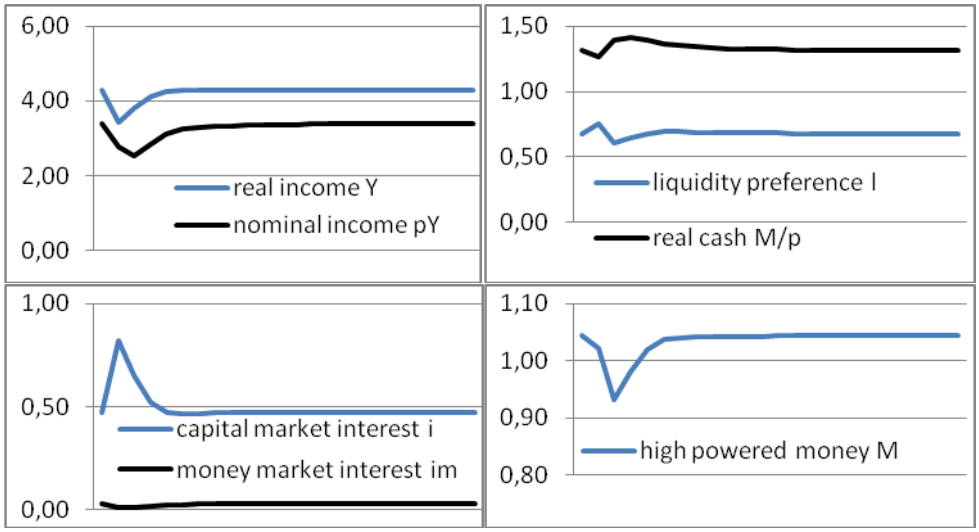
is a permanently increased price level. The middle term results of a monetary expansion by direct central bank credits are quite similar and are therefore not dealt with here in more detail.

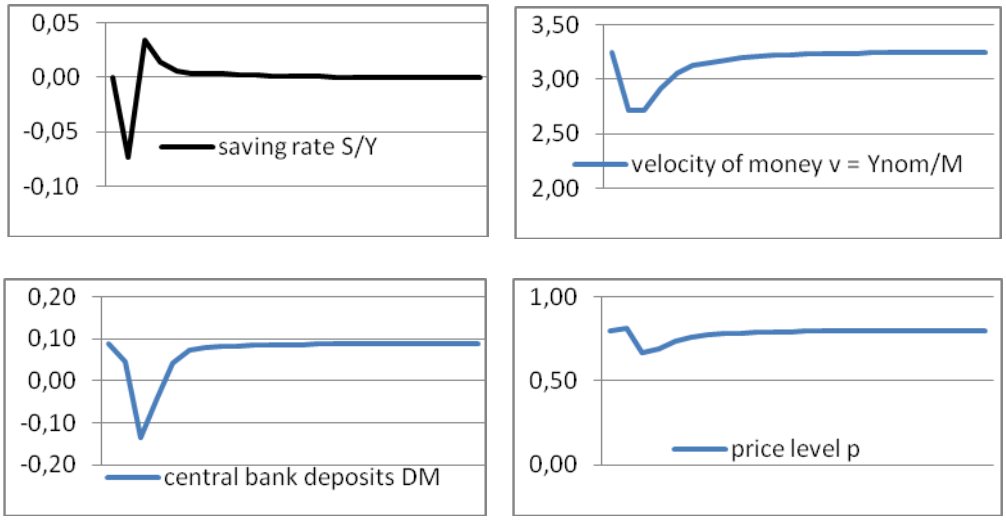
Instead of that, I present a simulation in which I have incorporated the idea of a growth-dependent money interest rate referred to in Section 1. In particular, I assume that the money interest rate is determined by the central bank according to the following simple rule:

$$(32) i_M = i_M^* + \varphi(q-1)$$

In (32), i^* denotes the "normal" money market interest rate which is chosen by the central bank in a stationary state with economic confidence q = 1. Thus, according to (32), the base rate is lowered in a recession but exceeds i^* in a boom. Although economic confidence cannot directly be measured in reality, it can be approximated either by respective survey data or by some other early cycle indicators. At first glance, (32) appears to reflect nothing else than the old idea of an anticyclical Keynesian policy. However, there are two important differences to the common interpretation of this idea: First, it is here applied to interest policy rather than to fiscal policy and, hence, much less subject to problems of time lags and sprawling expenses. Second, (32) explicitly allows for a negative money market interest rate in case of a deep recession, depending on the value of φ. Third, (32) implies a rule rather than pure discretion, which is important for both the private bank sector and private firms to make rational investment decisions. I call (32) a business cycle interest rule.

Simulation (iv): negative confidence shock with the business cycle interest rule applied





In simulation (iv), the consequences of a negative confidence shock $\varepsilon = -0.2$ are examined when the business cycle interest rule (with $i^* = 0.03$ and $\vartheta = 1$) is applied in every period. Because of the lowered money market rate, which is even negative at the beginning of the recession, both the rise in the capital market interest rate and the decline in total output is substantially dampened. The same applies to most of the other variables, including the price level. In the long run, the money market interest and all other variables regain their initial values. Note that this also applies to the price level, which has even declined in the interim.

The business cycle interest rule is not costless. Because of the decreasing interest caused, central bank profits decline, thereby requiring either higher taxes or lower government expenses. On the other hand, seignorage normally does not make for a substantial part of public expenditure. In the present simulation, central bank profits fluctuate only between 0.08% and -0.08 % of total nominal income. This is not too high a price for stabilizing the economy.

Limitations of the model

Before I proceed to more practical issues of my proposal, some remarks on the limitations of my model seem appropriate. First, I have confined to a stationary economy, leaving a respective extension towards a growth model to future research. Second, the assumption of a fixed real wage rate is quite restrictive, in particular when the price level declines (as is the case in most of my simulations). Thus, when nominal wages are sticky, a modest inflation rate might be needed to justify my assumption. On the other hand, with a fixed nominal wage, an analytical solution of the model would be much more difficult, if not impossible, so I abandoned a respective extension.

Last not least, I have disregarded both long term credit contracts and borrowed capital with interest fixed for more than one period. As a consequence, the model does not fully reflect the liquidity needs of firms which arise from a combination of fixed costs and declining demand. This is the more unfortunate as these liquidity problems are in the core of my argument in favor of particularly low interest rates in a recession. The model only indirectly takes account of these problems, by generating a general rise in liquidity preference of the suppliers of real capital, namely both private households and the private banking sector. A more realistic modeling of the firm`s liquidity situation in a recession must, however, be left to subsequent research.

4. How the business cycle rule could work in practice

Of course, things are always much more complicated in reality. One has to ask what can be saved from the theoretical idea for practical economic policy. Therefore I now leave the model and turn to a more practical point of view. First I state that the stylized facts of the current crisis fit quite well to those in my model:

- There is both much money and a huge liquidity preference in the economy, and at the same time a relatively high interest rate for firms, if not a credit clamp.

- Both consumer confidence and private bank`s confidence are depressed, with many firms being unwilling or unable to invest.
- Consumption and total demand are low, but long term interest rates are much higher than short term money interest rates are.

The core idea of the business cycle rule is to help providing firms with capital in such a situation. However, in order to make them maintain their original investment plans, it will not be sufficient just to reduce the normal market interest rate. For with declining demand and sticky costs firms are often in severe liquidity need, with any additional burden aggravating the danger of insolvency. Therefore, it is little surprise that the interest elasticity of investment is low in the crisis, as Keynes had rightly stressed.

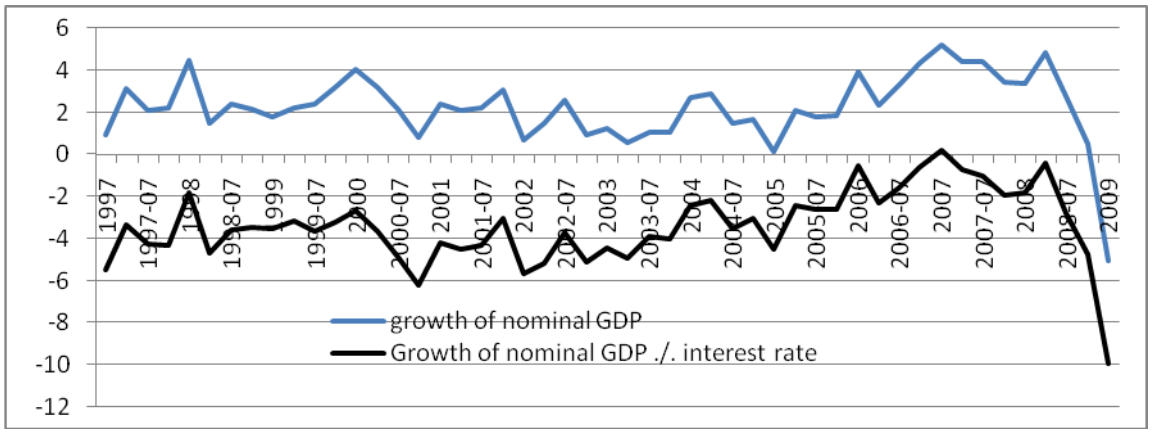
With a zero or even negative interest rate (and no deletion), there would be no additional liquidity stress from a fresh investment in the crisis. Moreover, there are nowadays many options of unbundling production and factor income, e.g. by labor time accounts and other measures like short time working and a generous unemployment insurance system. Therefore, firms could readily bypass even a deep recession without a severe cut down of investments, if only their liquidity problem were solved.

Given that, how could the business cycle interest rule be realized in practice? In order to assure an appropriate consideration of the normal entrepreneurial risk ("micro risk"), it makes sense to leave the decision on the credits to be given principally with the commercial banks. This would also preserve competitive neutrality. In contrast, the "macro risk" of insolvency due to the temporary liquidity problems should be taken away from the firms. With the business cycle interest rule applied, the macro risk is effectively taken on by the central bank. On the other hand, as there are no direct central bank credits to the firms, both the initiative and the responsibility for every credit would stay with the private banks.

In order to get an idea of the practical implications, I finally present a rough calculation for Germany in the last 12 years.[10] Between I/2007 and I/2009, the interest rate which firms had to pay for a five-years-credit was 5.64 % on average, which was about 3.4 percentage points higher than the average nominal growth of GDP (2,25 %) in that period. However, in boom periods the difference was typically much smaller with a minimum of -0.23 percentage points in I/2007, while in recession periods the difference increased up to a maximum of 9.95 percentage points in I/2009 (see Figure i).

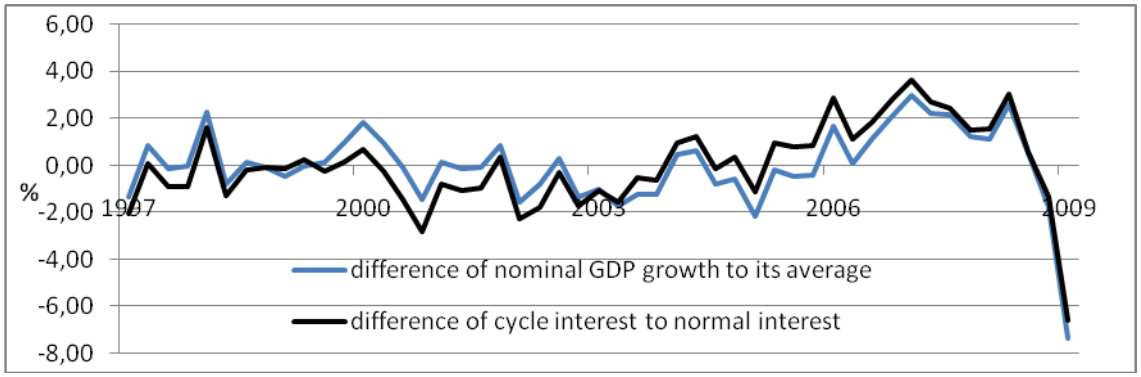
[10] The source of the following figures is Deutsche Bundesbank, monetary statistics (online).

Figure i



Suppose now that the business cycle interest rate is adjusted such that the 5-years interest rate at any time equals the nominal GDP growth rate plus the average growth-interest-spread of 3.4%. This would mean that it is equal to the normal capital market rate on average, yet with a substantial negative spread in bad times and a positive spread in good times. I assume that the business cycle credit is offered as an option, but that it is also still possible to borrow at the normal market interest rate. This could be accomplished by offering the private banks a special refinancing by the central bank, which is only available for giving credits to firms which are linked to the growth rate accordingly.

Figure ii



The result of this simple rule is depicted in Figure ii, revealing a very close parallelism between the business cycle and the business cycle interest rate. Note that it should not be possible to borrow at these rates for a shorter time than five years, in order to prevent misuse. For in case of recovery, the business cycle interest automatically increases above the normal capital market rate, thus making the former benefiters now pay a price for the benefit.

This is only meant as an illustration. Of course, it is neither possible nor even necessary to have such a mechanistic rule. However, the core idea appears worth to be pursued. In the current crisis, for example, a negative interest rate for five years firm credits of -1.7% (in I/2009) would have been implied. This surely would have been a substantial help for many firms in severe liquidity problems and thus could have helped to effectively fight the recession.

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