Fachhochschule Nordwestschweiz
Hochschule für Wirtschaft

Arbeitsberichte der
Hochschule für Wirtschaft FHNW - Nr. 1

Is there a Growth Imperative in Capitalist Economies? A Circular Flow Perspective

Discussion paper - School of Business FHNW

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ISSN	Nr. 1662-3266 (Print)
	Nr. 1662-3274 (Internet)
ISBN	Nr. 978-3-03724-092-2
Institute	Institute for Competitiveness and Communication, ICC
Date	February, 2008

Abstract

This paper postulates the existence of a growth imperative in capitalist economies. The argument is based on a simple circular flow model of a pure credit economy, where production takes time. In this economy positive growth rates are necessary in the long run in order to enable firms to make profits in the aggregate. If the growth rate falls below a certain positive threshold level, firms will make losses. Under these circumstances they will go out of business, which moves the whole economy into a downward spiral. According to our model, capitalist economies can either grow (at a sufficiently high rate) or shrink if the growth rate falls below the positive threshold level. Therefore, a zero-growth economy is not feasible in the long run.

Key Words: Growth, Profits, Bank Money, Credit

JEL classifications: E12, E40, E44, E50

Olten, February, 2008

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Contents

1 Introduction

In a recent article, Gordon and Rosenthal (2003) have postulated a growth imperative for firms operating in competitive markets, as they are typical for modern capitalist economies. The authors argue that the risk of going bankrupt is too high in an economy, where there is a zero or negative average growth rate of consumption, investment and the capital stock over the years. Only positive mean growth rates of a sufficiently high level lower the long-run probability of bankruptcy to a level, which is low enough to be tolerable for firms.

In this paper we provide an alternative explanation for a growth imperative in modern capitalist economies, which are also credit money economies. Our argument is based on a simple circular flow model of a pure credit economy, where production takes time. According to our model, a sufficiently high positive mean growth rate is necessary because otherwise firms, in the aggregate, will not be able to realize profits. And firms, which are not able to realize profits over longer periods, will stop investing and eventually go out of business. This in turn will cause a downturn of the whole economy, as also implied by the model of Gordon and Rosenthal (2003). Based on this argument we can derive an important conclusion concerning the role of growth in capitalist economies. In the long run, abstracting from business cycle fluctuations, capitalist economies can either grow (at a sufficiently high rate) or shrink if the growth rate falls below the positive threshold level. A zero-growth economy is not feasible in the long run. This result may also help to explain why economic growth has always been the major goal of economic policy in capitalist economies even though average subjective well-being does not increase any further along with income in developed economies (see, for example, Blanchflower and Oswald, 2004; Easterlin, 2001)[1]

Establishing the growth imperative, as it is postulated in this article, requires a departure from conventional, neoclassical growth theory (including new growth theory), where a zero-growth (or even negative-growth) economy would always be feasible. In these models growth is a matter of taste (Gordon and Rosenthal, 2003, p. 26) and it is the preference between present and future consumption, which determines saving and investment. In the original Solow growth model even saving does not matter, once the economy has reached a steady state. The exogenous growth rates of population and technological progress determine the growth rate in the steady state and if these growth rates become zero, the growth rate of the economy becomes zero as well.

However, neoclassical growth theory abstracts from important institutional features of modern capitalist economies. The most important one concerns the ability of banks to create additional money by credit expansion. This essential feature of modern capitalist economies was emphasized by Keynes and Schumpeter. They both came to the conclusion that modern capitalist economies cannot be described in the same way as traditional economies, where credit money did not exist yet. Keynes (1933a, 1933b) distinguished between “real exchange economies”, where money is just used as an instrument that facilitates the exchange of goods and services, and “monetary economies”, where banks possess the ability to increase the money supply by credit expansion. Schumpeter (1912) made a similar distinction between “pure exchange economies” and “capitalist economies”. Both economists also recognized that growth would not be possible without banks and their ability to increase the supply of money. Keynes (1937, p. 667) stated that

“…the banks hold the key position in the transition from a lower to a higher scale of activity.”

And Schumpeter (1927, p. 86, translated by the author) wrote:

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[1] The existence of a growth imperative also provides a challenge to concepts of sustainable development, which have criticized the goal of economic growth due to its negative impacts on the environment (see, for example, Daly, 1996)

“Without the creation of new purchasing power by bank credits… financing of industrial development in modern economies would have been impossible.”

Keynes and Schumpeter also stressed the fact that an increase in investment spending cannot be financed by previous saving, if the economy is supposed to grow (see Binswanger, 1996; Bertocco, 2007). Whenever saving increases, it reduces consumption by the same amount. Therefore, if investment is financed by additional saving, the increase in demand by investment spending is offset by a corresponding decrease in consumption spending.[2] Under these circumstances, the economy cannot expand. According to Keynes, it is investment that determines saving and not the other way around. He writes (1939, p. 572):

“Credit expansion provides not an alternative to increased saving but a necessary preparation for it. It is the parent, not the twin of increased saving.”

This view is radically different from neoclassical growth theory, where investment is determined by saving and where credit expansion has no role to play.

Furthermore Keynes stressed the fact that firms’ goal is the realization of profits in monetary terms (Keynes, 1933b, p. 82):

“An entrepreneur is interested, not in the amount of product, but in the amount of money which will fall to his share. . .. The explanation of this is evident. The employment of factors of production to increase output involves the entrepreneur in the disbursement, not of product, but of money.”

The relevance of firms’ “monetary profits”, as they are shown in the income statements, can hardly be overstated in a modern capitalist economy. If a firm is not able to create profit expectations, neither banks will lend money nor will anybody invest in this firm. In the real world, banks and private investors will only invest, if, on average, they are compensated by sufficiently large amounts of money in the future (future profits). Moreover, a company, which is not able to generate expectations of future profits, has no value on the stock exchange, as the fundamental value of a company is determined by expected dividends, which are a portion of firms’ expected profits.

Not many economists after Keynes and Schumpeter (not even so-called Keynesians or Schumpeterians) paid attention to the role of money and credit in the growth process, which features so prominently in Keynes’s and Schumpeter’s work.[3] Only one leading exponent of growth theory, Domar (1957, p. 92), recognized the importance of money creation, when he wrote:

“ It is not sufficient… that savings of yesterday be invested today, or, as it is often expressed, that investment offset savings. Investment today must always exceed the savings of yesterday…. An injection of new money… must take place every day.”

But in spite of this remark Domar did not further investigate the link between money creation and growth. Mainstream economic theory has continued to neglect this link in spite of the fast growing importance of financial markets and institutions. Money creation and growth have been treated as two totally different phenomena, as growth (in the long run) is not supposed to be influenced by monetary variables.

[2]To be precise, this is true for a closed economy. In an open economy an increase in investment can also be financed by an inflow of foreign savings and in this case there is no corresponding decrease in domestic consumption spending. But for the aggregate world economy, the situation is the same as in a closed economy.

[3] Keynes developed his ideas on the crucial role of credit expansion by banks in some articles, which were published after the *General Theory*. In the *General Theory* Keynes did not tackle this issue because he assumed that all agents have at all times sufficient money to carry out desired expenditure. But few economists paid attention to Keynes’s writings after the *General Theory* and, therefore, these writings soon fell into oblivion in spite of Keynes’s fame as an economist.

The few economists who continue to emphasize the link between money creation and growth are mainly associated with the "post-Keynesian school of thought" or of the related "monetary circuit school of thought".[4] These "schools of thought" emphasize the fact that commercial banks are able to create money by the creation of credit, as "loans make deposits". They advocate the theory of "endogenous money creation", where the money supply is not exogenously determined by the central bank. Instead the money supply depends on banks' lending activity (or the demand for loans by firms) and the central bank accommodates their additional need for reserves and "deposits make reserves" (see, for example, Wray, 1991). Furthermore, many post-Keynesians and Circuitists also acknowledge that production takes time implying that investment projects must be financed before they lead to profits at a later date. Taken together "endogenous money creation" and the fact that production takes time establish an important role for banks and credit creation in the growth process.[5] Banks then "hold the key position in the transition from a lower to a higher scale of activity" as described by Keynes (1937). Otherwise it is not possible to finance an increase in productive activities. "In a monetary economy of production, credit is needed to enable firms to continue and expand production. There is a definitive link between bank credit and economic growth." (Rochon and Rossi, 2004, p. 146). However, to my knowledge, none of the exponents of the "post-Keynesian" or the "monetary circuit" school of thought has derived a growth imperative up to date, as Gordon and Rosenthal did in their 2003-article.

The aim of this article is to show that capitalist economies indeed need to grow, as otherwise firms will not be able to realize profits. In order to demonstrate this relation, we construct a simple circular flow model of an economy, which incorporates some further institutional details of modern capitalist economies as outlined in Section 2. Section 3 shows some simulation results based on the model developed in Section 2, which illustrate the growth imperative. Section 4 concludes and summarizes the main arguments.

[4]There are, of course, some differences between these schools of thought as well as differences between adherents of the post-Keynesian school (such as "horizontalists" versus "structuralists"). But they all agree on the importance of credit money in capitalist economies.

[5]This link is also emphasized by Binswanger, H.C. (2006), who describes the economic process as a "growth spiral".

2. The model

The following model assumes a closed, pure credit economy, where the only exchange media are bank liabilities (deposits). There are three sectors: households, firms and banks, while the government is omitted in order to keep the model as simple as possible.

The economy is modeled from a circular flow perspective, and, except for real capital (a stock), it only includes flow variables. Furthermore, the model takes care of the temporal ordering of financial flows and, therefore, is a multi-period model. During one period, households, firms and banks spend their income once. This implies that the income velocity of money is constant and equal to one.

The main purpose of the model is to demonstrate how firms' profits are linked to money creation and growth, which allows us to establish the growth imperative postulated at the beginning of this article. Due to its simplifications, the model is not suited to explain business cycle fluctuations. It highlights the link between bank credit, growth and profits in the long run. Furthermore, the model neither aims explaining the sources of real growth, nor does it aim giving a full description of a modern capitalist economy. In this respect, the model should be distinguished from some recent modeling attempts in the post- Keynesian tradition (for example, Godley, 1999; DosSantos, 2006; Lavoie and Godley, 2006), who set out to provide "comprehensive, fully articulated, theoretical models", which could serve as "blueprint for an empirical representation of a whole economic system" (Godley, 1999, p. 394). The structure of the model, however, is similar to Lavoie's "growth model with private money" (Lavoie, 2001), the model of a "pure credit-money economy" presented in Park (2004) and the .. model presented in Beltrani (1999).

2.1 Major premises

Most importantly our model is built on some premises, which are characteristic for modern capitalist economies and which will turn out to be essential for establishing the growth imperative. These premises are:

1. An increase in firms aggregate spending must be financed by credit expansion of banks (an increase in the money supply)[6] and cannot be financed by additional saving, because in this case the increase in aggregate demand by investment spending is offset by a corresponding decrease in consumption spending. "Financing investment by additional saving is a zero-sum game, which only reallocates financial resources." (Chick, 2000, p. 133)
2. Production takes time. The output of goods produced in the current period is not available for sale until the next period.
3. The aggregate business sector must be able to realize profits meaning that the sum of profits (after interest) of successful firms must exceed the sum of losses of non-successful firms.
4. Banks have to increase their capital on the liability side of their balance sheet (equity and reserves) along with the increase in loans, as a certain fraction of loans (a risky asset) must be covered by owners' capital. Therefore, a portion of banks income is not put back into circulation but used to increase banks' capital, which does not represent money.

[6] This is the „initial finance" needed by firms in the beginning of the period, as described in Graziani (1990) or Lavoie (2001).

Premises 1. to 3. are common assumptions in post-Keynesian approaches (see, for example, Davidson 1986; Wray, 1991; Chick, 2000; Lavoie and Godley, 2006) or monetary circuit approaches (for example Graziani, 1996). Premise 4, on the other hand, has not been considered to be a crucial feature of capitalist economies so far. [7] However, in some recent contributions, Binswanger, H.C. (2006, p. 331) and Douthwaite (1999, p. 24) have argued that one should not overlook the development of the liability side of banks' balance sheets in a credit money economy. And indeed, as we will see from the simulations presented in Section 3, Premise 4 is crucial for establishing the growth imperative. Therefore, we explain this premise in a bit more detail.

In the simple model presented in this section, banks' income exclusively comes from interest payments,[8] which they receive from firms (fees and commissions as further sources of income are neglected). Therefore, in each period, an amount of money equal to the interest payments is removed from circulation by banks, as this amount of money is withdrawn from firms' accounts (which represent money) and put into in accounts in the banks' own names (which do not represent money). Of course, a large share of this income is put back into circulation, when banks pay wages to their employees (the amount is credited to employees' accounts), pay their operating expenses and invest in machines and equipment (the amount is credited to firms' accounts) and pay out dividends (the amount is credited to the accounts of shareholders).[9] However a portion of banks' income remains in accounts in the banks own name and, therefore, there is a "net removal" of money from circulation. This amount serves to increase owners' capital, which, in a sound financial system, must grow more or less in line with loans. If this is not the case, owners' capital will fall continuously in relation to loans, which increases the risk associated with the banking system as financial crises and bank panics will become more frequent.

If we look at the income statements and balance sheets of commercial banks in various countries (OECD database), we can observe that banks' capital (including reserves) on the liability side of the consolidated balance sheet of commercial banks has grown substantially from 1979 to 2003. In the US the average annual growth rate of banks' capital was 8.4 percent, while loans, on average, grew at a rate of 6.6 percent. And in Germany the average annual growth rate of banks' capital was 9.3 percent, while loans grew at a rate of 7.0 percent during the same period. These growth rates imply that banks have used a substantial portion of their income to increase their own capital, which therefore is not put back into circulation and lost to the rest of the economy.

An increase in capital along with loans is, to a certain degree, also enforced by capital adequacy ratios, which require that owners' capital may not fall below a certain fraction of banks' risky assets. The Basle Committee on Banking Regulation and Supervision established these capital adequacy ratios in the early 1990s and they are enforced in all major economies today.[10] Traditionally, loans are the most important risky asset on a bank's balance sheet. Therefore, an increase in loans also requires an increase in owners' capital, as otherwise capital adequacy ratios will fall below the required minimum level.

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[7]For example, Park (2004), who provides a post-Keynesian model of a credit money economy, assumes that interest revenue to banks is entirely paid out to those who work for banks.

[8]More precisely it is net interest payments (the difference between interest received and interest paid), which is equal to banks' income, because banks also have to pay interest to customers, who hold money at their bank accounts.

[9]In the following model, we will only consider wages paid to banks' employees and neglect operating expenses, investment in machines and equipment, and dividends.

[10]The exact definition of these capital adequacy ratios has varied over time (from Basle I to Basle II), as the Basle Committee tries to distinguish between various categories of risky assets.

2.2 Institutional and behavioral assumptions

2.2.1 Firms

There are two types of firms: firms in the consumption goods sector and firms in the investment goods sector. In each period business firms in the consumption goods sector produce goods X using labor N and capital K. Labor costs are equal to wages, WC, paid to households, interest Z paid to banks and the depreciation of real capital, dK, where d stands for the depreciation rate. Because production takes time (Premise 2), we assume that the output of consumption goods X_{t-1} produced in period t - 1 is not available for sale until the next period t. Therefore, when period t begins, firms will be holding stocks of last period's output X_{t-1}, which are ready for sale at a price P_t. Firms receive income in period t at an amount equal to P_tX_{t-1}, which in turn is equal to consumption C_t in period t.

$$C_t = P_tX_{t-1}. \qquad (1)$$

Firm's costs in period t are all associated with the production of the consumption goods in period t – 1. These costs consist of wages, WC_{t-1}, paid to households, interest, Z_{t-1}, paid to banks and depreciation of the capital stock, dK_{t-1}. Profits (net of interest payments on loans), Π_t, are determined by firms income in period t, which is equal to spending on consumption goods, C_t,[11] minus the costs associated with the production of X_{t-1}, which include wages, WC_{t-1}, interest payments, Z_{t-1}, and depreciation, dK_{t-1}

$$\Pi_t = C_t - WC_{t-1} - Z_{t-1} - dK_{t-1}. \qquad (2)$$

At the beginning of period t a portion of profits from the previous period, $(1 – r)\Pi_{t-1}$, is paid out as dividends, D_t, and a portion, $r\Pi_{t-1}$, is retained (business saving) and fully reinvested in the company.

$$D_t = (1 – r)\Pi_{t-1}, \qquad (3)$$

Therefore, r ($0 \leq r \leq 1$) indicates the fraction of profits, which are reinvested in the firms.

Firms in the consumption goods sector demand loans, L_t, from banks at the beginning of period t (initial finance). As we consider a pure credit money economy, loans, L_t, are also equal to the money supply, M_t, in period t. A portion of these loans, cL_t, together with retained profits from the previous period, $r\Pi_{t-1}$, is used to finance investment in real capital of period t, I_t

$$I_t = r\Pi_{t-1} + cL_t \ . \qquad (4)$$

[11]In the terminology of Graziani (1990) or Lavoie (2001), C_t represents the "final finance" as firms recover their spending on wages, WC_t, their spending on investment, I_t, their dividend payments D_t, and a portion of their interest payments Z_t. See equation (8).

Equation (4) can be interpreted as an investment function, where investment depends on profits from the previous period, Π_{t-1}, and on firms' demand for loans, L_t, which is determined by the exogenous growth rate w (see equation (11)). The parameter c ($0 \leq c \leq 1$) indicates the portion of loans, which is used for financing investment and, therefore, c is termed investment ratio. The other portion of loans, $(1 - c)L_t$, is used to finance the wage bill

$$WC_t = (1 - c)L_t. \tag{5}$$

A constant amount of bank loans provides the "revolving fund of finance" (see Wray, 1991, p. 956), which allows firms to finance a constant level of spending. If firms plan to expand their business activities, bank loans also have to be expanded to finance a higher level of spending. We can either assume that firms pay back their loans L_t at the end of period t and then borrow an amount L_{t+1} in period $t + 1$. Or we can also assume that loans are not paid back but that firms always borrow some more money, i.e. the difference between L_{t+1} and L_t, in order to increase spending from period t to period $t + 1$.

The stock of real capital in the consumption goods sector at the end of period t, K_t, is equal to the capital stock inherited from period $t - 1$, K_{t-1}, minus deprecation, dK_{t-1}, plus investment in period t, I_t

$$K_t = (1 - d)K_{t-1} + I_t. \tag{6}$$

Additionally, there are also firms producing investment goods (firms in the investment goods sector) but they are not explicitly modeled in this simple three-sector model. It is assumed that all money spent on investment goods, I_t, is paid out as wages to households WI_t.

$$WI_t = I_t\,. \tag{7}$$

By making this simplifying assumption, we abstract from profits and dividends of firms in the investment goods sector and we also neglect their own investment expenses. These variables could easily be included, but they increase the complexity of the model without changing its basic message.

2.2.2 Households

In the beginning of period t households receive income from wages, WC_t, which they earn by working for firms in the consumption goods sector, from wages, WI_t, which they earn by working for firms in the investment goods, sector and wages, WB_t, which they earn by working for banks. They also receive dividends D_t, as they own all the shares of firms in the consumptions goods sector. Furthermore, we make the simplifying assumption that households do not save and that they spent all their income during the same period on consumption goods C_t. Therefore, households' spending is captured by the following equation.

$$C_t = WC_t + WI_t + WB_t + D_t. \tag{8}$$

It would also be possible to include households' saving in the model without changing its basic message. However, in order to keep the model as simple as possible, we only consider business saving (retained profits), which, in most economies represents the largest share of total saving. Moreover, households do not receive loans from banks and there is no household debt.

2.2.3 Banks

At the beginning of period t, banks provide loans L_t to business firms, which they credit to firms' bank accounts (loans make deposits). In exchange for these loans they receive interest payments Z_t at the end of the same period t. This is their only income and we neglect other sources of banks' income (mainly fees and commissions). The interest paid on loans, Z_t, is equal to the amount of loans, L_t, times the interest rate z

$$Z_t = zL_t. \tag{9}$$

A portion b of the interest income Z_t is paid out to the employees of banks at the beginning of the next period t + 1. Therefore, wages paid out in period t, WB_t, are equal to the fraction of interest income from period t - 1, bZ_{t-1}, as they are financed by banks' income of period t – 1

$$WB_t = bZ_{t-1}. \tag{10}$$

The other portion of interest income, (1 - b)Z_{t-1} is used to increase banks' capital as stated in Premise 4. This portion does not flow back to the economy and the money supply in the economy is diminished by the same amount. Therefore, we denote b ($0 \leq b \leq 1$) the banks' payout ratio, as, in our model, it determines the portion of banks' income, which banks pay out to their employees.

In fact, interest income Z_t of banks should be interpreted as net interest income, as banks also pay interest to households and firms, who all have accounts at banks in a pure credit money economy. Z_t stands for interest paid by firms for borrowing money from banks minus the interest paid to the holders of bank deposits. However, for simplicity, we just consider the net income flow to banks. Furthermore, same as for firms in the investment goods sector, we abstract from profits, dividends and investment of banks. Interest income of banks is either spent for wages, WB, or it used to increase owners' capital.

2.3 Profits and growth in the steady state

Equations (1) to (10) represent a system of 10 difference equations with 11 endogenous variables in period t (C_t, P_t, Π_t, D_t, I_t, L_t, K_t, Z_t, WC_t, WI_t, WB_t). Therefore, we need one more equation in order to find a solution of this system. The additional equation (11) describes the growth in loans, which is determined by the exogenously given growth rate w:

$$L_t = (1 + w)L_{t-1}. \tag{11}$$

The growth rate of loans, w, captures the average increase of firms' demand for loans, which in reality will depend on their optimism about future economic development (animal spirits). It is the crucial exogenous variable in our model. In the steady state all variables will grow at the growth rate, w, as will be shown in Section 3. Therefore, w is also the growth rate of the economy in the steady state and it determines the magnitude of firms' profits.

If we combine the system of difference equations (1) to (11) we get the following linear constant-coefficient difference equation for Π_t:

$$\Pi_t = \quad (1-r)\Pi_{t-1} + r\Pi_{t-1} + cL_t + (1-c)L_t + bzL_{t-1} - dK_{t-1} - (1-c)L_{t-1} - zL_{t-1}$$

or

$$\Pi_t = \quad \Pi_{t-1} + L_t - (1-c+z(1-b))L_{t-1} - dK_{t-1}. \qquad (12)$$

Current profits are a function of current loans and of past profits and past loans either directly or indirectly through K_{t-1}. The capital stock K_{t-1} is determined by past investment, which in turn is determined by past profits and loans.

If we use (11) and substitute for L_t we can write

$$\Pi_t = \Pi_{t-1} + (w + c - z(1-b))L_{t-1} - dK_{t-1}. \qquad (12a)$$

The system will be in a steady state, once profits (and also the other variables) grow at the same rate as loans. Therefore we can define the steady state by a constant profit-to-loans ratio in the consumption goods sector, π

$$\pi = \frac{\Pi_{t-1}}{L_{t-1}} = \frac{\Pi_t}{L_t}. \qquad (13)$$

We find the stationary level for π by using (4) and substituting for I_t, in equation (6). In this case, the capital stock K_t can be expressed as

$$K_t = (1-d)K_{t-1} + r\Pi_{t-1} + cL_t. \qquad (14)$$

Starting at time t - 1 and substituting recursively, we get

$$K_{t-1} = cL_{t-1} + (1-d)cL_{t-2} + (1-d)^2cL_{t-3} + \ldots + (1-d)^{n-1}\mathrm{c}L_{t-n} + r\Pi_{t-2} +$$
$$(1-d)r\Pi_{t-3} + \ldots + (1-d)^{n-1}\mathrm{c}L_{t-n-1} + (1-d)^{n-1}K_{t-n}. \qquad (15)$$

After many periods, as n becomes very large, the last term, $(1-d)^{n-1}K_{t-n}$, goes towards zero. Therefore, in the steady state, the capital stock is just determined by past loans and profits, which have always grown at the rate w. In this case we can express K_{t-1} as

$$K_{t-1} = cL_{t-1}\left[1 + \frac{1-d}{1+w} + \left(\frac{1-d}{1+w}\right)^2 + \ldots + \left(\frac{1-d}{1+w}\right)^n\right] + r\Pi_{t-2}\left[1 + \frac{1-d}{1+w} + \left(\frac{1-d}{1+w}\right)^2 + \ldots + \left(\frac{1-d}{1+w}\right)^n\right]$$

(16)

If n goes towards infinity, the terms in brackets on the right hand side of the equation are infinite converging geometric series, as $\frac{1-d}{1+w} < 1$. Applying the formula for the sum of an infinite converging geometric series we get

$$K_{t-1} = \frac{c(1+w)}{d+w} L_{t-1} + \frac{r(1+w\ )}{d+w} \Pi_{t-2} \tag{17}$$

Substituting (17) for K_{t-1} in (12a) leads to

$$\Pi_t = \Pi_{t-1} + (w + c - z(1-b))L_{t-1} - \frac{dc(1+w)}{d+w} L_{t-1} - \frac{dr(1+w\ )}{d+w} \Pi_{t-2} \tag{18}$$

In the steady state, Π_t and L_t must grow at the same rate w. Therefore, if we divide (18) by Π_{t-1} and use condition (13), the profit-to-loans ratio in the steady state, π, is

$$\pi = \frac{w + c - z(1-b) - \dfrac{dc(1+w)}{d+w}}{1 + w - \dfrac{d(1-r)+w}{d+w}}. \tag{19}$$

The denominator of (19) will always be positive, as $\frac{d(1-r)+w}{d+w} < 1$. Therefore, it is sufficient to analyze the nominator of (19) in order to determine how π depends on w. Taking the first derivative of the nominator of (19) with respect to w, we get $1 - \frac{dc(d-1)}{(d+w)^2}$, which is always positive. Therefore, the profit-to-loans ratio, π, is increasing in the growth rate w.

Furthermore we can also see from (19) that a zero growth rate (w = 0) will result in a negative value of π, since profits (the nominator) will be negative in this case. We get

$$\pi = \frac{-z(1-b)}{r} < 0. \tag{20}$$

If there is no growth, firms in the consumptions goods sector will make losses. Hence, we can conclude from (19) and (20) that a negative or zero-growth rate will result in losses and that there is a minimal positive growth rate, at which the economy must grow so that firms can realize profits.

In order to determine this minimal growth rate, we define a particular steady state, where profits are always equal to zero. We will call the corresponding growth rate, w_o, zero-profit growth rate. It is characterized by the condition

$$\frac{\Pi_{t-1}}{L_{t-1}} = \frac{\Pi_t}{L_t} = \Pi_t = \Pi_{t-1} = 0. \tag{21}$$

In this special case K_{t-1} can be expressed as

$$K_{t-1} = cL_{t-1}\left[1 + \frac{1-d}{1+w_o} + \left(\frac{1-d}{1+w_0}\right)^2 + ... + \left(\frac{1-d}{1+w_0}\right)^n\right]. \tag{22}$$

Setting (19) equal to zero allows us to calculate the growth rate w_o, which is the positive root of the equation[12]

$$w_0 = \frac{-c - d + cd + z(1-b) + \sqrt{[c + d - cd - z(1-b)]^2 + 4dz(1-b)}}{2}. \tag{23}$$

The zero profit growth rate w_o depends on the values of the parameters, *c*, *d*, *z*, *b*, while firms dividend policy, as expressed by *r*, is irrelevant in this respect.

From (19) and (20) follows that firms are only able to realize profits if the steady state growth rate *w* exceeds w_o. If *w* falls below w_o, firms will make losses. Furthermore, if either the interest rate, *z*, or the depreciation rate, *d*, are zero, the zero-profit growth rate is zero as well. The same is also true if the payout ratio *b* is equal to 1. In these special cases any positive growth rate *w* of the economy will ensure positive profits.

The first derivatives of w_o in (23) with respect to the parameters *c*, *d*, *z*, *b* have no definite sign. Therefore, it is not possible to generally determine the impact of changes in these parameters on the zero-profit growth rate without imposing further restrictions on parameter values. But we can analyze their impact on w_o by using plausible values for these parameters in the following section.

Note also that the model describes the economy in purely nominal terms. The model establishes a necessary condition (the growth imperative) for the realization of aggregate profits in a circular flow framework, where credit expansion is needed to finance an increase in productive activities and where production takes time. Of course, this is not a sufficient condition for growth. Profits and nominal growth must eventually be supported by real economic growth. An increase in loans without a corresponding increase in productive activities (unproductive loans) just results in inflation and there will be no growth in real terms under these circumstances. In order to get the full picture of the growth process our model must be combined with a growth model, which explains growth in real terms. But if we neglect the circular flow perspective, which is highlighted in our model, we miss an important aspect of the growth process. The circular flow perspective allows us to see a link between profits and growth, as,

[12] The negative root cannot be a solution, as in this case the infinite geometric series of (22) is not converging anymore.

in the steady state, aggregate profits depend on the growth rate of the economy. And this link results in a growth imperative given the institutional features, which are incorporated in our model.

3. Simulations

In the following simulations, no significance should be attributed to the magnitude of the endogenous variables, since these values depend on the arbitrary initial values X_0, Π_0, L_0, K_0, Z_0, WC_0. The focus of the simulations is on the development of firms' profits over time and its relation to the growth rate of the economy.

We will assume plausible values for the parameters, *r*, *c*, *z*, *d* and *b* in order to make our model economy as realistic as possible. However, we have to keep in mind that our economy is simplified and that there is no government and no foreign sector. In particular we assume that $r = 0.5$, which implies that 50 percent of firms' profits are reinvested, while 50 percent are paid out as dividends. The value for the investment ratio *c* is chosen to be 0.4. This value for the investment ratio leads to a share of investment in the steady state, which is about 30 percent of GDP (which in our model consists only of consumption and investment). The interest rate is set at 10 percent ($z = 0.1$) and the depreciation rate *d* is also assumed to be 10 percent ($d = 0.1$).

Finally, we also have to choose a realistic value for banks' payout ratio *b*. Based on data of the income statements and balance sheets of commercial banks in the OECD database ranging from 1979 to 2003, we can calculate the average increase in capital and reserves as a percentage of the average net interest income over these years. In the US this percentage is 18.3 percent and in Germany it is 19.3 percent. Therefore, we choose a value of 0.8 for banks' payout ratio ($b = 0.8$) implying that about 20 percent of banks' income is not put back into circulation.

The simulations are run for 1000 periods. Figures 1 to 3 show the results from period 200 to 1000. During the first 200 periods, results are strongly influenced by the arbitrarily chosen initial values for the variables, which also determine the dynamics of the system while moving towards the steady state. The system exhibits oscillatory convergence towards the steady state, but after 200 periods these oscillations have largely died out.

Figures 1 to 3 about here

From Figure 1 we can see that a growth rate, *w*, of 0.5 percent enables firms to make positive profits, which in the steady state, also grow at a rate of 0.5 percent. The return to capital, which corresponds to the growth rate of 0.5 percent, is equal to 0.1 percent, as can be seen from Figure 2. However, if the growth rate drops from 0.5 to 0.4 percent, profits turn into losses, which, again will grow at a rate of 0.4 percent in the steady state. Therefore, losses will constantly increase in absolute value, which is not feasible in the long run. The corresponding rate of profits on firms' capital in the steady state is –0.1 percent as shown in Figure 2. Although consumption (and also investment) would still grow at a rate of 0.4 percent in this economy (Figure 3), firms would always make losses. In order to understand this result, we have to remember that, in the steady state, also the money supply grows at a rate of 0.4 percent. However an inflow of new money at this rate is not sufficient to compensate for the portion of interest payments to banks, which is used to increase banks' capital and which does not flow back to the economy. The inflow of new money by credit expansion must exceed the outflow of money due to an increase in banks' capital, which is the case at a growth rate of 0.5 percent but not at a growth rate of 0.4 percent.

Using equation (23) we can calculate the value of the growth rate, w_o, where firms will make zero profits. This growth rate turns out to be 0.45 percent. Whenever the growth rate of our model economy exceeds 0.45 percent, firms will make profits. If the growth rate falls below 0.45 percent, profits are not feasible any more and firms will make losses.

A growth rate of 0.45 percent does not appear to be very high and, therefore, one could conclude that already a growth rate of 0.5 percent will be sufficient, as it ensures positive profits. However, in reality, the required return may substantially exceed the interest rate because of the risk associated with investment projects. Firms will only borrow additional money from banks, if they expect to make profits, which are on a sufficiently high level. In this case, the growth imperative becomes stronger than implied by the zero-profit growth rate and the economy must grow at a higher rate.

In order to analyze the influence of the parameters z, b, d and c on the zero-profit growth rate, w_o, we will vary the value of each single parameter, while holding the other parameters constant at the values chosen for the simulation shown in Figures 1 to 3. This allows us to find out, how the growth imperative is affected by these parameters.

3.1 Variations in the interest rate

Intuitively, we would expect a positive relation between the zero-profit growth rate, w_o, and the interest rate z. The higher the interest rate gets, the larger is the share of income, which firms have to pay to banks. And since a constant fraction of this income does not flow back into the economy, the loss resulting from interest payments increases along with the interest rate. This intuition turns out to be correct as is shown in Figure 4.

Figure 4 about here.

There is a positive linear relationship between the interest rate and the zero-profit growth rate. For example, if the interest rate is 5 percent instead of 10 percent, the zero-profit growth rate decreases to 0.23 percent. On the other hand, if the interest rate increases to 15 percent, the zero-profit growth rate increases to 0.69 percent. Generally, the growth imperative gets the stronger the higher is the interest rate.

3.2 Variations in banks' payout ratio

We expect the zero-profit growth rate to decrease with banks' payout ratio, as a higher portion of interest payments to banks is spent again on goods and services.

Figure 5 about here.

Figure 5 shows that there is indeed a negative linear relation between banks' payout ratio and the zero-profit growth rate. If, for example, the payout ratio increases from 0.8 to 0.9, the zero-profit growth rate drops to 0.22 percent. On the other hand, if the payout ratio decreases to 0.7, the zero-profit growth rate increases to 0.69 percent.

3.3 Variations in the depreciation rate

An increase in the depreciation rate increases the costs of production and, therefore, has a negative impact on firms' profits. Therefore, the zero-profit growth rate should be increasing in the depreciation rate, as a higher inflow of money is necessary to cover the higher costs. Figure 6 shows the relation between the depreciation rate and the zero-profit growth rate, which is positive and convex.

Figure 6 about here.

At low levels of deprecation, an increase in the depreciation rate has a large positive impact on the zero-profit growth rate, which however becomes the weaker the more the depreciation rate increases. Starting from the value of 10 percent, which we have chosen for our simulation, we can see that a decrease in the depreciation rate to 5 percent lowers the zero-profit growth rate down to 0.24 percent. If, on the other hand, the depreciation rate increases to 15 percent, the zero-profit growth rate increases to 0.63 percent. Overall, we can also conclude that the growth imperative becomes the more prevalent the faster real capital depreciates.

3.4 Variations in the investment ratio

Recall that the investment ratio determines the portion of firm's loans c, which is used to finance investment, while the other portion, $1 - c$, is used to finance the wage bill. At first sight, it does not seem to be obvious, how a variation in the investment ratio should affect the zero-profit growth rate. Figure 7 reveals that there is a negative relation, which is the stronger, the lower is the investment ratio.

Figure 7 about here

An investment rate of 0.3 increases the zero-profit growth rate to 0.56 percent, while an investment rate of 0.5 decreases the zero-profit growth rate to 0.38 percent.

The decrease in the zero-profit growth rate can be explained by the fact that current labor costs are fully accounted as costs in the next period, while only a portion (as indicated by the depreciation rate) of the investment expenses are accounted as cost in the next period. Therefore, the more loans are used to finance an increasing wage bill instead of financing additional investment, the higher is the growth rate, which is necessary to ensure positive profits. If the depreciation rate is equal to 1, and if capital costs, therefore, are fully accounted in the next period, the investment ratio has no more influence on the zero-profit growth rate, which can be verified by using equation (23).

Generally, we can conclude that the growth imperative is strong in an economy, where interest rates are high, where banks keep a large portion of their interest income at their own accounts in order to increase owners' capital, where real capital depreciates fast, and where loans are mostly used to increase the wage bill instead of financing investment in new capital. However, the last finding should be interpreted with caution. It does not generally imply that the more an economy invests in capital the less prevalent is the growth imperative in that economy. It just implies that the zero-profit growth rate in an economy is the lower the more a given amount of loans is used to finance investment in real capital.

4. Conclusion

This paper postulated the existence of a growth imperative in capitalist economies. The argument is based on a simple circular flow model of a pure credit economy, where production takes time. In this economy positive growth rates are necessary in the long run in order to enable firms to make profits in the aggregate. If the growth rate falls below a certain positive threshold level, the so-called zero-profit growth rate, firms, in the aggregate, will make losses. Under these circumstances they will go out of business, which moves the whole economy into a downward spiral. Therefore, according to our model, capitalist economies can either grow (at a sufficiently high rate) or shrink, if the growth rate falls below the positive threshold level. A zero-growth economy is not feasible in the long run. This conclusion is in accordance with Gordon and Rosenthal (2003), who also establish a growth imperative for capitalist economies. However, the explanation provided in this paper differs substantially from the explanation offered by Gordon and Rosenthal (2003).

The growth imperative established in this paper crucially depends on some institutional features of capitalist economies, which are neglected in conventional growth theory. Therefore, the growth imperative can only be understood, once we are ready to include these features into theory. Most importantly, this concerns the role of banks, who are able to create additional money by credit expansion. Such a credit expansion is necessary in order to finance an increase in aggregate spending, as has been argued by Keynes and Schumpeter. If additionally, we also take care of the fact that production takes time, we can establish a fundamental link between credit expansion (money creation), aggregate spending and growth. Whenever aggregate spending increases due to credit expansion, firms immediately receive more income, as the newly created money is spent on goods and services. But these goods and services have been produced previously (production takes time) and, therefore, yesterday's supply meets today's (higher) demand, which explains how firms are able to make profits in the aggregate, as long as credit expansion continues. A continuous credit expansion enables a continuous increase in aggregate spending, which in turn results in profits and, as long as firms operate successfully, continuous growth. We can indeed observe this development over the history of capitalist economies, if we abstract from short-run business cycle fluctuations.

However, there is one more crucial feature of capitalist economies, concerning the role of banks, which turned out to be essential for establishing the growth imperative. Banks have to increase their capital (equity and reserves) along with the increase in loans, as a certain fraction of loans must be covered by owners' capital. Therefore, a portion of banks income, which in our model is equal to interest payments, is not put back into circulation but used to increase bank owners' capital. This represents a constant loss of income to firms, as some portion of their interest payments to banks cannot be retrieved. This loss must be compensated by an inflow of new money, if firms shall make profits in the aggregate. But only a growing economy can sustain a continuous inflow of new money by credit expansion, which compensates for the increase in bank owners' capital.

The minimal growth rate, which is necessary to ensure positive profits, is determined by a few parameters in our model. The growth rate must be the higher, the higher is the interest rate, the higher is the depreciation rate of real capital, and the larger is the portion of banks' income, which they use to increase owners' capital. In a hypothetical economy, where either the interest rate or the depreciation rate is zero, or where banks would not increase owner's capital along with an increase in loans, any positive growth rate would ensure positive profits. But such an economy is a far cry from economic reality.

In our numerical example, we got a rather low value for the zero profit growth rate, which must be maintained to avoid losses of firms in the aggregate. Based on realistic parameter values, the zero-profit growth rate was found to be just 0.45 percent. This growth rate is below the average real growth rate of most economies and way below the average growth rate of the world economy over the last decades. Therefore, it is tempting to conclude that the growth imperative exists but that it is rather mild. Or to put it in other words: economic growth could be slowed down considerably, and positive profits would still be feasible.

However, we have to take care of the fact that our model, from which we derived the zero profit growth rate of 0.45 percent, is quite simple. For example, it abstracted from household saving, the government sector, financial markets, and also risk. The latter may be especially important, as firms in the real world usually will only invest in new capital, if the return to capital exceeds the interest rate by a certain amount (allowing for a risk premium). Therefore, the growth imperative is likely to be stronger in reality than implied by the zero-profit growth rate calculated from our model. The higher is the uncertainty about future profits in an economy, the higher is the required rate of return. And, consequently, the economy has to grow at a higher average rate in order to allow for profits, which are sufficiently high to cover the risk associated with investment projects. In this respect there is a link to the growth imperative established by Gordon and Rosenthal (2003), who emphasize the risk of going bankrupt in an economy, where uncertainty about firms' profits is high. Uncertainty about future profits amplifies the growth imperative and higher growth rates are necessary as compared to an economy without uncertainty about future profits.

Acknowledgements

The author would like to thank Guido Beltrani for valuable inputs while writing this paper and Robert Kölbl for his efforts to put the model into a programmable version. Helpful comments have also been provided by Sergio Rossi and Johannes Binswanger. Furthermore, the author would like to thank the members of the Club of Vienna, where part of the content of the paper has been presented in a public conference.

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Figures

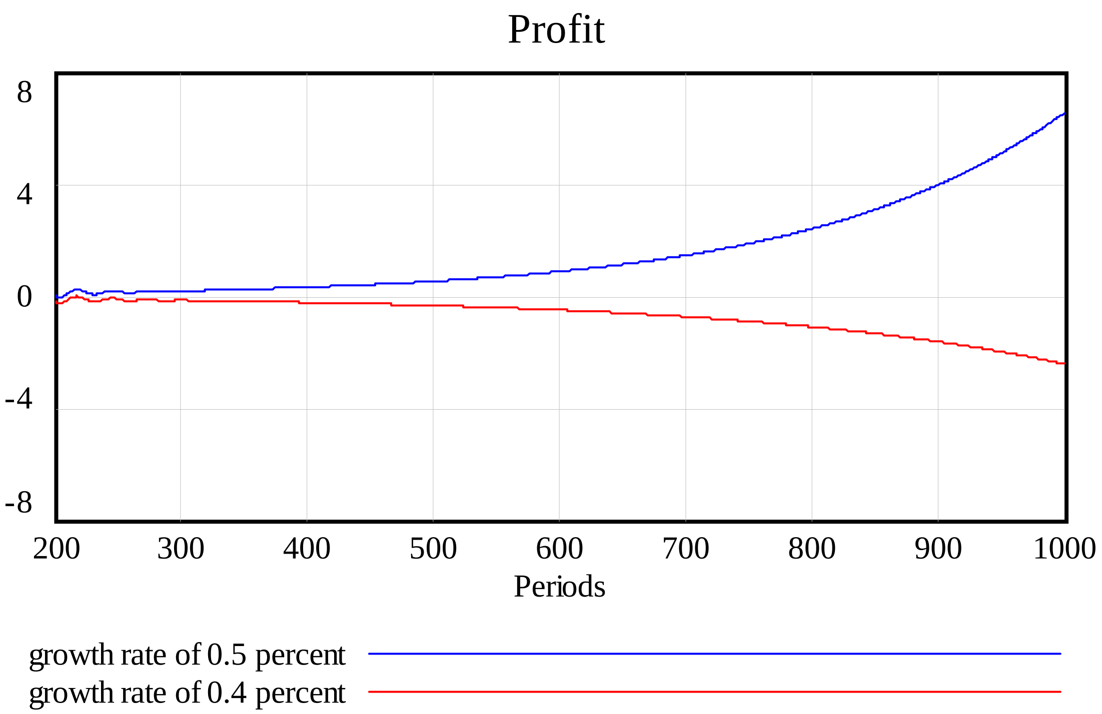

Figure 1. Simulations: Profits

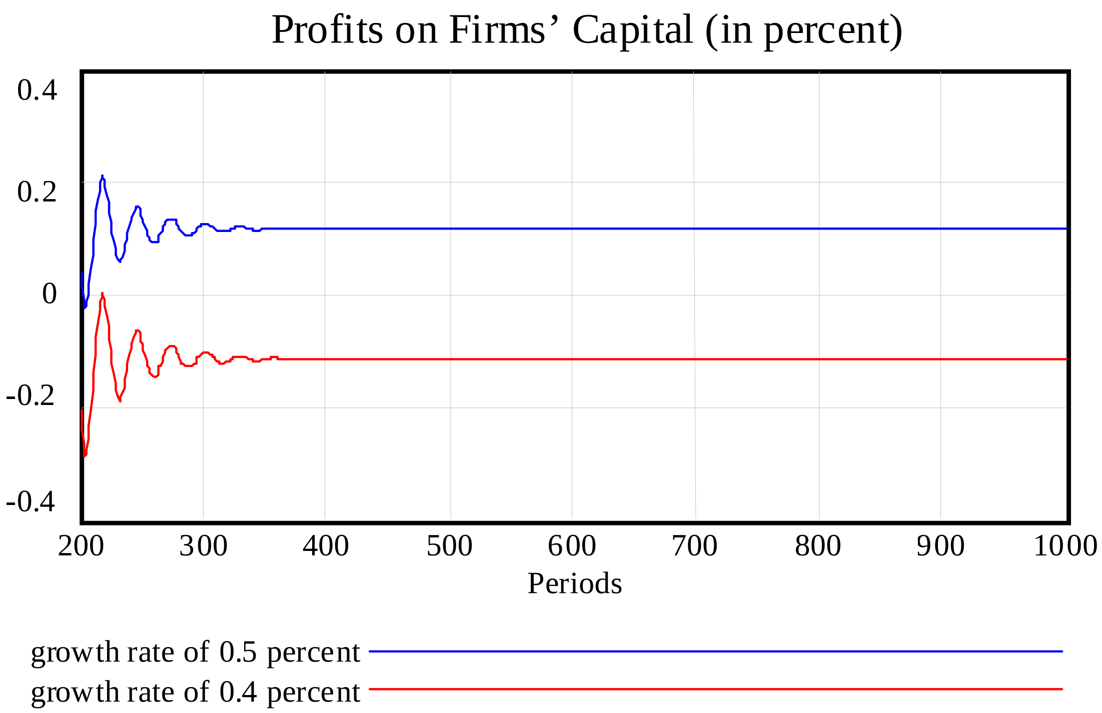

Figure 2. Simulations: Profits on Firms' Capital

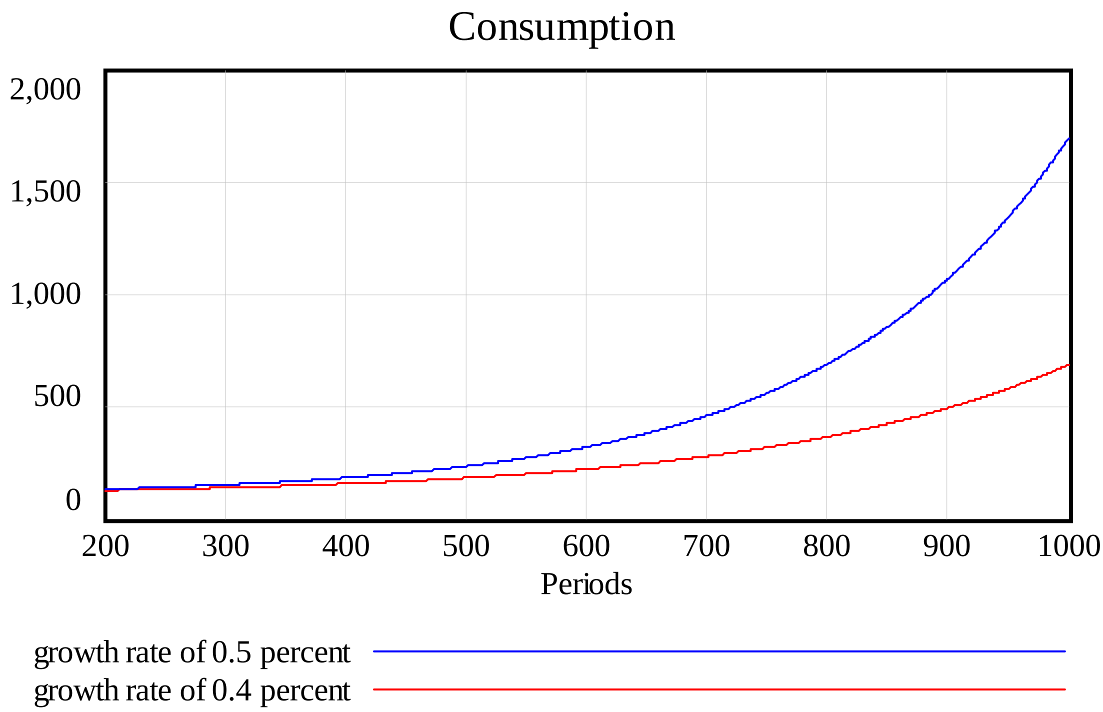

Figure 3. Simulations: Consumption

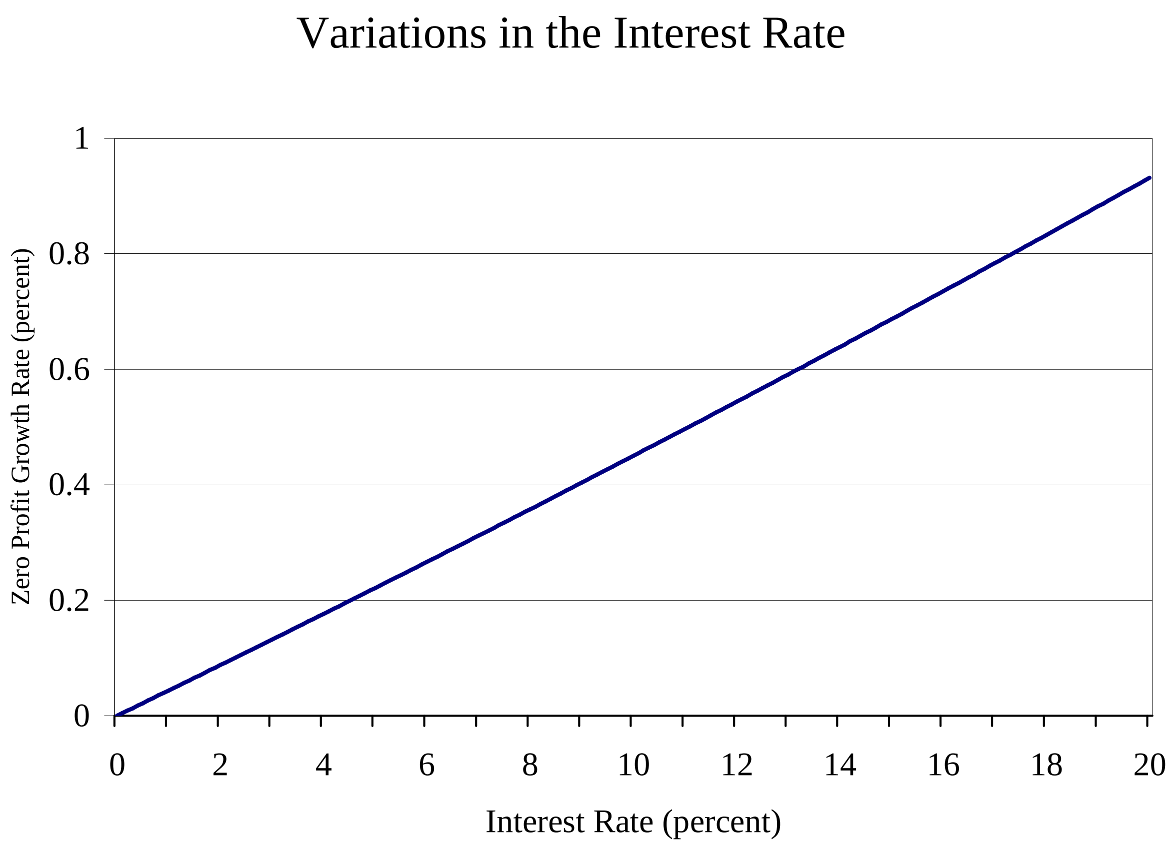

Figure 4. Relation between the interest rate and the zero-profit growth rate.

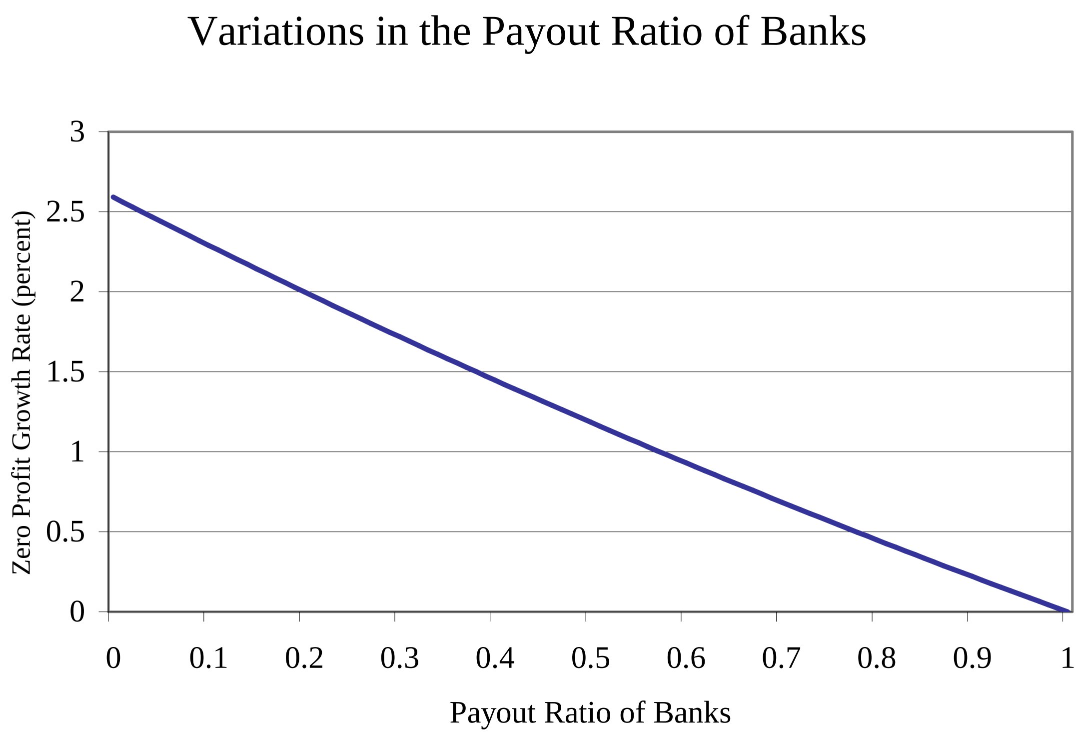

Figure 5. Relation between the payout ratio of banks and the zero-profit growth rate.

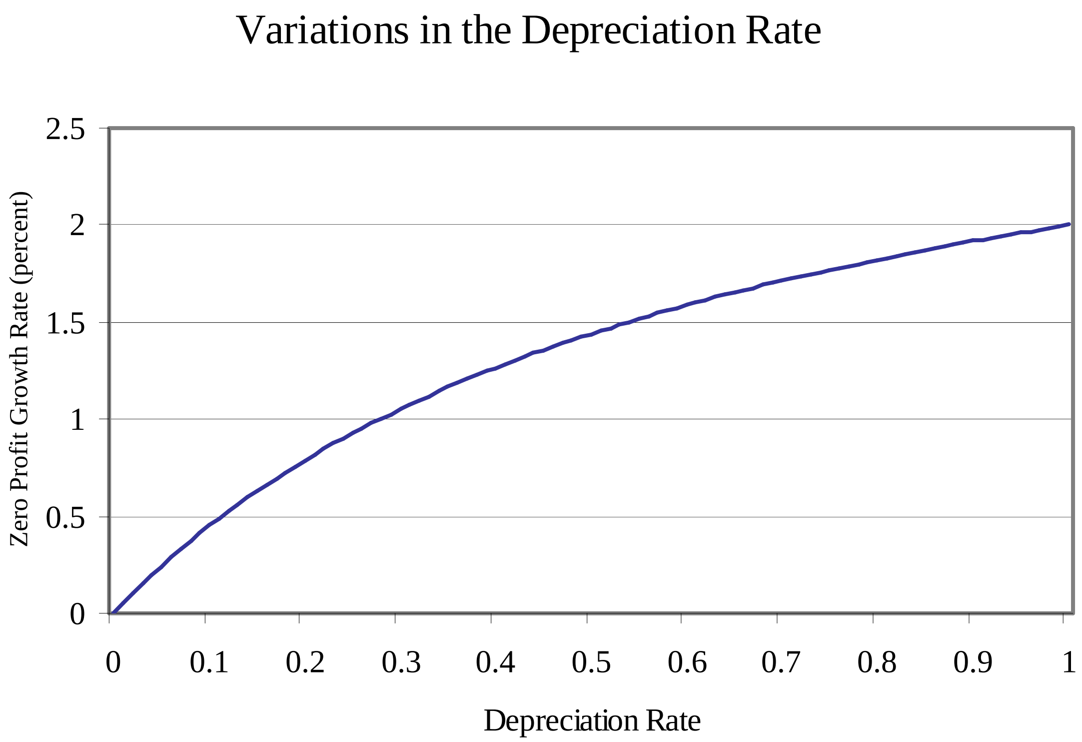

Figure 6. Relation between the depreciation rate and the zero-profit growth rate.

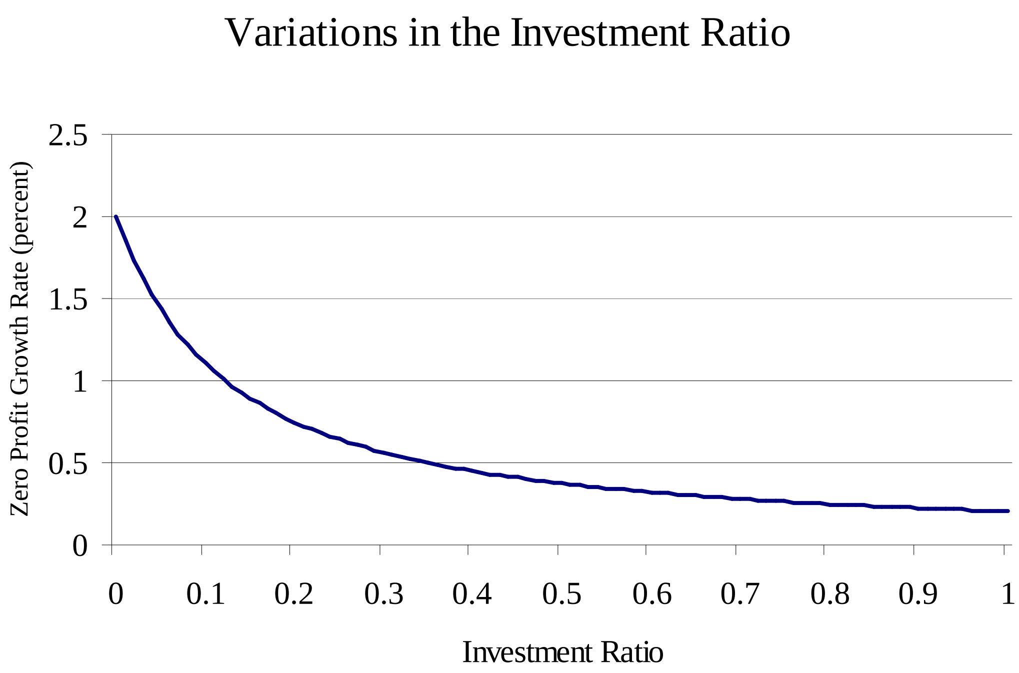

Figure 7. Relation between the investment ratio and the zero-profit growth rate.