Interest Rates, Income Shares, and Investment in a Kaleckian Model

Hein, Eckhard

Carl von Ossietzky University Oldenburg

1999

Eckhard Hein

Interest Rates, Income Shares, and Investment in a Kaleckian Model

in: Political Economy. Review of Political Economy and Social Sciences, Issue 5, Autumn 1999, pp. 5-22.

Dr. Eckhard Hein

Carl von Ossietzky Universität Oldenburg

Fachbereich Wirtschafts- und Rechtswissenschaften

Institut für Volkswirtschaftslehre II und Statistik

26111 Oldenburg

Germany

Interest Rates, Income Shares, and Investment in a Kaleckian Model

Abstract

Neither the older post-Keynesian models of growth and distribution (Kaldor, J. Robinson) nor the models based on the work by Kalecki and Steindl take sufficiently account of monetary variables. Starting from a non-monetary Kaleckian effective demand model by Bhaduri & Marglin in which investment is determined by costs and capacity utilisation and in which equilibrium capacity utilisation may be below normal, this paper deals with the effects of an exogenous variation in the monetary interest rate on the real equilibrium position of the economic system. Different regimes of accumulation are derived and it is shown that a negative relation between the interest rate and the rates of capacity utilisation, accumulation and profit usually expected in post-Keynesian theory only exists under special conditions.

JEL classification: E12, E22, E25, E40, E44

Interest Rates, Income Shares, and Investment in a Kaleckian Model*

1. Introduction

The impacts of monetary policy on economic growth and income shares have rarely been considered in post-Keynesian and Kaleckian theories of growth and distribution. Contrary to Keynes's research program of a „monetary theory of production", money and a monetary interest rate do not matter in determining the real equilibrium of the economic system.[1] In the models by Kaldor (1956, 1957, 1961) and J. Robinson (1962) the income shares are determined by investment which itself is influenced by the expected rate of profit. If the propensity to save out of profits exceeds the propensity to save out of wages, a changing income distribution will allow for the adjustment of savings to investment also in the long run, when the capital stock is fully utilised.[2] The recent models by Amadeo (1986, 1986a, 1987), Dutt (1984, 1987), Kurz (1994, 1995), Rowthorn (1981), and Taylor (1983) that are based on the work by Kalecki (1954) and Steindl (1952) abandon the assumption that the economy tends towards a full-utilisation accumulation path. The rate of capacity utilisation is rather considered to be an endogenous variable of the accumulation process and is determined by investment, when the propensities to save out of profits and wages are given.[3] Income distribution depends on the firm's pricing procedure adding a mark-up on unit labour costs. The level of the mark-up can generally be taken as an indicator of the firm's capacity to enforce a certain claim on profits against labourers and competitors. In these Kaleckian models the rate of capacity utilisation is introduced as a major variable influencing investment.

* I would like to thank two anonymous referees for helpful comments. The remaining errors are mine.

[1] This aspect has been highlighted especially by Kregel (1985).

[2] If a classical savings hypothesis is assumed we get the Cambridge-equation which relates the rate of profit r to the rate of capital accumulation g for a given propensity to save out of profits s_{Π}: $r=g/s_{\Pi}$. For the older post-Keynesian model see also Marglin (1984).

[3] The following reasons are given for a deviation of capacity utilisation from full utilisation in equilibrium. On the one hand, the accumulation path only is a centre of gravity for cyclical fluctuations. Full utilisation of capacity is only achieved in the boom of the trade cycle. On average over the cycle, the rate of capacity utilisation will be well below full utilisation (Kalecki, 1971, p. 137). On the other hand, especially Steindl (1952, pp. 76) has made the argument that in oligopolistic markets firms deliberately hold excess capacity in order to meet unforeseen fluctuations in demand and to prevent potential competitors from market entry.

Lavoie (1992, 1995) has recently tried to introduce monetary variables into the Kaldorian and Kaleckian variants of the post-Keynesian model. His attempts, however, are not fully convincing because of the accumulation function used. In Lavoie (1995) the decisions to accumulate are assumed to depend on the difference between the rate of profit and the interest rate; in Lavoie (1992, pp. 362) the rate of capacity utilisation is also integrated. Both variants do not consider that a shifting of increasing interest rates to prices affects the functional income distribution and hence the real wage. This should be taken account of in the accumulation function. The same objection applies to the model by Dutt & Amadeo (1993), in which the decisions to invest are assumed to depend solely on the interest rate and the rate of capacity utilisation, and to the model by Dutt (1992) where the capacity utilisation and the difference between the rates of profit and interest are introduced as the variables determining investment. Taylor (1985) also introduces monetary elements only into an underconsumptionist model and makes the decisions to invest depend on the difference between the rates of profit and interest and on an accelerator term.

Lavoie (1993) is the only paper that sketches a model which also considers the effects of interest rate variations on distribution and costs of production in the investment function. This aspect will be further elaborated in this paper. The discussion of the links between interest rates, income shares and investment will here be based on the non-monetary model by Bhaduri & Marglin (1990). In this model the decisions to invest are assumed to be influenced by the development of income shares, i.e. the development of unit labour costs, and by the development of capacity utilisation. A monetary interest rate will be integrated in this model, the consequences of variations in the interest rate for the equilibrium rates of capacity utilisation, accumulation and profit will be analysed and different accumulation regimes will be derived. It will be shown that a negative relation between the interest rate and the rates of capacity utilisation, accumulation and profit usually expected in post-Keynesian theory only exists under special conditions.

2. A monetary extension of the model by Bhaduri & Marglin (1990)

The monetary extension of the Bhaduri & Marglin model assumes a closed economy without economic activity of the state. Technical change is not explicitly considered. Under given conditions of production, there is just one type of commodity produced that can be used for

consumption and investment purposes. The production of the commodity requires only labour and the commodity itself as inputs. It is assumed that there is a constant relation between the employed volume of labour L and real output Y^r, i.e. there is no overhead-labour. The productivity of labour is therefore constant up to full capacity output and we get a constant labour-output-ratio a. The capital-potential-output-ratio v which describes the relation between the real capital stock K^r and potential real output Y^p is also supposed to be constant. The capital stock is assumed not to depreciate.[4] The rate of capacity utilisation u shows the relation between actual real output and potential real output. The relation between nominal output Y and real output is given by the price level p:

$$(1) \qquad a = \frac{L}{Y^r},$$

$$(2) \qquad v = \frac{K^r}{Y^p},$$

$$(3) \qquad u = \frac{Y^r}{Y^p},$$

$$(4) \qquad \mathrm{Y} = \mathrm{pY}^{\mathrm{r}}.$$

Setting w for the nominal wage rate and assuming that firms set prices according to a mark-up m on constant unit labour costs up to full capacity output, we can derive a pricing equation. The mark-up in this equation is determined by the degree of competition in the goods markets and by the relative strength of capital and labour in the labour market:[5]

$$(5) \qquad p = (1+m)wa, \qquad\qquad m > 0.$$

From this follows for the real wage w^r:

$$(6) \qquad w^r = \frac{w}{p} = \frac{1}{(1+m)a}.$$

For the profit share h, the proportion of profits Π in nominal output, we get:

[4] The introduction of an exponential rate of depreciation would not substantially alter the results derived below.

[5] Arestis (1996) mentions four factors which influence the mark-up: the substitution effect of price changes, the market entry effect, the threat of administrative price controls, and the strength of unions to answer increasing prices by increasing wages.

(7) $$h = \frac{\Pi}{Y} = 1 - w^r a = \frac{m}{1+m}.$$

The profit rate r relates the annual flow of profits to the nominal capital stock K which is given by the real capital stock and the price level:

(8) $$r = \frac{\Pi}{pK^r} = \frac{\Pi}{K} = (1 - w^r a)\frac{u}{v} = \frac{m}{1+m}\frac{u}{v} = h\frac{u}{v}.$$

Introducing monetary variables into the model, we follow the post-Keynesian „horizontalist" monetary view by Kaldor (1970, 1982), Moore (1988, 1989), and Lavoie (1984, 1992, pp. 149, 1996) and assume that the monetary interest rate is an exogenous variable for the accumulation process whereas the volume of credit and money is determined endogenously by economic activity.[6] The interest rate is determined by the policy of the central bank and by the liquidity preference of commercial banks and monetary wealth holders. We suppose that the central bank's interest policy controls the real long-term interest rates, i.e. the nominal interest rate corrected by the inflation rate.[7] The pace of accumulation therefore has no direct feedback on the interest rate.

The position taken here differs from those post-Keynesian views which assume that a decreasing liquidity position of commercial banks and rising lender's and borrower's risk finally lead to rising interest rates when the volume of credit is expanding in the accumulation process (Minsky, 1986, Palley, 1996, Rousseas, 1998, Wray, 1990). If an accomodating policy of the central bank is supposed, however, there will be no decreasing liquidity position of commercial banks when credit is expanding. If we further suppose that commercial banks only supply credit to creditworthy borrowers there will also be no increasing borrower's or lender's risk when credit is increasing. For the economic system as a whole, increasing credit means increasing expenditures and hence increasing revenues from which credit can be repaid. There is therefore good reason to assume that the interest rate is the exogeneous

[6] A survey of the post-Keynesian monetary theory is given by Cottrell (1994), Pollin (1991) and Wray (1990, 1992, 1992a).

[7] This does not mean that the central bank directly controls the market rates of interest. These are determined by the mark-ups on the central bank's base rate according to risk, period of validity and degree of liquidity of promises to pay.

variable of the accumulation process and that the volumes of money and credit are endogenous variables. If interest rates are rising when the volume of credit is expanding this is due to restrictive monetary policies chosen by the central bank (Lavoie, 1996).

The pace of accumulation is determined by the entrepreneurs' decisions to invest. But investment as the causal force of accumulation has to be financed independently of savings, because investment precedes income and hence savings.[8] Therefore, firms need the access to credit. Short-term credit is needed for „finance" or „initial finance" of additional production.[9] The banking sector is capable of supplying any creditworthy demand for credit at a given interest rate determined by the central bank. The supply of short-term credit is therefore not limited by the supply of savings. When production has been initiated and income has been generated, the proportion of income not consumed, i.e. savings, stands ready to supply the „final finance" or „funding" of investment goods newly produced. This may take place through retained earnings, the issueing of bonds and shares or through long-term credit. Here we shall assume that funding is supplied only by retained earnings or by long-term credit of rentiers' households.[10] The volumes of short-term and of long-term credit are both endogenous variables in the process of income generation and accumulation. The causality runs from investment and initial finance to income, savings and final finance.

We further assume that the monetary circuit will be closed in every period. This means there is no varying demand for liquidity by private households which would disturb the transformation of short-term credit into long-term credit or the conversion of „initial finance" into „final finance".[11] Under these conditions, we may also assume a single interest rate determined by the policy of the central bank, which stands for the structure of interest rates that we take as given in our model.[12]

---

[8] Kaldor (1939) assumes that firms may finance investment by means of issueing bonds. But the demand for those bonds cannot be financed by savings, because the income corresponding to investment has not been created when the demand for those bonds arises.

[9] For the distinction between short-term finance of production called „finance" or „initial finance" and long-term finance of investment usually labelled „final finance" or „funding" see Graziani (1989) and Carvalho (1992, p. 151).

[10] For a model which also deals with dividend payments see Lavoie (1995). In that model, however, the distribution and cost aspects of interest rate variations on which our model will focus are not dealt with.

[11] A model of a monetary circuit can be found in Graziani (1989) and Hein (1997, pp. 227).

[12] As mentioned above, the structure of the market rates of interest is given by the commercial banks' mark-ups on the central bank's base rate according to risk, period of validity and degree of liquidity of promises to pay.

Introducing interest payments to rentiers' households into the model, profit splits into profit of enterprise Π^n and rentiers' income Z.[13] Rentiers' income is determined by the stock of long-term credit B granted to firms and the exogenously given rate of interest i. The debt-capital-ratio B/K is denoted by λ. This ratio is assumed to be positive and given in the short run but may vary in the long run.

$$(9) \qquad \Pi = \Pi^n + Z = \Pi^n + iB = \Pi^n + i\lambda K, \qquad 0 < \lambda < 1.$$

The mark-up and the profit share also consist of two parts when interest is introduced, a part that covers profits of enterprise and a part for interest payments. The profit share may respond to a variation in the interest rate when the debt-capital-ratio is given:

$$(10) \qquad h = h(i), \qquad \frac{\partial h}{\partial i} \geq 0 .$$

Discussing the distribution effects of interest rate variations we will consider two cases:
1. the case of an interest-inelastic or rigid mark-up,
2. the case of an interest-elastic or flexible mark-up.

If an interest-inelastic mark-up prevails the real wage will not be affected by interest rate variations. Changing interest rates do not affect the distribution of income between wages and profits but only cause a redistribution between profits of enterprise and rentiers' income. This view can be found in Marx's theory of interest that considers interest payments a part of surplus value produced by productive labourers (Marx, 1967, pp. 338).[14] It can be found as

[13] In what follows the terms „profit", „profit share" and „profit rate" are related to gross profits as the sum of profit of enterprise and interest.

[14] See also Pivetti (1987).

well in the Kaleckian and post-Keynesian theories of cost-plus-pricing where there is no direct impact of interest variations on the mark-up.[15]

If an interest-elastic mark-up dominates, changing interest rates will directly affect the real wage. Rising (falling) interest rates cause rising (falling) mark-ups, rising (falling) prices, and falling (rising) real wages at constant nominal wages. Under these conditions, changing interest rates affect the distribution of income between profits and wages, whereas the profits of enterprise remain constant. This position that considers interest a part of firms' costs of production can be found in recent neo-Ricardian work (Panico, 1985, Pivetti, 1985, 1988, 1991). There it is assumed that the exogenously given interest rate determines the rate of profit and closes the degree of freedom of the production price model by Sraffa (1960).[16] Our analysis, however, will demonstrate that in a Kaleckian framework - with an endogenous rate of capacity utilisation - an unambiguous change in the rate of profit cannot be deduced a priori, even if variations in the interest rate are completely shifted to prices.

As the successful shifting of variations in interest rates to prices means a change in the mark-up, the ability to enforce a permanent and stable redistribution of income at the expense of labour income by shifting interest rate changes to prices depends on those factors that determine the mark-up, i.e. the intensity of competition in the goods market and the relative strength of unions in the labour market. We may expect that a high intensity of competition and strong unions prevent rising interest rates from being shifted to higher prices permanently but enforce falling interest rates to be transferred to falling prices. If the intensity of competition is rather low and unions are rather weak rising interest rates will probably be accompanied by rising prices whereas falling interest rates will not lead to falling prices.

---

[15] Neither in Kalecki's model of pricing (Kalecki, 1954) nor in Eichner's model (Eichner, 1980) a direct relation between interest rate and mark-up exists. Kalecki considers the mark-up to be determined by the degree of monopoly. Eichner assumes that the target rate of return is given by the internal means of finance required for an intended rate of accumulation. There is hence no direct influence of the interest rate on mark-up, real wage and the rate of profit. But there are indirect effects. If we follow Lavoie (1995) and assume an accumulation function that makes the decisions to invest depend on the difference between the rate of profit and the interest rate, we will get for Eichner's model, that - like the other older post-Keynesian models - assumes a normal rate of capacity utilisation in equilibrium, a reduction in the rates of accumulation and profit and a rising real wage after an increase in the interest rate. In Kalecki's model - with a variable equilibrium rate of capacity utilisation - the rates of accumulation, profit, and capacity utilisation will show a negative reaction when the interest rate rises, whereas the real wage will remain constant.

[16] According to this neo-Ricardian position, lasting changes in the interest rate cause changes in the price level in the same direction. As the rate of profit of enterprise is considered to be given by the risks and troubles of real investment and the nominal wage rate is also taken as given, the interest rate determines the rate of profit and the real wage becomes a residual variable. For a critique of this position see Nell (1988) and Wray (1988).

Introducing the interest rate into the savings and accumulation function of the model the following aspects have to be considered. First, interest payments by firms are an income for rentiers‘ households that will affect those households’ expenditures and thus consumption demand and the rate of capacity utilisation. Second, in the case of a flexible mark-up interest rate variations have an impact on real wages and hence on the wage-costs of production. Third, interest payments are costs for firms that will directly affect their decisions to accumulate.

In order to keep the argument simple, we will assume a classical savings hypothesis, i.e. labourers do not save. The part of profits retained is completely saved by definition. The part of profits distributed to rentiers‘ households, i.e. the interest payment, is used by those households according to their propensity to save s_z for consumption and savings S_z. Total savings S comprise therefore retained profits and savings out of interest income:[17]

$$(11) \qquad S = S_\Pi = \Pi - Z + S_Z = \Pi - Z + s_Z Z, \qquad 0 < s_Z < 1.$$

The retention ratio s_c depends on the rate of interest, the rate of profit and the debt-capital-ratio:

$$(12) \qquad s_C = \frac{\Pi - Z}{\Pi} = 1 - \frac{i}{r}\lambda .$$

Using (11) and (12) we get for the propensity to save out of profit s_Π:

$$(13) \qquad s_\Pi = \frac{S_\Pi}{\Pi} = 1 - \frac{i}{r}\lambda(1 - s_Z) .$$

With the propensity to save out of rentiers‘ income given, the savings propensity out of profits depends on the profit rate, the interest rate and the debt-capital-ratio. When the interest rate is changing, the propensity to save out of profit can no more be taken as a constant parameter, as is usually done in post-Keynesian theories of growth and distribution. We rather get that the

[17] See also Lavoie (1995, 1992, pp. 362).

higher the interest rate the lower will be the retention ratio and the propensity to save out of profit when the profit rate and the debt-capital-ratio are given. For the savings rate σ which relates total savings to the nominal capital stock we obtain the same dependence on the interest rate:

$$(14) \qquad \sigma = \frac{S}{K} = r - i\lambda(1 - s_Z) = h\frac{u}{v} - i\lambda(1 - s_Z)\,.$$

The higher the interest rate at a given rate of profit, a given debt-capital-ratio and a given propensity to save of rentiers' households the lower will be the savings rate, because income is transfered from firms that do not consume to rentiers who consume at least a part of their income.

Next we have to introduce the interest rate into the accumulation function of the model by Bhaduri & Marglin (1990). In that model the decisions to invest are assumed to depend on the rate of profit. Assuming the technical conditions of production to be constant the profit rate is decomposed into the profit share reflecting the development of unit costs and the rate of capacity utilisation indicating the development of demand. Firms now have to initially finance their net investment outlays by credit. We shall assume that the commercial banks' willingness to supply credit is positively correlated with the firms' internal means of finance and therefore with the retention ratio. The higher the amount of own capital of the firm the higher the amount of debt capital that can be obtained for investment.[18] This position supposes that there is a maximum degree of indebtedness that banks are willing to tolerate in order to minimise borrower's risk and that firms are willing to accept because of lender's risk. From this follows, that the higher the retention ratio the greater the prospects for expansion of the firm. As retained earnings depend negatively on the interest rate, the interest rate becomes an additional argument in the accumulation function when the rate of profit and the debt-capital-ratio are given. Therefore, a simple linearized function for the accumulation rate *g* that relates net investment *I* to the capital stock can be formulated as follows:

[18] A similar view was taken by J. Robinson (1962, p. 86) and by Kalecki (1971, p. 106). Recent empirical work has shown that the interest rate has important effects on investment through its impacts on internal funds and hence on the access to external borrowing on imperfect capital markets. The direct effects of interest changes on investment, however, are rather small or insignificant (see Fazzari/Hubbard & Peterson, 1988, Schiantarelli, 1996).

(15) $$g = \frac{\Delta K}{K} = \frac{I}{K} = \alpha + \beta u + \tau h - \theta \lambda i, \qquad \alpha, \beta, \tau, \theta > 0, \qquad g > 0 \ \textit{for} \ r - i > 0 .$$

The parameter α stands for the motivation to accumulate which derives from the competition of firms independently of the development of distribution, effective demand or monetary policy. The intensity of the influence of effective demand is indicated by β, whereas τ shows the weight of distribution struggle and θ the impact of debt services and hence of the interest rate. To induce investors to demand real capital goods instead of financial assets the expected rate of profit has to exceed the rate of interest in financial markets.

3. The short-run equilibria of the model

The short-run equilibrium of the model is determined by the equality of the decisions to invest and the decisions to save. From equations (14) and (15) we get:

(16) $$\begin{aligned} &\sigma = g, \\ &h\frac{u}{v} - i\lambda(1 - s_Z) = \alpha + \beta u + \tau h - \theta \lambda i. \end{aligned}$$

The Keynesian stability condition for the g-σ-equilibria requires that the decisions to save respond more elasticly to a variation in the rate of capacity utilisation than the decisions to invest:

(17) $$\begin{aligned} &\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0, \\ &\frac{h}{v} - \beta > 0. \end{aligned}$$

As equations (18) - (20) show, the effects of a variation in the exogenous interest rate on the short-run equilibrium position of the system, i.e. on the equilibrium rates of capacity utilisation, accumulation and profit as endogenous variables of the model, now depend on the values of the parameters β, τ, and θ in the investment function, s_z in the savings function and on the debt-capital-ratio λ taken to be positive and exogenous in the short run.

$$(18) \qquad \frac{du}{di} = \frac{(\tau - \frac{u}{v})\frac{dh}{di} + \lambda(1 - s_Z - \theta)}{\frac{h}{v} - \beta},$$

$$(19) \qquad \frac{dg}{di} = \beta \frac{du}{di} + \tau \frac{dh}{di} - \theta\lambda,$$

$$(20) \qquad \frac{dr}{di} = \frac{h}{v}\frac{du}{di} + \frac{u}{v}\frac{dh}{di}.$$

If only stable equilibria are considered we can distinguish ten potential regimes of accumulation in our simple model. In the case of a rigid mark-up we get four possible regimes of accumulation, the regimes 1 to 4 in table 1. Note, that a positive debt-capital-ratio has no effect on the direction which the real equilibrium will take after interest rate variations when the mark-up is rigid. Regime 1 is a special case in which interest rate variations only affect capital accumulation inversely but have no effects on capacity utilisation and on the rate of profit. In this regime the effect of an interest rate variation on investment demand is exactly balanced by its opposite effect on consumption demand through redistribution between profits of enterprise and rentiers‘ income. Regime 2 shows the consequences usually associated with a rising interest rate in post-Keynesian models: the rates of capacity utilisation, capital accumulation and profit are decreasing.[19] This regime is dominated by a high responsiveness of investment to a change in the interest rate and a high propensity to save out of interest income. If investment, however, is hardly affected by the interest rate and the propensity to save out of interest income is relatively low, there may arise regimes of accumulation with positive responses throughout the rates of capacity utilisation, accumulation and profit to an increasing interest rate.

If the case of a flexible mark-up is considered, six further regimes of accumulation can be distinguished: the regimes 5 to 10 in table 1. Here the debt-capital-ratio is of importance for the direction of change of the real equilibrium in response to an interest rate variation, because it moderates the intensity of the direct effects of interest rate variations on investment and on consumption demand relative to the indirect effects under consideration. Only regime 5 shows the typical post-Keynesian results of a rising interest rate, when firms raise the mark-up. This regime is given when there is a high direct responsiveness of investment to the

[19] For a survey of the integration of the interest rate into post-Keynesian models of growth and distribution see Lavoie (1995).

interest rate, a high propensity to save out of interest income, a high debt-capital-ratio and additionally a redistribution at the expense of labour income which causes a loss of consumption demand, because the propensity to consume out of wages exceeds the propensity to consume out of rentiers‘ income. If the responsiveness of investment to interest changes, however, is weak, the propensity to save out of interest income shows lower values and the debt-capital-ratio is also rather low, regimes of accumulation with a positive reaction of the rates of capacity utilisation, accumulation and profit throughout can be derived - as expected by some authors in the classical and neo-Ricardian tradition.[20]

[20] Introducing the interest rate into a classical production price model Franke (1988) gets the result that a decline in the interest rate causes a decline in the level of prices and therefore a rising real wage, a decreasing rate of profit and a decline in the rate of accumulation. These results are based on the neo-Ricardian relationship between changes in the interest rate and distribution and on the classical assumption that accumulation is deteremind by savings out of profits. Pivetti (1985), however, concludes also in a neo-Ricardian framework that the effects of a variation in the interest rate on the level and the composition of effective demand and therefore on output and employment are rather vague.

Table 1: Responses of the profit share, the rate of capacity utilisation, the rate of accumulation and the rate of profit to a variation in the interest rate: stable short-run equilibria				
	$\frac{dh}{di}$	$\frac{du}{di}$	$\frac{dg}{di}$	$\frac{dr}{di}$
	$\frac{dh}{di}=0$	$\frac{du}{di}>0,\ if:1-s_Z-\theta>0$	$\frac{dg}{di}>0,\ if:\beta\frac{(1-s_Z-\theta)}{\frac{h}{v}-\beta}-\theta>0$	$\frac{dr}{di}>0,\ if:1-s_Z-\theta>0$
1	0	0	**-**	0
2	0	-	**-**	**-**
3	0	+	**-**	**+**
4	0	+	**+**	**+**
	$\frac{dh}{di}>0$	$\frac{du}{di}>0,\ if:$ $(\tau-\frac{u}{v})\frac{dh}{di}+\lambda(1-s_Z-\theta)>0$	$\frac{dg}{di}>0,\ if:$ $\beta\left[\frac{(\tau-\frac{u}{v})\frac{dh}{di}+\lambda(1-s_Z-\theta)}{\frac{h}{v}-\beta}\right]+\tau\frac{dh}{di}-\theta\lambda>0$	$\frac{dr}{di}>0,\ if:$ $\frac{h}{v}\left[\frac{(\tau-\frac{u}{v})\frac{dh}{di}+\lambda(1-s_Z-\theta)}{\frac{h}{v}-\beta}\right]+\frac{u}{v}\frac{dh}{di}>0$
5	**+**	**-**	**-**	**-**
6	**+**	**-**	**-**	**+**
7	**+**	**-**	**+**	**-**
8	**+**	**-**	**+**	**+**
9	**+**	**+**	**-**	**+**
10	**+**	**+**	**+**	**+**

4. Conclusions

We may conclude that the integration of the interest rate into the simple one-sector model has shown that this exogenously determined monetary variable has a major influence on the real equilibrium position of the economic system. The effects of an interest rate variation, however, are not unique but do heavily depend on the values of the parameters in the accumulation and the savings function. Variations in the interest rate affect the equilibrium position of the system through different channels: Consumption demand is influenced by a redistribution of income between wages and profits on the one hand and between rentiers' income and profits of enterprise on the other hand. Investment demand is affected directly by interest rate changes but there are also indirect impacts through the consequences interest rate variations have for the rate of capacity utilisation and for the wage costs of production.

Taking these effects into account, different reactions of the real equilibrium position of the system to a variation in the monetary interest rate have been derived. Therefore, no generally valid statement about the consequences a changing interest rate has for the equilibrium rates of capacity utilisation, accumulation and profit can be made. Neither the post-Keynesian view of a negative relation nor the neo-Ricardian view of a positive relation can claim general validity. Following our model, assessing the effects of interest rate changes on capacity utilisation, accumulation and the profit rate requires some knowledge about the parameters in the accumulation and savings function and about the response of distribution. In other words, in a post-Keynesian framework we need a concrete historical analysis in order to judge the effects of monetary policy.

References

Amadeo, E.J. (1986), The role of capacity utilisation in long-period analysis, *Political Economy*, 2, pp. 147-160.

Amadeo, E.J. (1986a), Notes on capacity utilisation, distribution and accumulation, *Contribution to Political Economy*, 5, pp. 83-94.

Amadeo, E.J. (1987), Expectations in a steady-state model of capacity utilisation, *Political Economy*, 3, pp. 75-89.

Arestis, P. (1996), Post-Keynesian economics: towards coherence, *Cambridge Journal of Economics*, 20, pp. 111-135.

Bhaduri, A. & Marglin, S. (1990), Unemployment and the real wage: the economic basis for contesting political ideologies, *Cambridge Journal of Economics*, 14, pp. 375-393.

Carvalho, J.C.d. (1992), *Mr. Keynes and the Post Keynesians: Principles of Economics for a Monetary Production Economy* (Aldershot, Brookfield, Edward Elgar).

Cottrell, A. (1994), Post-Keynesian monetary economics, *Cambridge Journal of Economics*, 18, pp. 587-605.

Dutt, A.K. & Amadeo, E.J. (1993), A post-Keynesian theory of growth, interest and money, in: Baranzini, M. & Harcourt, G. (Eds.), *The Dynamics of the Wealth of Nations* (Basingstoke, London, MacMillan).

Dutt, A.K. (1984), Stagnation, income distribution and monopoly power, *Cambridge Journal of Economics*, 8, pp. 25-40.

Dutt, A.K. (1987), Alternative closures again: a comment on 'Growth, distribution and inflation', *Cambridge Journal of Economics*, 11, pp. 75-82.

Dutt, A.K. (1992), Rentiers in post-Keynesian models, in: Arestis, P. & Chick, V. (Eds.), *Recent Developments in Post-Keynesian Economics* (Aldershot, Brookfield, Edward Elgar).

Eichner, A.S. (1980), A general model of investment and pricing, in: Nell, E. (Ed.), *Growth, Profits and Property* (Cambridge, Cambridge University Press).

Fazzari, S.M., Hubbard, R.G. & Petersen, B.C. (1988), Financing constraints and corporate investment, *Brooking Papers on Economic Activity*, Vol. 1, 1988, pp. 141-195.

Franke, R. (1988), Integrating the financing of production and a rate of interest into production price models, *Cambridge Journal of Economics*, 12, pp. 257-272.

Graziani, A. (1989), The Theory of the Monetary Circuit, *Thames Papers in Political Economy*, Spring 1989.

Hein, E. (1997), *Geld, effektive Nachfrage und Kapitalakkumulation. Eine Betrachtung aus Marxscher, Keynesscher und post-keynesianischer Perspektive* (Berlin, Duncker & Humblot).

Kaldor, N. (1939), Speculation and economic stability, *The Review of Economic Studies*, 7, pp. 1-27.

Kaldor, N. (1956), Alternative theories of distribution, *The Review of Economic Studies*, 23, pp. 83-100.

Kaldor, N. (1957), A model of economic growth, *The Economic Journal*, 67, pp. 591-624.

Kaldor, N. (1961), Capital accumulation and economic growth, in: Lutz, F.A. & Hague, D.C. (Eds.), *The Theory of Capital* (London, MacMillan).

Kaldor, N. (1970), The new monetarism, *Lloyds Bank Review*, No. 97, July 1970, pp. 1-17.

Kaldor, N. (1982), *The Scourge of Monetarism* (Oxford, Oxford University Press).

Kalecki, M. (1954), *Theory of Economic Dynamics* (London, George Allen).

Kalecki, M. (1971), *Selected Essays on the Dynamics of the Capitalist Economy, 1933-70* (Cambridge, Cambridge University Press).

Kregel, J. (1985), Hamlet without the prince: cambridge macroeconomics without money, *American Economic Review, Papers and Proceedings*, 75, pp. 133-139.

Kurz, H.D. (1994), Growth and distribution, *Review of Political Economy*, 6, pp. 393-420.

Kurz, H.D. (1995), The Keynesian project: Tom Asimakopulos and „the other point of view", in: Harcourt, G.C., Roncaglia, A. & Rowley, T. (Eds.), *Income and Employment in Theory and Practice. Essays in Memory of Athanasios Asimakopulos* (New York, St. Martin's Press).

Lavoie, M. (1984), The endogenous flow of credit and the post-Keynesian theory of money, *Journal of Economic Issues*, 18, pp. 771-797.

Lavoie, M. (1992), *Foundations of Post Keynesian Economic Analysis* (Aldershot, Brookfield, Edward Elgar).

Lavoie, M. (1993), A post-classical view of money, interest, growth and distribution, in: Mongiovi, G. & Rühl, C. (Eds.), *Macroeconomic Theory: Diversity and Convergence* (Cambridge, Camridge University Press).

Lavoie, M. (1995), Interest rates in post-Keynesian models of growth and distribution, *Metroeconomica*, 46, pp.146-177.

Lavoie, M. (1996), Horizontalism, structuralismus, liquidity preference and the principle of increasing risk, *Scottish Journal of Political Economy*, 43, pp. 275-300.

Marglin, S.A. (1984), Growth, distribution and inflation: a centennial synthesis, *Cambridge Journal of Economics*, 8, pp. 115-144.

Marx, K. (1967), *Capital. A critique of Political Economy. Vol. III. The Process of Capitalist Production as a Whole* (New York, International Publishers).

Minsky, H.P. (1986), *Stabilizing an Unstable Economy* (New Haven, London, Yale University Press).

Moore, B.J. (1988), *Horizontalists and Verticalists: the Macroeconomics of Credit Money* (Cambridge, Cambridge University Press).

Moore, B.J. (1989), The endogeneity of credit money, *Review of Political Economy*, 1, pp. 65-93.

Nell, E. (1988), Does the rate of interest determine the rate of profit? *Political Economy*, 4, pp. 263-268.

Palley, T.I. (1996), Accomodationism versus structuralism: time for an accomodation, *Journal of Post Keynesian Economics*, 18, pp. 585-594.

Panico, C. (1985), Market forces and the relation between the rates of interest and profit, *Contributions to Political Economy*, 4, pp. 37-60.

Pivetti, M. (1985), On the monetary explanation of distribution, *Political Economy*, 1, pp. 73-103.

Pivetti, M. (1987), Interest and profit in Smith, Ricardo and Marx, *Political Economy*, 3, pp. 63-74.

Pivetti, M. (1988), On the monetary explanation of distribution: a rejoinder to Nell and Wray, *Political Economy*, 4, pp. 275-283.

Pivetti, M. (1991), *An Essay on Money and Distribution* (Basingstoke, London, MacMillan).

Pollin, R. (1991), Two theories of money supply endogeneity: some empirical evidence, *Journal of Post Keynesian Economics*, 13, pp. 366-396.

Robinson, J. (1962), *Essays in the Theory of Economic Growth* (London, New York, MacMillan).

Rousseas, S. (1998), *Post Keynesian Monetary Economics*, 3rd ed. (Basingstoke, MacMillan).

Rowthorn, R. (1981), Demand, real wages and economic growth, *Thames Papers in Political Economy*, Autumn 1981.

Schiantarelli, F. (1996), Financial constraints and investment: methodological issues and international evidence*, Oxford Review of Economic Policy*, 12, 1996, pp. 70-89.

Sraffa, P. (1960), *Production of Commodities by Means of Commodities* (Cambridge, Cambridge University Press).

Steindl, J. (1952), *Maturity and Stagnation in American Capitalism*, 2nd ed. 1976 (New York, London, Monthly Review Press).

Taylor, L. (1983), *Structuralist Macroeconomics* (New York, Basic Books).

Taylor, L. (1985), A stagnationist model of economic growth, *Cambridge Journal of Economics*, 9, pp. 383-403.

Wray, L.R. (1988), The monetary theory of distribution - a critique of Pivetti, *Political Economy*, 4, pp. 269-274.

Wray, L.R. (1990), *Money and Credit in Capitalist Economies: the Endogeneous Money Approach* (Aldershot, Brookfield, Edward Elgar).

Wray, L.R. (1992), Alternative approaches to money and interest rates, *Journal of Economic Issues*, 26, pp. 1145-1178.

Wray, L.R. (1992a), Alternative theories of the rate of interest, *Cambridge Journal of Economics*, 16, pp. 69-89.