The repayment of investments financed by bank credit in the Harrod-Domar model

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Abstract:

In the Harrod-Domar model, based on the Keynesian multiplier theory, investment generates savings. Therefore, savings cannot fund investments, at least *ex ante*. Investments have first to be financed by bank credit, hence the question on their repayment. In this article, we suppose that investments are financed by bank credits issued on several periods, as it typically takes years for firms to reimburse their investment debt. What we then obtain is that in order to avoid an overproduction crisis, the rate of capital accumulation has to gradually rise throughout a growth phase. This result paves the way to a new theory of cycles, based on the repayment of bank credits.

Keywords: Growth model, Endogenous Money, Business cycle

Classification JEL: E12, E32

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1. Introduction

According to Maurice Allais, the "Nobel Prize" winner for economics[2], "*since the publication in 1911 of Irving Fisher's The purchasing power of money, it is fully recognized that credit mechanism leads to the creation of money*[3]*"* (Allais 1999, p.83). The issuance of a credit by a bank results in the increase of the monetary masse *ex nihilo*, its repayment leading to a destruction of money. If the whole economists' community acknowledges this fact, few are the models that raise the question of the impact of the repayments of bank credits upon the functioning of economies.

However, the repayment of a bank credit cannot be seen as entirely insignificant. Part of the revenues a firm dedicates to the repayment of a bank credit previously incurred, is, with the exception of the interests, destroyed. Revenues that the firm will distribute throughout a production process could therefore be inferior to the revenues collected, which is likely to hinder Say's Law.

At the very beginning of his famous *Expansion and Employment* article (1957, p.83), Domar explains why Say's Law is not automatically verified:

> *"Our comfortable belief in the efficacy of Say's Law has been badly shaken in the last fifteen years. Both events and discussions have shown that supply does not automatically create its own demand. A part of income generated by the productive process may not be re-turned to it; this part may be saved and hoarded."*

In the same way, we could write that the repayment of bank credits constitutes a production expenditure that firms will not get back because the corresponding money is being destroyed. The repayment of a bank credit represents a cost that does not generate revenues. Therefore, it clearly constitutes, in the same way as hoarding, an outflow outside the economic circuit.

Though fundamental, this idea is rarely dealt by economists to study the unbalances of an economy. It can partially be explained by the fact that this result is only true when money is seen as endogenous, a theory that experienced a belated recognition. In the theory of exogenous money, which benefited from a bigger voice, the repayment cannot be considered as an outflow. Here is why.

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[2] The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.
[3] Our translation.

When money is presumed to be exogenous, the monetary mass is determined by the quantity of central money offered by the Central Bank. The Central Bank makes available to commercial banks a certain amount of central money, which allows them *through* the credit multiplier, to give the economic agents a given volume of credits. The interest rates (endogenous) enable the balance between both supply and demand for money. Therefore, supply for money restrains the demand for credits; the value of money comes from its scarcity. In this theory, a credit repayment does not affect the banks' reserves in central money because those reserves are determined upstream by the Central Bank. The repayment of a bank credit lowers the entire mass of credits granted by the banks in relation to the reserves of their central money. And so, it allows the banks to issue new credits for the exact same amount as the one of the repayments. In such an economy, the repayment of credits neither influences on the volume of the issued credits, nor, *a priori*, on the level of overall demand, for with constant money supply, they are the requirements necessary to the issuance of new credits.

Things are different when money that is said to be endogenous is concerned. The Central Bank merely set the value of money, its quantity being determined by the demands of bank credits of solvent agents. The interest rates are exogenous and every solvent agent sees their demands of credits approved at the current interest rates. Consequently, the repayment of a credit is not necessarily followed by a new demand of credit, as it was the case for endogenous money. On one hand, banks can, in theory, grant credits without limitation, obtaining afterwards the reserves required by law (Moore, 1988). On the other hand, every demand of credit has already been satisfied at the current rate of interest. The repayment of a credit results in a net monetary destruction, and to a net outflow outside the economic circuit.

Therefore, as soon as we take an interest in an economy in which money is endogenous, as the Post Keynesians do, the repayment of a bank credit, in constituting outflow outside the economic circuit, must have an impact on the functioning of the economies. The aim of this article is to evaluate the influence of the repayments of bank credits on the growth of an economy within a Post Keynesian framework.

To do so, we are suggesting to integrate the repayments of bank credits in what is appearing as the first model of growth based both on the principle of effective demand and endogenous money: the Harrod-Domar model. The Harrod-Domar model is based on the Keynesian multiplier. According to this theory, investment generates savings, not the opposite,

investments have thus to be financed, at least *ex ante*, by bank credit. We will suppose in this article that investments are financed by bank credits issued on several periods, as it typically takes years for firms to reimburse their investment debt. We will then integrate the repayment of those bank credits in the Harrod-Domar model and consider their influence on the dynamics of economies. This result will be a prelude to the elaboration of a new theory of cycles.

2. The Harrod-Domar model

What is now commonly known as the Harrod-Domar model is based on the articles of Harrod (1939) and Domar (1947). The model makes the proposition to spread to the long term the multiplier theory developed by Keynes in the *General Theory*. To this end, it integrates the effects of investment on the evolution of the capital stock, and so on the aggregate supply. This considered, Harrod and Domar build a growth model, giving the chance to study the dynamics of an economy on a longer basis, as indicated in the following quotation (*ibid*, p.73):

"Because investment in the Keynesian system is merely an instrument for generating income, the system does not take into account the extremely essential, elementary, and well-known fact that investment also increases productive capacity. This dual character of the investment process makes the approach to the equilibrium rate of growth from the investment (capital) point of view more promising: if investment both increases productive capacity and generates income, it provides us with both sides of the equation the solution of which may yield the required rate of growth".

In this model, the evolution of the overall demand is based on the Keynesian multiplier theory. Keynes thus explains in the *General Theory* that "*given what we shall call the community's propensity to consume, the equilibrium level of employment* (…) *will depend on the amount of current investment*" (1936, p.24). Investment and revenue are linked by "*a definite ratio, to be called the Multiplier"* (*ibid*, p.76) highlighted by Kahn (1931). Kahn sums up the principle of the multiplier in this famous extract (*ibid*, p.1):

"The increased employment that is required in connection actually with the increased investment will be described as the "primary" employment. It includes the "direct"

employment, and also, of course, the "indirect" employment that is set up in the production and transport of the raw materials required for making the new investment. To meet the increased expenditure of wages and profits that is associated with the primary employment, the production of consumption-goods is increased. Here again wages and profits are increased, and the effect will be passed on, though with diminished intensity. And so on ad infinitum. The total employment that is set up in this way in the production of consumption-goods will be termed the "secondary" employment. The ratio of secondary to primary employment is a measure of these "beneficial repercussions" that are so often referred to."

A volume of initial investments triggers a series of reactions, which lead to an increase of the revenues and of the production both superior to the amount of the initial investment. This series of reactions takes place because the firms' revenues constitute the households' income, which use them to consume, increasing the firms' revenues in return. Incomes and revenues flows gradually weaken because households keep part of their incomes as savings. To pursue this thinking to its conclusion, to the moment where the sums spent and perceived become infinitesimal, we get the value of the multiplier. The propensity to consume (c) or to save (s) is presumed to be constant.

$$Y = I + cI + c^2 I + ... + c^n I$$
$$= \frac{I}{1-c} = \frac{I}{s} \quad \text{pour } n \to \infty \qquad (1)$$

In the Harrod-Domar model, this phenomenon reproduces itself period after period: investments of the first period generate the overall demand of the first period, those of the second period the overall demand of the second period, and so on.

At the same time, those investments come to raise the capital stock and therefore the production capacity of the economy, as cited in Domar's previous quotation. Domar makes the link between the production capacity and investments by the parameter σ which he calls the "*potential social average productivity of investment*", and that "*indicates the increase in productive capacity which accompanies rather than which is caused by each dollar invested*" (1947, p.40). Harrod links them by the parameter C, which "*stands for the value of the capital goods required for the production of a unit increment of output*" (1939, p.16). Both obtain the same result with $\sigma = \frac{1}{C}$. For commodity purposes in calculations, we keep the parameter

chosen by Domar. These two effects of investments, both on supply and demand, are at the core of the Harrod-Domar model and can be described by the following equations:

$$\begin{cases} Q_{t-1}^{d} = \dfrac{I_{t-1}}{s}, Q_{t}^{d} = \dfrac{I_{t}}{s} \Rightarrow \Delta Q_{t}^{d} = \dfrac{\Delta I_{t}}{s} & (2) \\ Q_{t-1}^{s} = \sigma K_{t-1}, Q_{t}^{s} = \sigma K_{t} = \sigma \left(K_{t-1} + I_{t-1} \right) = Q_{t-1}^{s} + \sigma I_{t-1} \Rightarrow \Delta Q_{t}^{s} = \sigma I_{t-1} & (3) \end{cases}$$

In this model, investment is at the same time the main factor to the increase of demand and supply. However, as Domar wrote it (*ibid*, p.47), it will not have the same effect on the two: "*the whole body of investment, so to speak, increases productive capacity, but only its very top -the increment -increases national income*". There is a "*lack of symmetry between the effects of investment on productive capacity and on national income*".

Investment, by diminishing the short-term overproduction *via* the increasing of demand it generates, can therefore worsen overproduction in the long-term by augmenting the production capacity of the economy: "*As far as unemployment is concerned, investment is at the same time a cure for the disease and the cause of even greater ills in the future*". (*ibid*, p 49-50)

Nevertheless, it exists an investment rate for which the demand growth is compatible with the supply growth. This rate gives us the *required* growth rate of the capital, and consequently the growth rate required for the economy to rise along the path to full employment. Domar makes his point in the following extract *(ibid*, p.7):

> *"If investment increases productive capacity and also creates income, what should be the magnitude of investment, or at what rate should it grow, in order to make the increase in income equal to that of productive capacity? Couldn't an equation be set up one side of which would represent the increase (or the rate of increase) of productive capacity, and the other- that of income, and the solution of which would yield the required rate of growth?"*

By equalizing (2) and (3), we obtain the required growth rate. It depends on the marginal propensity to save and on the coefficient σ :

$$\Delta Q_{t}^{d} = \Delta Q_{t}^{s} \Rightarrow \left(\frac{\Delta I}{I} \right)_{t} = \sigma s \qquad (4$$

If investments grow to an inferior rate to the one obtained, the supply growth will be higher than the one of demand. Factors of production will be underused. If they grow at a superior rate, the demand growth will be higher than the supply growth. The production capacity of the economy will be insufficient regarding the demand.

That could be the end of the story. But it appeared to us that a key element was missing to this model. In the Harrod-Domar model, and in general most Post Keynesian models, investment is financed *ex post* by savings. Households buy securities issued buy firms, and firms used the money collected to repay their bank debt. This means that Households hold their whole savings as securities and not as money (on a bank account or in cash), which is annoying for anyone try to understand the functioning of a monetary economy. This also means that firms repay their whole investment debt at the end of the period, whereas it generally takes years in fact. Here, we will take the opposite view and suppose that Households hold their savings as bank deposits and firms financed their investments by bank credits issued on several periods. Firms remain then in debt with banks at the end of the period and repay their debt during the following periods. Households' savings balance banks' balance sheets. The reality is probably between these two extremes. We will study in the next part the consequences of these two hypotheses on the dynamics of the model.

3. The repayment of credits having financed investments

In introduction, we have seen that the repayment of a bank credit that has financed an investment constituted an outflow outside the economic circuit. In the previous part, we have supposed that Households hold their savings as bank deposits and firms finance their investments by credits issued on several periods. Firms will then repay their bank debt during the following periods. We are now going to analyze the consequences of the repayment of investments on the dynamics of the Harrod-Domar model.

A priori, there are two possible approaches to take into account these repayments (R). The first one consists in suggesting that firms incurred more credits, in order to reimburse the previous ones. In that case, if the firms want to make investments for a sum I, they will incur to banks credits for a sum ($I+R$), in order to make their investments and pay back their previous credits. If this phenomenon does exist, it cannot be considered as recurrent. The

long-term objective for a firm is to make a return on its investment and not basking in a Ponzi Game in which every investment is reimbursed thanks to the issuance of a new credit. In the same way, a bank will not bask itself in this kind of relationships with its clients. The fact that a firm regularly resorts to bank credit for cash balances matters is very different from the idea according to which it will ask for new credits to reimburse old ones. We therefore rule out this possibility of our study.

The second possibility consists in suggesting that firms devote part of their revenues to the repayment of past credits. In that case, firms do not distribute their entire revenues to households anymore, as it was the case with the multiplier theory. A part of their revenues will be devoted to the repayment of previously incurred credits from banks, resulting in the destruction of money.

The repayment of a bank credit comprises two parts: the interest, which forms the banks' revenues, and the capital, which brings to the elimination of the corresponding credit line. The payment of the interests goes back into the economy, as well as the other revenues allocated by firms. Considering the framework that is ours, it does not change anything to the multiplier principle. On the contrary, the capital repayment constitutes an outflow outside the economic circuit and for this reason has an impact on the multiplier value, together with savings. From now on, when we will talk about credits' repayment, we will therefore allude to capital repayment only, interest excluded.

Before, in every production-revenue-consumption cycle, part of the allocated sums (s) was leaving the circuit in the form of savings. Now, within each and every of these cycles, a part ($s+b$) will leave the circuit, with (b) the part devoted by firms to the repayment of credits to previous allocated credits.

The relation (1) then becomes:

$$Y = I + (1-s-b)I + (1-s-b)^2 I + ... + (1-s-b)^n I$$
$$= \frac{1}{s+b} I \quad \text{pour } n \to \infty \qquad (5)$$

The multiplier value does not only rely on the propensity to consume, but also on the share of revenues devoted by firms to the repayment of previously allocated bank credits. To paraphrase Keynes, we can now say that for a given value of the propensity of the community

to consume *and a given volume of repayment of bank credits*, it is the sum of the current investment that determines the volume of employment. To take into account the repayments of credits decreases the multiplier value.

It is possible to calculate the total amount of credits reimbursed by firms for a given value of (b):

$$R = bI + b(1-s-b)I + b(1-s-b)^2 I + ... + b(1-s-b)^n I$$
$$= \frac{b}{s+b} I \quad \text{pour } n \to \infty \qquad (6)$$

In other words, if firms had to face repayments for a sum $\left(R = \frac{b}{s+b} I \right)$ and if initial investments were of (I), firms would then have to devote a share (b) of their revenues to those repayments.

In the same way, we can calculate the sums saved for a volume of initial investments (I):

$$S = sI + s(1-s-b)I + s(1-s-b)^2 I + ... + s(1-s-b)^n I$$
$$= \frac{s}{s+b} I \quad \text{pour } n \to \infty \qquad (7)$$

Contrarily to the teachings of the *General Theory*, savings are no longer equal in this context to the amount of investments made at the beginning of a period. It can be easily explained. In the usual multiplier theory, savings constitute the final destination of the entire money poured into circulation at the beginning of a period. Therefore, it is logical that the sums saved are equal to those invested. However, in the theory presented in these pages, the funds raised have, in the end, two destinations: the repayment of past credits and savings. Savings can only be inferior to investments.

Thus, we can note that the sums of savings and of repayments of credits strictly correspond to the sum of initial investments:

$$S + R = \frac{s}{s+b} I + \frac{b}{s+b} I = I \qquad (8)$$

We can rewrite this equation under the form:

$$S = I - R \qquad (9)$$

The right hand side of the equation represents the net change investments within a period. Savings is therefore equal to the *net* change of investments. This result makes sense. In the multiplier model and the one of Harrod-Domar, an investment financed by bank credit generates equivalent savings. Here, the repayment of a bank credit that has financed an investment symmetrically leads to a decrease of savings. The decrease of revenues engendered by these repayments results in a decrease of future receipts and revenues, and eventually in a decrease of savings.

We have seen in this part that taking into account the repayments of credits affect the multiplier value. It will then also affect the level of the aggregate demand and consequently the dynamics of the Harrod-Domar model. In the following part, we incorporate this result to this model.

4. The model dynamic when the repayment of investments is taken into account

The evolution of the aggregate supply is not modified, in the Harrod-Domar model, by the previously obtained results. However, for reasons previously mentioned, the evolution of the overall demand is going to be affected by the decrease of the multiplier effect coming from the taking into account of the repayment of credits. The new equations ruling the Harrod-Domar model now become:

$$\begin{cases} \Delta Q_t^d = \dfrac{\Delta I_t}{s + b_t} & (10) \\ \Delta Q_t^s = \sigma I_{t-1} & (11) \end{cases}$$

A balanced growth consequently needs a growth rate of investments of:

$$\Delta Q_t^d = \Delta Q_t^s \Rightarrow \left(\frac{\Delta I}{I} \right)_t = \sigma \quad s + b_t \qquad (12)$$

The multiplier effect being lower, a given change of investments will generate a lower growth of the overall demand. A higher growth rate of the investments will consequently be required to allow demand to grow at the same pace as supply.

The propensity of households to save and the coefficient σ are parameters of the model. The main variable of the model, investments, is totally endogenous. Present investments depend of the value of (b), which depends of the repayment of past investments. Once the values of the parameters s and σ and the initial conditions are known (K_0, R_0), it is possible to determine the dynamics of such an economy. The initial conditions allow to indicate the investments necessary to the equalization of supply and demand for the first period, which will determine the value of the repayments for the following period, and therefore the one of new investments needed to maintain a balanced growth.

$$K_0, R_0 \rightarrow I_0 \rightarrow R_1 \rightarrow I_1 \xrightarrow[\text{avec } I_0]{} R_2 \rightarrow \ldots$$

We are trying to determine the sum of required investments as to experience the same increase in both supply and demand from one period to another. To do this, we first express b_t in terms of I_t, R_t, s in equation (6), and then solve equation (12).

$$R_t = \frac{b_t}{s + b_t} I_t \Rightarrow b_t = \frac{s}{I_t / R_t - 1} \qquad (6')$$

$$\left(\frac{\Delta I}{I}\right)_t = \sigma \; s + b_t \quad \Rightarrow \frac{I_t^{\text{required}} - I_{t-1}}{I_{t-1}} = \sigma\left(s + \frac{s}{I_t / R_t - 1}\right) \qquad (13)$$

We end up with a single-unknown equation, giving investments of the present period, whose only positive solution is:

$$I_t^{\text{required}} = \frac{(R_t + I_{t-1} + \sigma s I_{t-1}) + \sqrt{(-R_t - I_{t-1} - \sigma s I_{t-1})^2 - 4 I_{t-1} R_t}}{2} \qquad (14)$$

Knowing the value of previous investments, therefore of present repayments, this equation gives us the sum of the investments necessary to the equalization of both overall supply and demand.

Then, what are left to clarify are the conditions to the repayments of credit to be able to determine the evolution of investments required throughout the periods. For us, the hypothesis best to make a compromise between realism and a necessary simplification of reality consists in suggesting that every investment is equally reimbursed on the n periods that follow its issuance. In that case, the repayments of credits of one period will vary according to the investments made during the previous n periods.

$$R_t = \frac{1}{n} I_{t\text{-}1} + \frac{1}{n} I_{t\text{-}2} + \ldots + \frac{1}{n} I_{t\text{-}n} \qquad (15)$$

By inserting the equation (15) into the equation (14), we get a recurrent series of degree n. Investments from the period *t* rely on the value of the investments made from the period ($t-1$) to the period ($t-n$). It is extremely complicated to determine analytic values for such a series. Hence our proposal to determine the evolution of investments required thanks to simulations. Once the evolution of investments known, we can determine the evolution of the rate of capital accumulation required to maintain demand on a same level as supply:

$$\frac{K_{t+1}^{\text{required}} - K_t}{K_t} = \frac{K_t + I_t^{\text{required}} - K_t}{K_t} = \frac{I_t^{\text{required}}}{K_t} \qquad (16)$$

To do these simulations, we need to fix the values of the parameters as well as the initial conditions. For the parameters s and σ we choose the most commonly used values $\left(s = 0,2 \; ; \; \sigma = \frac{1}{3} \right)$. We suppose that the repayments at the beginning of the model are null ($R_0 = 0$) and consider the initial stock of capital equal to the unit ($K_0 = 1$). We then focus on the evolution of the rate of capital accumulation for different values of n, the duration of repayments of credits.

In the graphic below, we present the result obtained over about twenty periods for credits being issued for 3, 5 and 10 years.

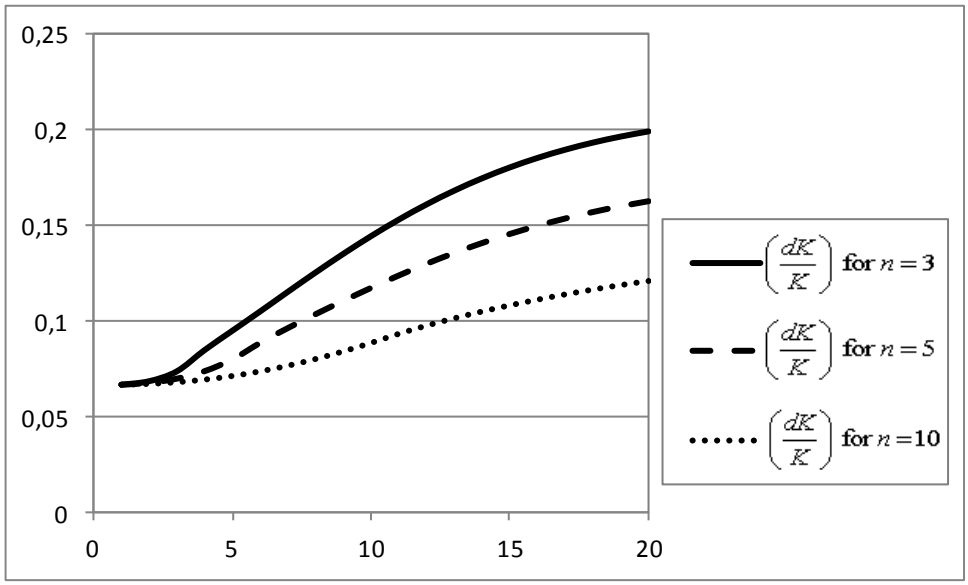

Fig.1: Evolution of the capital growth rate *required* to maintain full employment of production inputs

The main result, identical to every simulation made is: the rate of capital accumulation has to gradually increase throughout the development of the economy, to increase supply and demand at the same pace. In other words, it has become more and more difficult in a growing economy to maintain a balanced growth. The main reason for this result is that we take into account the repayments of credits that have financed past investments. The more important the repayments are, the more a big share of the firms' revenues leave the economy in order to reimburse them, the more the multiplier effect and so the increase of the overall demand is low and the more big investments are needed.

When Domar writes: "*investment is [...] the cause of even greater ills in the future*", he is thinking of the increase of production capacities of the economy, caused by investment. The more the present investments are important, the more the production capacities of the economy will be considerable tomorrow and the more a great demand will be needed to fully use the production factors. By taking into account the repayments of credits, we add, on top of this effect on supply, the depreciative effect on overall demand, which causes the repayment of past investments. To overcome these two effects, the accrual rate of investments has then to gradually rise before stabilising itself after a certain number of periods.

We notice that the more the duration of the issuance of credits is short, the more the growth rate required of the capital will be high. This is how it can be explained: the more the duration

of the issuance of credits is short, the more the volumes to reimburse are important during the next periods and the more it is necessary for new investments to be made to counterbalance the decrease of the demand provoked by these repayments. Moreover, these bigger investments will increase future repayments, once again requiring bigger investments flows.

These results could give an explanation to the shifting from a prosperity phase to a depression one. It will be easy to understand, considering the given figures, that an economy would not be able to follow the pace, after several periods, of a capital accumulation required. To take, for instance, the case when credits are reimbursed on a 3-year-period, the required rate of capital accumulation becomes exorbitant after a few periods. An economy under such conditions would not be able to keep up the pace for more than a few periods and would rapidly find itself with a rate of capital accumulation inferior to the one required. It would then see a faster increase of its capacity of production over its overall demand that would lead to a crisis of overproduction.

The main result obtained, the increase of the required growth rate of investments, can therefore explain how, after a few years time, a developing economy can face a crisis of overproduction. Now is to observe that, symmetrically, this result could give an explanation on how we pass from a phase of depression to a prosperous phase, offering a new explanation to the genesis of the economic cycles.

5. An explanation of economic cycles based on the repayment of bank credits

Two main results emerge from the previous parts. First, the more the volumes of repayment of credits are important, the more the volumes invested, and thus the rate of capital accumulation, will have to be significant to reach a same level of overall demand. Second, in a growing economy, the investment rate or the rate of capital accumulation required to obtain a balanced growth has to gradually rise to reach a threshold value. This value, according to the conditions, can be very high and therefore almost unreachable, compared with what an economy can do.

If we gather these results with the idea developed by Harrod, that an excess demand with regard to supply will stimulate investments while an excess supply with regard to demand will abase them, making an unstable balance, we can obtain a succession of economic cycles.

Let's put ourselves at the very beginning of a growing phase. The rate of capital accumulation required to obtain a balanced growth is low, as shown in the graphics above. An investment rate or capital accumulation, even weak, is therefore sufficient to allow demand to rise at the same pace as the supply. However, if the growing phase keeps going, the rate of capital accumulation required to obtain a balanced growth is going to rise, as shown in the previous results. The opportunities of investment also multiply themselves during the growing phase. The effective capital accumulation rate can therefore last for a certain time above the required rate without impairing the growing phase to stop. However, we have seen that, after some periods, the accumulation rate required of the capital was becoming too important regarding what an economy can do. There will therefore be a time when the effective capital accumulation rate will be below the required accumulation rate, namely a time when the growth rate of demand will become inferior to the one of supply. Firms will then have to face with excess capacities of production, which will mark the end of the prosperity phase. These excess capacities are going to make the investment rate drop while the accrual rate required, which vary according to the repayment of the previous investments, is going to maintain itself at a high level. The gap between required and effective capital accumulation rate will be heightened, abasing even more investments and heightening the extent of depression. However, after several periods, the decreasing of investments will result in a decrease of the repayments, and so, of the required capital accumulation rate. This last rate will then be so low that, even for a small volume of investments, the demand growth will be able to overtake the one of supply. This result will tend to stimulate investments, while the required capital accumulation rate, which depends on the repayment of investments made during the depression phase, will remain low for a few more periods. These conditions will put a start to a new growing phase that will end when the volumes of repayment, and so the required capital accumulation rate, will reach again levels that are too high.

The said reasoning is represented in the graphic below.

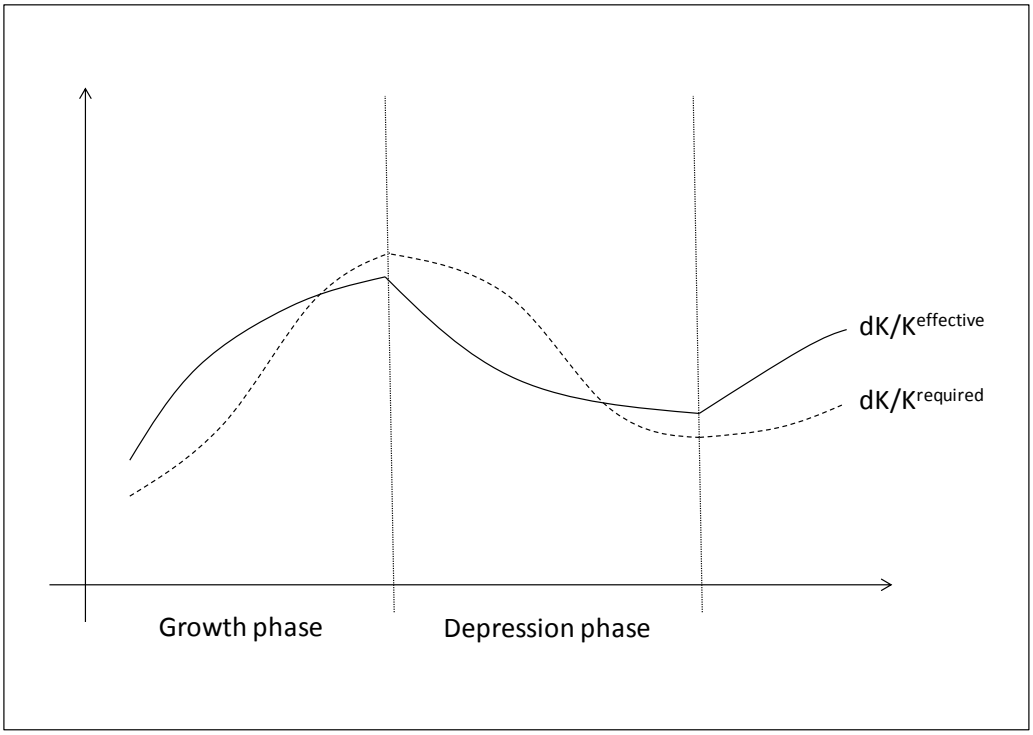

Fig.2: An explanation of economic cycles based on the repayment of bank credits

Here, we settled for a description of the chains that, on the basis of the obtained results, could explain the succession of economic cycles, without looking for a modelling from the Harrod-Domar model. Such a modelling would ask to issue a certain number of hypothesis, obviously arbitrary, considering the links between growing rate and investment rate, excess capacities of production and decreasing of investments, which is highly above the framework of this article. Moreover, a situation in which the repayment of bank credits is over the issue of bank credits cannot be modelled in the Harrod-Domar framework, as repayments cannot excess investment. The intuitive appeal of this result will then be the subject of a future article.

6. Conclusion

Investments play a fundamental role in Post Keynesian theories. Not only do they allow to accumulate capital, they also play a dynamic role in the evolution of overall demand or in the genesis of profits, as in Kalecki (1943). However, no works have, to our knowledge, focused on the conditions of their reimbursement, when Households hold monetary savings and investments are financed by bank credits issued on several periods. Here we demonstrate that

by doing so, it will modify the conditions of growth of an economy in the Harrod-Domar model and could give an explanation to the origins of the economic cycles.

In both cases, the point made is similar. As written by Graziani (1988, p.154), "*It would not be possible to know how prior savings could be formed and put aside before the realization of the investment and the generation of the revenue*[4]". Investments have therefore to be financed, some time or another, by bank credit. And yet, as for hoarding, the repayment of this bank credit clearly constitutes an outflow outside the economic circuit. The repayment of a bank credit is recorded as a cost for the firms, but does not generate any revenue in the economy because the corresponding money is destroyed.

However, if the explanation of crisis by excess of savings leads to an abundant literature, it is the opposite situation as for the repayments of bank credits. What we are showing in this article is that, in addition to savings, crisis and economic cycles could find their origins in the outflow that constitutes the repayments of bank credits. Crisis and economic cycles could therefore find their origin not only in the monetary nature of the economies, but also in the money nature, which is a *temporary and indebtedness* money (Gurley and Shaw, 1960).

In addition to the implementation of stimulus policies by demand, the solution to the problem of underemployment could therefore lies in a modification of the mechanisms of the creation and destruction of money. This conclusion meets the point of view of Jean de Largentaye, the French translator of *General Theory*, when he writes in the preface of this book:

"*The key to full employment is not to be found in monetary expansion, or in the Revenue Policy, nor in the other expedients deduced from the General Theory. As far as we are concerned, it is to be found in the abandonment of the empirical institution, unfair and inefficient namely the credit money and its replacement by rational money adjusted to its economic and social functions. May Keynes' work help to make this point understood*."

May this article contribute to this debate.

[4] Our translation.

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