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BEING KEYNESIAN IN THE SHORT TERM AND CLASSICAL IN THE LONG TERM
The Traverse to Classical Long-Term Equilibrium

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RÉSUMÉ

ÊTRE KEYNÉSIEN DANS LE COURT TERME ET CLASSIQUE DANS LE LONG TERME

Cette étude est consacrée au rapport entre les analyses keynésienne (post-keynésienne, kaleckienne) et classique, considérées du point de vue de deux horizons temporels, court terme et long terme. On y présente un modèle dans lequel la traverse vers un équilibre de long terme classique, avec des prix de production, est décrite comme une séquence d'équilibres keynésiens de court terme (dans lesquels les productions sont ajustées aux demandes). Dans le court terme, les prix et les stocks de capitaux sont constants; ils ne sont ajustés que dans le long terme. Les prix répondent aux déséquilibres des taux d'utilisation du capital. L'investissement est soumis à une contrainte de financement, dans laquelle est impliqué l'octroi de crédits par le système bancaire. Les prêts sont modifiés au regard de l'inflation (politique monétaire).

ABSTRACT

BEING KEYNESIAN IN THE SHORT TERM AND CLASSICAL IN THE LONG TERM

The paper analyses the relationship between the Keynesian (post-Keynesian, Kaleckian) and classical perpectives, emphasizing the distinction between two time frames, short term and long term. A model is presented in which the traverse to a long-term classical equilibrium, with prices of production, is obtained as a sequence of short-term Keynesian equilibria (in which outputs are adjusted to demands). In the short term, prices and capital stocks are constant; they are only adjusted in the long term. Prices respond to disequilibria concerning capacity utilization rates. Investment is subject to a financing constraint, in which the provision of loans by the banking system is involved. Loans are modified in response to inflation (monetary policy).

MOTS CLEFS : Traverse, classiques, post-Keynesiens, monnaie, déséqulibre.

KEYWORDS : Traverse, classicals, post-Keynesians, money, disequilibrium.

J.E.L. Nomenclature: E11,E12,E40,D50,B12,B14.

INTRODUCTION

Two major trains of thought coexist within heterodox economics which share many common elements but which diverge on a number of basic issues. *Keynesians* (Kaleckians, Post-Keynesians, etc.) emphasize the problem of "effective demand" and equilibrium at different levels of utilization of resources. *Classicals* (neo-Ricardians, Marxists, etc.) favor an equilibrium with equalized profit rates, prices of production, and a full utilization of productive capacity. The relationship between these two schools has always remained somewhat ambiguous. The need for a synthesis has been in the air for long (see, for example, EICHNER A.S., KREGEL J.A. 1975, CARVALHO F. 1984, ARENA R. 1987, SKOTT P. 1989, HALEVI J., KRIESLER P. 1991, and LAVOIE M. 1992(a)), but the difficulty of actually "connecting" the core models has always been an intractable obstacle, and the gap still appears to many as unbridgeable.

This paper discusses the relationship between Keynesian and classical equilibria emphasizing the distinction between two time frames, short term and long term.[1] Obviously, the issue is not to simply juxtapose a *Keynesian model in the short term*, on the one hand, and a *classical model in the long term*, on the other hand, but to build a *single model* in which the two time frames are analytically connected.

A number of models, relating short- and long-term equilibria, already exist, and are often called *traverse* models. In such models, an economy is subject to a *shock*, and the issue is the return to a long-term equilibrium. This movement is described as *a sequence of short-term temporary equilibria*.[2] In a *post-Keynesian traverse* (LAVOIE M., RAMIREZ-GASTON P. 1993, DUTT A. 1988), a sequence of Keynesian short-term equilibria converges toward a Keynesian long-term equilibrium, a steady state, in which resources are not fully used. In a *Walrasian traverse*, known as a turnpike, a sequence of Walrasian short-term equilibria (where prices ensure market clearing) converges to a Walrasian long-term equilibrium (BEWLEY T. 1982). A few models also exist within the classical tradition, related to the convergence to long-term equilibria, with various conceptions of short-term equilibria (FRANKE R. 1987, ARENA R., FROESCHLE C., TORRE D. 1990, KUBIN I. 1990, and DUMÉNIL G., LÉVY D. 1990(a) and 1993(a), Ch. 7).

The purpose of the paper is to study a model in which the traverse to a long-term classical equilibrium is obtained as a sequence of short-term Keynesian equilibria. The economy is initially considered in a disequilibrium, corresponding to any supply or demand "shock," affecting technology, distribution, or prices. Then, no structural change is allowed,

1. A similar characterization of the two schools of thought in reference to two distinct time frames, short and long terms, can be found in ROBINSON J. 1962 and 1979 (p. xvii), MAINWARING L. 1977 (pp. 674-675), and VIANELLO F. 1985 (pp. 69-73). This viewpoint is severely criticized in RONCAGLIA A. 1996. Another view considers the classical analysis as a theory of prices, and the Keynesian analysis as a theory of output (quantities produced).

2. Traverse models have been originally devised to deal with structural change. A prominent example of such an investigation of structural change in terms of traverse is that of Hicks in its founding analysis in *Capital and Growth* (HICKS J. 1965, Ch. XVI), or in *Capital and Time* (HICKS J. 1973, Part II). See also LOWE A. 1976 and, more recently, HAGEMAN H. 1992. To NELL E.J. 1996, the existence of structural change renders the reference to long-term equilibrium position irrelevant. Conversely CESARATTO S. 1995 contends that the classical viewpoint is compatible with structural change. In DUMÉNIL G., LÉVY D. 1995(a), we present a model, in which the classical gravitation occurs around a long-term equilibrium shifting over time as an effect of structural change.

in particular, technology and the real wage are given, and it is, consequently, possible to refer to a long-term equilibrium, also called *steady state* or *long-term center of gravitation*[3]. The definition of this equilibrium is conventional. On the classical long-term equilibrium, the profit rates among enterprises are uniform, prices are equal to prices of production, *and* the capacity utilization rates are "normal." The short-term equilibrium is a standard multi-sectorial Keynesian-Kaleckian equilibrium: any prices, profit rates, and capacity utilization rates may prevail, and the equilibrium between the supply and demand of the various commodities results from the adjustment of capacity utilization rates. The purpose of the demonstration is to show that the sequence of Keynesian equilibria can converge toward classical equilibrium — the *synthesis* contemplated above.

Obviously, the convergence to a classical equilibrium follows from specific assumptions concerning the dynamics of a number of variables (capital stocks, prices, etc.), called *long-term variables*. These variables are treated as constant parameters within short-term equilibria, and are slowly modified between two short-term equilibria. Four such mechanisms are considered:

1. *Supply and demand, capacity utilization rates, and the dynamics of prices (or mark-up rates).* Prices are constant in the short term, and the equality between supply and demand is obtained by the adjustment of capacity utilization rates. In the long term, enterprises, which are *price-makers*, vary their prices (or their mark-up rates) depending on the value of the capacity utilization rate.
2. *Profitability differentials and capital mobility.* In the short term, capital stocks are given and profitability differentials exist among enterprises. A specific category of agents, called *capitalists*, observe these differentials and invest more in enterprises where profit rates are larger.
3. *Investment and the financing constraint.* In the short term, investment is partly exogenous, *i.e.*, combines an exogenous component and a component depending on short-term variables. However, the exogenous component must be treated endogenously in the long term. In our opinion, the main component of long-term dynamics is related to monetary and financial mechanisms and, more specifically, to the changing *financing constraint* under which investment is undertaken.
4. *Monetary and financial mechanisms.* The financing constraint to which investors are subject evolves in the long term. Credit and the issuance of money allow for the expansion of investment beyond the limit determined by preliminary financing. These mechanisms are controled and limited by the reaction of monetary institutions to inflation.

The acknowledgement of the convergence to long-term equilibrium must not be understood as a denial of business-cycle fluctuations. The more elaborated classical contention in this respect, that of Marx, is that the general level of activity "gravitates" around such a long-term equilibrium with a normal utilization of productive capacity. Marx actually combines the two notions, the convergence to long-term equilibrium (MARX K. 1894, Ch. 10) and the business cycle, that he carefully describes in various occasions. In the following passage, cited in VIANELLO F. 1985, Marx clearly refers to the normal use of productive capacity as a feature of the center of business-cycle fluctuations. He criticizes Smith's

3. Or *fully-adjusted position* (VIANELLO F. 1985).

analysis of the tendency for the profit rate to fall that Smith links to an overabundance of capital:

> When Adam Smith explains the fall in the rate of profit from an over-abundance of capital, an accumulation of capital, he is speaking of a *permanent* effect and this is wrong. As against this, the transitory over-abundance of capital, over-production and crises are something different. Permanent crises do not exist.[4]

This study divides into 5 sections. Section 1 introduces the four classical mechanisms listed above. These four long-term mechanisms define the fundamentals of our classical approach to long-term equilibrium. At this point the presentation of the model is nearly curtailed, but a little must added to allow for the determination of the two equilibria: *short-term Keynesian equilibria* with any capacity utilization rates and profit rates, and the *long-term classical equilibrium* with a normal capacity utilization rate and prices of production. This is the object of section 2. This framework allows for the interpretation of a number of traditional divergences between the two perspectives, such as, for example, the relationship between investment and profits (which determines which?). The dynamics of long-term variables are then revisited in section 3, where the crucial issue in this study, *viz* the convergence of Keynesian equilibria to a long-term equilibrium is addressed (formally, the problem is that of the stability of long-term equilibrium). These three sections bring the presentation and treatment of the model and, therefore, the *theoretical facet* of the synthesis, to completion. However, because of the emphasis placed on monetary mechanisms, section 4 discusses four alternative models of these mechanisms. The purpose of this demonstration is to show that the results obtained are not dependent on a specific framework, provided that monetary mechanisms respond to inflation. Section 5 discusses the explanatory power of our analysis concerning the movements of the general level of activity. The model accounts for the low-frequency component of business-cycle fluctuations, which is related to monetary mechanisms. Sufficient centripetal forces exist that ensure the gravitation of the general level of activity around a normal value but, in relation to the imperfect character of these mechanisms, significant and lasting deviations are observed. This defines the *empirical facet* of the synthesis between the Keynesian and classical conceptions of equilibria.

1 - The Classical Dynamics of Long-Term Variables

The first section below recalls the main features of temporary equilibria: the distinction between short- and long-term variables, the sequence of short-term equilibria and its long-term equilibrium position. We then turn to the dynamics of long-term variables, which will account for the convergence of Keynesian equilibria to classical equilibrium: the adjustment of prices in response to disequilibria between potential production and demand in section 1.2, the determination of investment, the financing constraint to which it is subject, and capital mobility in section 1.3, and the issuance of money, in relation to the level of activity and inflation in section 1.4. Since the purpose of the demonstration is to connect short-term Keynesian equilibrium and long-term classical equilibrium, recurrent references will

4. MARX K. 1862, Volume II, p. 497 footnote.

be made in this section to the Keynesian (in particular, post-Keynesian) perspective for comparison.

1.1 Sequences of Temporary Equilibria

Traverse models employ the conventional framework of *a sequence of short-term or temporary equilibria*, where two groups of variables are distinguished, *long-term variables* and *short-term variables*, depending on the speed of their variations. Long-term variables adjust slowly. For given values of long-term variables, a temporary equilibrium is supposed to exist and short-term variables to be equal to their short-term equilibrium values. One then investigates the convergence of the sequence of short-term equilibria to long-term equilibrium[5]:

$$\cdots \to \begin{pmatrix} \textit{Modification} \\ \textit{of long-term} \\ \textit{variables} \end{pmatrix} \to \begin{pmatrix} \textit{Temporary} \\ \textit{equilibrium} \end{pmatrix} \to \begin{pmatrix} \textit{Modification} \\ \textit{of long-term} \\ \textit{variables} \end{pmatrix} \to \begin{pmatrix} \textit{Temporary} \\ \textit{equilibrium} \end{pmatrix} \to \cdots$$

This method is very helpful in the comparison between Keynesian and classical equilibria. The long-term variables include capital stocks and one component of the money stock, as well as prices. Short-term variables include demand (consumption and investment), output (or, what is equivalent, since productive capacity is given in the short term, the *capacity utilization rates*) and, possibly, inventories. For given values of capital stocks, the money stock, and prices, an equilibrium exists for capacity utilization rates and the other short-term variables.

In this paper, we use a *standard Keynesian framework* to describe short-term equilibrium. Investment and consumption are expressed as functions of the current output of the period (and depend on the present value of long-term variables). Consumption is modeled as is traditional within Kaleckian (or classical) models, distinguishing between wages, entirely consumed, and profits, of which a given fraction is consumed. The analysis focuses on capacity utilization rates and abstraction is made from inventories:

1. Equilibrium is defined by the *equality between production (or supply) and demand* on each market. Prices are given in the short term, and this equality is obtained as a result of the adjustment of production to demand (enterprises produce what is demanded at given prices). It follows from this equilibrium on commodity markets that *aggregate* savings and investment are equal.
2. As a result of the adjustment of supply to demand, any capacity utilization rates, u^i, may prevail in a short-term equilibrium, which are different from the rates, $\overline{u}^i$, actually targeted by enterprises (*i.e.*, considered as normal or standard).[6] In other words, a deviation can be observed between *potential supplies* and *demands*, or between the prevailing capacity utilization rates and their normal values. When considered from the viewpoint of long-term equilibrium, this difference represents a disequilibrium.

5. The equilibrium values of the short-term variables are the solutions of a system of simultaneous equations. The values of long-term variables (which are not equilibrium values in any sense) are derived from their values at the previous period by adjustment.

6. A simple interpretation of the existence of target capacity utilization rates different from 100% is that there is a rapid fluctuation of demand. If demand is jerky, enterprises need to maintain comparatively large productive capacity.

The *classical* aspect of our analysis is entirely embodied in the dynamics of long-term variables between two successive temporary equilibria. These *long-term dynamics* are introduced in the following three sections.

1.2 Prices and Wages

In contrast to short-term equilibria where prices are given, the classical analysis of the formation of prices of production (a set of prices which ensures a uniform profit rate) assumes that prices are modified in response to the *disequilibria between supply and demand* (in the broad sense of the expression).

In this paper, the variation of the price, p_t^i, of enterprise i is assumed to respond to the deviation of the capacity utilization rate from its target value (for example, the price will be raised ($p_{t+1}^i > p_t^i$), if the capacity utilization rate is large ($u_t^i > \overline{u}^i$):

$$p_{t+1}^i = p_t^i(1 + \delta(u_t^i - \overline{u}^i)) \quad \textit{or} \quad \frac{p_{t+1}^i - p_t^i}{p_t^i} = \delta(u_t^i - \overline{u}^i) \tag{1}$$

In this equation, the intensity of the reaction to the disequilibrium, $u_t^i - \overline{u}^i$, is measured by δ, a *reaction coefficient*.[7] Concerning distribution, we will assume simply that *the real wage rate is constant*. This implies that the variations of the nominal wage rate must accompany those of prices. First, enterprises set their prices on the basis of prices prevailing at the previous period. Then, the nominal wage rate is adjusted to the level corresponding to the real wage rate for new prices.

The fact that prices are modified in response to disequilibria between supply and demand, does not imply that they are adjusted to levels which ensure *market clearing* in the Walrasian fashion. The classicals call *market prices*, prices which respond, in one way or another, to disequilibria between supply and demand, and differ from long-term equilibrium prices, but are not supposed to clear markets in the short term. This is clearly stated in the work of classical economists, even Adam Smith (see DUMÉNIL G., LÉVY D. 1993(a), Section 5.1).[8] The fact that the variation of prices is actually slow is also a major element in Keynesian analysis. The investigation of the reasons for this stickiness is the central issue within the *new-Keynesian* perspective.

Three distinct attitudes can be located within post-Keynesian studies concerning the response of prices to disequilibria on capacity utilization rates. A first point of view is that mark-up rates are increased when capacity utilization rates are large, but Kalecki defends the opposite view that mark-up rates respond negatively to the deviation of capacity utilization rates. Mark-up rates can also be indifferent to the level of activity.[9]

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7. In equation 1, prices do not depend on production costs (consequently, changing costs have no impact on prices). An alternative, and perhaps better, model would be a mark-up model in which the mark-up rate is adjusted instead of the price. We use equation 1 for simplicity.
8. A lot of ambiguity surrounds the notion of *market prices*. Marc Lavoie uses a definition different from ours when he writes, for example, "*Actual prices are not market prices which would clear out excess demand at each period.*" (LAVOIE M. 1992(b), p. 148). Ciccone interprets the classical notion of *market prices* as referring to averages: "*In sum, Ricardo's and Marx's concern in / with market prices is interpretable as referring to* averages *over time of those prices.*" (CICCONE R. 1992, p. 14).
9. The empirical evidence in this respect is mixed (LEE F.S. 1994, CHESNAIS F. 1996).

A *constant nominal wage rate* is the most common assumption made within (post-) Keynesian models, concerning distribution. With this approach, any theory accounting for the general level of prices also determines the real wage. This view corresponds to the post-Keynesian analysis of distribution based on market power. Our assumption of a constant real wage does not imply any specific theory of distribution; it is a simplifying assumption, meaning that, in the present study, we abstract from its determination (see DUMÉNIL G., LÉVY D. 1993(a), Section 15.4).

1.3 Investment

It is traditional within the Keynesian perspective to confer a prominent role on investment, and the model in this paper follows a similar line. We begin this analysis of investment in section 1.3.1 with a criticism of post-Keynesian investment functions, contending that the behaviors that these functions try to capture are sensible in the short term, but not applicable to the long term. An alternative classical framework, in which investment decisions are made under a financing constraint — consistent with the classical view of investment, but allowing for credit mechanisms — is introduced in section 1.3.2. Capital mobility, which is discussed in section 1.3.3, extends this view of financial "rationing" by the specific role conferred on capitalists in the social "dispatching" of these limited financial resources available for investment.

1.3.1 A Criticism of Kaleckian-Steindlian Investment Functions in the Long Term

Reference to long-term equilibrium is rare in the *General Theory* (see KEYNES J.M. 1936, p. 68). The acknowledgement of Keynesian *long-term* equilibrium, *i.e.*, a long-term equilibrium in which the utilization of productive capacity is not normal, is, in fact, typical of modern post-Keynesian analysis (see EICHNER A.S., KREGEL J.A. 1975).[10] There is no agreement among Keynesians, however, in this respect. Although his model actually has such a long-term equilibrium position, Kalecki rejects the notion: "*In fact, the long-run trend is but a slowly changing component of a chain of short-period situations; it has no independent entity* [...]" (KALECKI M. 1971, p. 165). H. Mynsky contends that "*time series* [...] *can be decomposed into a trend and fluctuations around this trend, but this is arithmetic not economics.*" (cited in MAINWARING L. 1990). The same rejection can be located in the work of Asimakopulos (in his reply to P.A. Garegnani, ASIMAKOPULOS A. 1988, p. 262).

The form given to the *investment function* is crucial in the attainment of a "Keynesian" steady state. The typical form of a Kaleckian-Steindlian investment function is the following:

$$\frac{I_t}{K_t} = a + bu_t = a' + b(u_t - \overline{u}) \tag{2}$$

in which $a' = a + b\overline{u}$. This equation represents the intuition that each value of the capacity utilization rate will be associated with a given value of investment (the larger the capacity

10. In addition to DUTT A. 1988 (second model) and LAVOIE M., RAMIREZ-GASTON P. 1993, in which actual models are presented, this point of view is also adopted, for example, in AMADEO E. 1986, CICCONE R. 1986, and KURZ H. 1994.

utilization rate, the larger the investment rate).[11] In spite of the reference to the capacity utilization rate, the constant term in the post-Keynesian investment function incorporates a large degree of stability into the system.

This view of investment may be valid in the short term. However, *it is not correct, in our opinion, to assume that this behavior will be maintained in the long term.*[12] From the point of view of equation 2, this means that parameters a or a', which model the "exogenous" component of investment, cannot be assumed to be constant. These parameters can be considered *exogenous* in the short term, but must be treated *endogenously* in the long term.[13] Three distinct expressions can be given of this statement:

1. The simplest formulation, which very concisely encapsulates our disagreement with the post-Keynesian approach to investment, is that *a deviation of the capacity utilization rate from its normal value would lead to a* variation *of investment, instead of a constant investment, in order to obtain a return to this normal level*:
$$\frac{I_t}{K_t} = \frac{I_{t-1}}{K_{t-1}} + b(u_t - \overline{u}) \tag{3}$$
(Instead of I_{t-1}/K_{t-1}, one could use some average of lagged values of the investment rate.) There is actually an "Harrodian" flavor in this function.
2. The "exogenous" component can be interpreted as the expected growth rate of demand:
$$\frac{I_t}{K_t} = \rho^e_t(D) + b(u_t - \overline{u})$$
In this model investment is set at a level such that the growth rate of the capital stock (of productive capacity) is equal to the expected growth rate of demand, whenever the capacity utilization rate is normal. If, for example, $u_t > \overline{u}$, investment is scaled up to allow for the return of the capacity utilization rate to its normal value. The expectation is readjusted in relation to previous realizations (for example, using adaptive expectation). This interesting line of argument has been introduced in COMMITERI M. 1986.[14]
3. The present paper builds upon a third type of mechanism, in line with the classical notion of *capital accumulation*, in which investment is subject to a *financing constraint*, which is tightened or relaxed progressively in the long term (see equation 6 below).

11. Note that this view of investment is very different from that of Keynes, who linked investment to the *marginal efficiency of capital*, whose degree of volatility is very high (*animal spirits*). This is actually how Keynes accounted for the business cycle (KEYNES J.M. 1936, Ch. 22).

12. A similar criticism has been set forward by Mainwaring and Commiteri: "*It is difficult to understand why, in the face of an increase in effective demand which is expected to endure, firms do not expand capacity to restore their desired margins.*" (MAINWARING L. 1990, p. 404). "[...] *Steady states characterized by a permanent under- or over-utilization of productive capacity can be viewed as arising from 'wrong' expectations held by producers* [*and this cannot be accepted in the long term*]." (COMMITERI M. 1986, p. 174).

13. Note that the same type of discussion could be held concerning the accelerator model of investment: $\frac{I_t}{K_t} = a + b(u_t - u_{t-1})$. Again, it is not possible to assume that the constant a will remained unchanged in the long term.

14. See also LAVOIE M. 1995.

1.3.2 Financing Investment

The existence of a financing constraint actually defines a prominent feature of the classical analysis of investment. Investment is fundamentally limited by the availability of financing: the advance of *capital* at the beginning of the period. (To be available for investment, this capital must be liquid, *i.e.*, exist under the form of money, or other liquid financial assets.) Thus, this capital has been *previously accumulated*, *i.e.*, in the possession of a capitalist.

In order to gain insight into the origin of these mechanisms, it is helpful to recall that there are three basic channels by which investment is financed within capitalism:

1. *Direct financing.* Earnings are retained within enterprises or funds are collected directly from other savers by floating new shares or bonds, or various forms of borrowings.
2. *Intermediation.* Funds are borrowed from financial intermediaries which collect savings and make loans.
3. *Bank loans.* Banks make loans to enterprises, but are not subject to preliminary savings (only institutional control). They issue money.[15]

Classicals base their view on the two first channels, in which savings are a preliminary to investment, and tend to overlook the third mechanism.[16] The basic Keynesian view emphasizes the third mechanism, and assumes that banks always accommodate demand from investors. *This point of view jointly denies the two aspects of the classical analysis of investment: preliminary saving and financial constraint.*

Although we obviously agree with the view that bank loans often finance investment, we believe that this mechanism *does not eliminate the classical financing constraint.* It is well known, for example, that borrowing for investment is conditioned by sufficient preliminary internal financing (retained earnings), and infinite debt-equity ratios are not institutionally tolerated. In spite of the apparent unlimited availability of financing, the career of capitalist is not opened to all.

The financing constraint will be expressed in the model by the following relationship between new borrowings and the previous holding of monetary assets, and the dependency of investment on total funding:

$$\underbrace{\left[\begin{pmatrix}\text{Monetary}\\\text{assets held}\end{pmatrix} \to \begin{pmatrix}\text{New}\\\text{borrowings}\end{pmatrix}\right]}_{\textit{Liquid Capital}} \to \text{Investment}$$

To refer to the intrinsic limitation of financial resources available for investment, we use the expression *financing constraint.* We could also say *monetary constraint* or *liquidity constraint.* The problem is that the funds must be there, but this assertion relates to the asset side of the balance sheet and financial assets, as well as to liabilities, their internal structure and relation to own funds. We call "liquid capital" the sum, L, of *monetary assets held* and *new borrowings*.

15. One could add to these mechanisms that enterprises may transact on reciprocal trade credits.
16. This is true, for example, of Marx's analysis of accumulation in Volume I of *Capital*, but not of his analysis of the business cycle in Volume III, in which credit mechanisms play a crucial role (see DUMÉNIL G., LÉVY D. 1994(a), Section 1.1.1).

As shown in the previous analysis of post-Keynesian investment functions, enterprises make their investment decisions on the basis of the observation of demand (reflected in the capacity utilization rate), and are typically not constrained in the financing of investment projects. These models abstract from the availability of money, even from the interest rate. However, the post-Keynesian perspective is actually quite ambiguous in this respect.[17] The advocates of "accommodative" money supply contend that, for a given interest rate, all funds demanded by investors are supplied (provided the borrowers are credit-worthy). Another group considers the existence of a *financing constraint* as the corner stone of the Keynesian analysis, thus, bridging an important gap between the traditional Keynesian analysis and the classical conception of the advance of capital.[18] The notion of *credit rationing* is central to the new-Keynesian paradigm (see, for example, STIGLITZ J.E., WEISS A. 1981 and BLINDER A.S. 1987).

1.3.3 Capital Mobility and Investment

Another important difference between Keynesian and classical analyses is that a category of agents, called capitalists, is considered within the classical perspective, independent of enterprises. They allocate capital among enterprises, which are in charge of investment, production, and price setting. This notion of capital mobility is in line with the classical conception of financing constraint. The idea of "moving" capital among enterprises would have no meaning if enterprises could borrow as much as they want, independently of preliminary funding.

In the model, there are two goods: $i = 1$ is the capital good, and $i = 2$, the consumption good. Each good is produced within one enterprise. K^i and I^i denote the fixed capital stock and investment within enterprise i. Fixed capital does not depreciate, and the investment rate, $\rho^i = I^i/K^i$, is equal to the growth rates of the fixed capital stock. The holding of a stock of liquid capital L^i allows for an investment of the same value, $I^i p^1 = L^i$, and the same relation holds for the total economy:

$$\rho^i_t = \frac{I^i_t}{K^i_t} = \frac{L^i_t}{K^i_t p^1_t} \quad \textit{and} \quad \rho = \frac{I_t}{K_t} = \frac{L_t}{K_t p^1_t}$$

For simplicity, we will assume that only one capitalist exists, who controls the total amount of liquid capital, L, and is informed with respect to all profit rates. This capitalist divides the total liquid capital, L, into several fractions, L^i, transferred to the two enterprises, depending on the *difference* between the profit rate, r^i, of each enterprise and the average profit rate, r, during the period, the profitability differential, $r^i - r$. With π^i denoting the profit of enterprise i, and π, total profit, one has:

$$r^i = \Pi^i/K^i p^1 \quad \textit{and} \quad r = \sum_i \Pi^i / \sum_i K^i p^1 = \sum_i r^i K^i / \sum_i K^i$$

The amount of liquid capital, L^i, will be comparatively larger where the profit rate is larger. In a growth model, this means that the larger the profit rate of an activity, the larger its growth rate.[19]

17. A number of models are now available in which interest rates or debt ratios are considered (DUTT A. 1992 and LAVOIE M. 1995).
18. This divergence is well known, even if it is not always recognized (WOLFSON M.H. 1996).
19. It is possible to test empirically for the classical mechanism, and show that profitability differentials are actually a significant variable in the explanation of investment (see DUMÉNIL G., LÉVY D. 1993(a), Ch. 5, BERNSTEIN S. 1988, and HERRERA J. 1990).

It is equivalent to write the model for the L^is or ρ^is, since $L^i = \rho^i K^i p^1$. With γ a reaction coefficient which measures the responsiveness of the capitalist to the profitability differential[20], investment in the various enterprises can be expressed as:

$$\rho^i_t = \rho_t + \gamma(r^i_t - r_t) \tag{4}$$

It is easy to check that the total liquid capital allocated by the capitalist satisfies the constraint $\sum_i L^i_t = L_t$:

$$\sum_i L^i_t = \sum_i \rho^i_t K^i_t p^1_t = \rho_t K_t p^1_t + \gamma \left(\sum_i K^i_t r^i_t - K_t r_t \right) p^1_t = \rho_t K_t p^1_t = L_t$$

This classical analysis of the mobility of capital led by profitability differentials, in combination with the modification of prices in response to disequilibria between supply and demand (the two components of *cross-dual dynamics*), ensures the *equalization of profit rates* and the prevalence of a specific set of prices, *prices of production* in the long term.

Note that it is also possible to refer to a post-Keynesian equalization of profit rates, which is obtained for any given set of prices by the adjustment of capacity utilization rates to values different from normal (see DUTT A. 1987 and our rejoinder in DUMÉNIL G., LÉVY D. 1995(b)). This view of profit rate equalization, without prices of production, is called *the Kaleckian profit rate equalization* in LAVOIE M., RAMIREZ-GASTON P. 1993.[21] The point of view of P. Garegnani differs simultaneously from the traditional classical analysis, in which prices of production coincide with normal capacity utilization rates, and the post-Keynesian vision, in which any set of prices and capacity utilization rates may prevail in the long term. His analysis combines a Keynesian long-term equilibrium with any capacity utilization rates, and the prevalence of prices of production. Equalized profit rates only obtain on newly installed capitals, for which he assumes a normal capacity utilization rate.[22]

1.4 Total Capital Available for Investment: The Issuance of Money

Monetary mechanisms are presented in this study as a "two-tier" system, corresponding to what may be called *money* and *liquid capital*. Section 1.4.1 deals with the issuance of money, the dynamics of M. Section 1.4.2 is devoted to the link between the money and liquid capital stocks, M and L. Last, a few remarks on the interest rate are presented in section 1.4.3. For brevity, the accounting framework underlying these mechanisms will not be discussed.

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20. The fact that only one coefficient γ is considered means that the capitalist has no *a priori* preference for any activity and is only sensitive to profit rates.

21. Dutt explicitly refers to Kalecki: "*Kalecki (1942), in replying to Whitman's criticisms, makes it quite clear that capacity utilization would change to make differential markups compatible with equalized profit rates.*" DUTT A. 1987 (p. 68, note 21). See also HALEVI J., KRIESLER P. 1991 p. 84, note 6.

22. "*The rate of profits is relevant only for new investment (old plant gets quasi-rent), and there the investor plans the size of his equipment relative to expected demand, so that it might have a normal degree of utilization. He therefore expects the rate of profits corresponding to that degree of capacity utilization, that is the rate of profits which is traditionally referred to in economic analysis.*" GAREGNANI P. 1988, p. 257, note 22. This view is shared by Roberto Ciccone (see CICCONE R. 1986 p. 24-26).

1.4.1 The Issuance of Money

Our overall interpretation of monetary mechanisms can be summarized in the four following statements that we will discuss subsequently:

1. Money is “issued” as a function of other variables.
2. The issuance of money cannot be expressed as the confrontation between supply and demand functions, each function corresponding to the aggregation of the behaviors of “rational” economic agents. The *institutional framework* in which money is issued has been of primary importance, because such institutions have always exercised a control over the issuance of money.
3. The *stability of the general level of prices* is the crucial variable in this control.
4. This stability of the general level of prices ensures the gravitation of the general level of activity around a *normal value*.[23]

The two first points above refer to the fact that money is *created* and that this creation happens *within a given set of institutions*. These two statements are not too controversial. With the exception of ultra *free-market* advocates, it is generally admitted that money is not a conventional “good,” and that the issuance of money must be controlled institutionally. The succession of bank failures and financial panics in the early 20th century and the 1930s drove this point home within the economic profession. The two latter points are more controversial.

Difficulties arise from the constant evolution and complexity of the functioning of monetary institutions. Obviously, there is a large difference between the Gold Standard and modern monetary systems. It is also clear that monetary authorities are not free to “set” the stock of money in line with their targets, and must confront the reactions of other agents. However, the central objective of *the control of inflation* has been a constant feature of monetary systems. In this section we will only consider the issuance of money within modern monetary systems.

Since growth occurs in the model and money is used only for the financing of investment, we normalize the money stock, M, by the value of the stock of fixed capital, as was done for investment ($\rho = Ip^1/Kp^1$):

$$m = M/Kp^1$$

We assume that the issuance of money (the net variation of the money stock) responds positively to the general level of activity, measured by the average capacity utilization rate U and negatively to the variations of prices, measured by the inflation rate j_t:

$$m_{t+1} - m_t = \beta_0(U_t - \overline{u}) - \beta_1 j_t \qquad (5)$$

One simple manner of interpreting this equation is to relate the first term to the activity of commercial banks responding to the demand for loans depending on the activity in the economy, and the second term to monetary policy emanating from the central bank.[24]

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23. Note that this point of view is not common in the literature, where two typical explanations of the convergence toward normal capacity utilization rates can be located. First, the convergence to normal capacity utilization rates in the long term is often related to “competition” (see, for example, MARGLIN S.E. 1984, p. 131 and HALEVI J., KRIESLER P. 1991). Sometimes it is the target capacity utilization rate which is defined to be equal to the long-term equilibrium capacity utilization rate (see, for example, AMADEO E. 1986, p. 155 and LAVOIE M. 1995).

24. The situation is obviously more complex. For example, the central bank is also responsive to unemployment (related to the general level of activity).

With the model in equation 5, the normalized money stock, m, is constant in a classical long-term equilibrium, since the capacity utilization rate is normal ($U = \overline{u}$) and there is no inflation ($j = 0$). Consequently, the money stock grows at the same rate as the capital stock.

The coincidence between the absence of inflation and the prevalence of a normal capacity utilization rate is related to the behavior of enterprises. Because enterprises consider the utilization of productive capacity in the setting of their prices, price stability is associated with a normal capacity utilization rate.[25] It can be easily understood from an examination of equation 1 that constant prices coincide with $u^i = \overline{u}^i$.

The adjustment of the money stock is slow. From a formal point of view, this means that the money stock, M, is a long-term variable (as the capital stocks and prices), whose value is given in the short term, and modified between two short-term equilibria.

It follows from the slow dynamics of money that the convergence of the macroeconomy to a normal (non-inflationary) capacity utilization rate is also slow (slower than the adjustment of output to demand). This slow convergence is manifested in the "gravitation" of the general level of activity at some distance from normal long-term equilibrium (see section 5.1). Obviously, this analysis assumes a degree of efficiency of monetary policy.[26]

This view of monetary mechanisms defines a clear difference between our analysis and the post-Keynesian perspective, in particular with the advocates of *accommodative money supply*. Within our analysis, prices are functions of disequilibria between supply and demand, whereas post-Keynesian basically consider prices as constant or as functions of market power. Concerning money, whose issuance is modeled by equation 5, it is neither exogenously determined nor purely accommodative. The first term, $\beta_0(U_t - \overline{u})$, accounts for a "degree" of accommodation, and the second term, $-\beta_1 j_t$, for a "degree" of control. Our analysis is actually reminiscent of Joan Robinson's *inflation barrier*.[27]

1.4.2 Liquid Capital

In the previous sections, two distinct stocks of purchasing power have been successively considered: the stock of liquid capital, L, of section 1.3.2 and the money stock, M, of section 1.4.1. These two stocks are not equal in the general case.

As recalled in section 1.3.2, the total stock of liquid capital can be enlarged by retained earnings and loans (from financial intermediation or issuance of money). Additional funds can be obtained in the short term by reciprocal trade credits. A model of liquid capital could therefore combine the effects of: (1) The money stock which conditions the overall liquidity in the economy, (2) The capacity utilization rate which measures the willingness to borrow in relation to demand levels, and (3) The profit rate which accounts for both

25. This is true in an economy in which prices are sensitive to demand. If prices were fixed centrally, the excessive issuance of money would lead to rationings, as in former socialist countries.
26. This problem is very controversial, and defines a crucial issue within new-Keynesian analysis. A major study is BERLINER J.S. 1992, where it is shown that monetary aggregates and, even more, the Federal Fund rate cause, in Granger's sense, nine real aggregates (industrial production, capacity utilization, employment, unemployment rate, housing starts, personal income, retail sales, consumption, and durable-good orders).
27. "*When the entrepreneurs are keen and eager to accumulate they may be attempting to carry out investment on such scale as to push the economy to the inflation barrier.* [...] *The most important rule of banking policy is to prevent this from happening. When they consider it necessary to check an inflationary tendency the bankers must raise the discount rate, and sell bonds.*" (ROBINSON J. 1969, pp. 227, 237).

the inducement to borrow and self-financing. For simplicity, we will only consider here the two former variables. (The model including the profit rate is introduced in section 4.3.)

Since the stock of liquid capital, L, is only used for investment, we write directly the relationship between investment, the money stock, and the capacity utilization rate:

$$\rho_t = \frac{I_t}{K_t} = \frac{L_t}{K_t p_t^1} = \alpha_0 + \alpha_1 m_t + \alpha_2 U_t \tag{6}$$

The stock of liquid capital is an aggregate of several components, and is larger than the *money stock* (the monetary base, M1, or M2) on which monetary institutions can impact more directly. Thus, the ratio $L/M = \rho/m$ can be interpreted as a "multiplier" which moves procyclically (because of U).

Whereas the money stock, m, is a long-term variable, the amount of liquid capital, L, is a short-term variable. Equation 6 is nothing other than a Kaleckian-Steindlian investment function in which $\alpha_0 + \alpha_1 m_t$ is the *"exogenous" component, constant in the short term, but which varies in the long term* (see section 1.3.1).

1.4.3 The Interest Rate

The interest rate is not considered in the above analysis, and the control of monetary institutions is described solely in relation to the quantity of money. *The abstraction from the interest rate as a tool in the control of the issuance of money is only a simplifying assumption.* Equations 5 and 6 account for the result of the interaction between the capitalist and monetary institutions, in which both direct rationings and interest rates are involved. The alternative model in which the central bank modifies the interest rate, and investment is a function of the interest rate, is introduced in section 4.4.

2 - Short- and Long-Term Equilibria

This section is devoted to the determination of short- and long-term equilibria, and the analysis of their comparative properties. Section 2.1 summarizes and supplements in some respects the presentation of the model. The equilibrium values of the variables in the two time frames are computed in section 2.2. Last, section 2.3 discusses a number of apparent divergences between the Keynesian and classical perspectives, which actually mirror the specific properties of the two time frames.

2.1 Basic Framework and Equations

The purpose of this section is to review and supplement the presentation of the basic framework in the previous sections, before turning to the determination of short- and long-term equilibria.

We will use the following notation:

i *Index of the good and of the industry / enterprise (i=1,2)*

j	*Rate of inflation*
K^i, k	*Capital stocks, relative capital stock:* $k = K^1/K^2$
M, m	*Money stock, normalized money stock:* $m = M/(K^1 + K^2)p^1$
p^i, x	*Prices, relative price:* $x = p^1/p^2$
r^i, r	*Profit rates, average profit rate*
ρ^i, ρ	*Growth rates of the capital stocks, average growth rate*
$u^i, \overline{u}$	*Capacity utilization rates, target capacity utilization rate*
$w, \overline{w}$	*Nominal wage rate per unit of labor, real wage rate*
Y^i	*Output*

Enterprises utilize a technology with fixed coefficients and constant returns to scale. When one unit of fixed capital is used fully, it requires l^i units of labor, and allows for the production of b^i units of product; when it is only used at a rate u^i (with $0 \leq u^i \leq 1$), $l^i u^i$ units of labor are needed, and output is $b^i u^i$. Consequently, a capital stock K^i, used at a rate u^i, requires $K^i l^i u^i$ units of labor and yields $K^i b^i u^i$ units of output. The target capacity utilization rate, $\overline{u}$, that enterprises attempt to attain, is assumed to be the same in the two industries.[28]

Labor is always available on the labor market, and enterprises are never rationed. Consequently, there is no full employment in short-term or long-term equilibria.

The real wage per unit of labor is given and denoted $\overline{w}$ and the nominal wage rate, w_t, is: $w_t = \overline{w}p_t^2$. The total amount of wages paid in one industry and for the entire economy are:

$$W_t^i = K_t^i l^i u_t^i w_t \quad \text{and} \quad W_t = W_t^1 + W_t^2$$

Profits in one industry and for the entire economy are:

$$\Pi_t^i = Y_t^i p_t^i - W_t^i = K_t^i u_t^i (b^i p_t^i - l^i w_t) \quad \text{and} \quad \Pi_t = \Pi_t^1 + \Pi_t^2$$

The profit rates are the ratios, $\Pi_t^i / K_t^i p_t^1$, of profits to the stocks of fixed capital. They can be expressed as functions of the capacity utilization rates and of the relative price $x = p^1/p^2$:

$$r_t^1 = u_t^1 \left(b^1 - \frac{l^1 \overline{w}}{x_t} \right) \quad \text{and} \quad r_t^2 = u_t^2 \frac{b^2 - l^2 \overline{w}}{x_t} \tag{7}$$

Profit rates depend on technology, distribution, and the capacity utilization rate in each industry.

Only two behavioral equations are considered in the short term: (1) Investment is given by equation 6, and (2) Total wages and a fraction $(1 - s)$ of profits are consumed.[29] These two aggregates define the demands to each industry:

$$I_t = D_t^1 = \rho_t K_t \tag{8}$$

$$C_t = D_t^2 = \frac{W_t + (1 - s)\Pi_t}{p_t^2} \tag{9}$$

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28. The case of different target capacity utilization rates is equivalent to the above, if parameters are redefined appropriately in the second enterprise, *i.e.*, substituting $\left(b^2 \frac{\overline{u}^1}{\overline{u}^2}, l^2 \frac{\overline{u}^1}{\overline{u}^2}, \overline{u}^1 \right)$ for $(b^2, l^2, \overline{u}^2)$.

29. More general investment and consumption functions are discussed in section 4.3.

2.2 Short- and Long-Term Equilibrium Values of the Variables

In a *Keynesian short-term equilibrium*, the long-term variables are given: prices, capital stocks, and the money stock (and, therefore, the relative price, x_t, the relative capital stock, k_t, as well as the normalized money stock, m_t). Equilibrium is defined by the equality between supply and demand in each industry: $D^1_t = Y^1_t$ and $D^2_t = Y^2_t$. The short-term equilibrium values of the variables, ρ, u^1, u^2, and r are functions of the long-term variables:

$$\begin{aligned} &\rho_t = \frac{\alpha_0 + \alpha_1 m_t}{1 - \alpha_2 E_t} \quad \textit{with} \quad E_t = \frac{1 + k_t}{x_t k_t b^1 + b^2} \frac{b^1 b^2 x_t + s\overline{w}(b^2 l^1 - b^1 l^2 x_t)}{s b^1 (b^2 - l^2 \overline{w})} \\ &u^1_t = \frac{1 + k_t}{k_t} \frac{\rho_t}{b^1}, \quad u^2_t = u^1_t \frac{k_t}{s} \frac{(1-s) b^1 x_t + s l^1 \overline{w}}{b^2 - l^2 \overline{w}}, \quad \textit{and} \quad r_t = \frac{\rho_t}{s} \end{aligned} \tag{10}$$

A *classical long-term equilibrium* is defined by the equality between the capacity utilization rates and their target values, and the equality between the two profit rates: $u^i = \overline{u}$ and $r^1 = r^2$. From these two equalities, one can determine the long-term equilibrium values of the relative price (corresponding to prices of production), the profit rate, and the growth rate[30]:

$$\overline{x} = \frac{b^2 - l^2 \overline{w} + l^1 \overline{w}}{b^1}, \quad \overline{r} = \overline{u} \frac{b^2 - l^2 \overline{w}}{\overline{x}}, \quad \textit{and} \quad \overline{\rho} = s\overline{r}$$

The equilibrium value of the relative capital stock can be derived:

$$\overline{k} = \frac{\overline{\rho}}{b^1 \overline{u} - \overline{\rho}}$$

The price equation 1 shows that $\overline{j} = 0$, that is *there is no inflation*. The investment equation 6 provides the value of the equilibrium money stock:

$$\overline{m} = \frac{\overline{\rho} - \alpha_0 - \alpha_2 \overline{u}}{\alpha_1} \tag{11}$$

Both the existences of long-term and short-term equilibria are subject to certain conditions. The existence of long-term equilibrium is subject to conditions concerning the structural parameters: technology, real wage, reaction coefficients in the function modeling the issuance of money, and parameters in the investment function. A positive equilibrium rate of profit ($\overline{r} > 0$) is obtained if real wages paid in the industry producing the consumption good are smaller than output:

$$b^2 - l^2 \overline{w} > 0 \tag{$H1$}$$

This condition also guarantees that the relative price and capital stock, as well as the growth rate are positive ($\overline{x} > 0$, $\overline{k} > 0$, and $\overline{\rho} > 0$). A positive equilibrium for the money stock requires a second assumption:

$$\alpha_0 + \alpha_2 \overline{u} < \overline{\rho} \tag{$H2$}$$

We will assume that these two conditions are satisfied.

30. We denote the long-term equilibrium values of the variables with bars, as for $\overline{u}$, although these values are not "targeted" by economic agents (they are actually unknown).

Consider now short-term equilibrium, with the u^is defined as in equations 10. Nothing ensures that these short-term equilibrium capacity utilization rates are positive and smaller than 1 ($0 \leq u^i(x, k, m) \leq 1$). However, these inequalities are satisfied in a region which contains long-term equilibrium, since $u^i(\overline{u}, \overline{k}, \overline{m}) = \overline{u}$. Consequently, short-term equilibrium exists with acceptable values of capacity utilization rates, if long-term variables are not too different from their long-term equilibrium values.

2.3 Seeming Disagreements

A number of traditional arguments between Keynesians and classicals are simply due to the fact that the two frameworks, Keynesian *short-term* equilibrium and classical *long-term* equilibrium, are not clearly distinguished. Examples of such controversial issues are the relationship between profits and investment (which determines which?) (section 2.3.1), the effect of real wage rates (is a larger real wage rate beneficial or detrimental to the activity or growth?) (section 2.3.2), or the impact of different saving rates (are savings a good or a bad thing?) (section 2.3.3). Along the lines developed in the previous sections, it is easy to resolve such issues.[31]

2.3.1 The Relationship between Investment and Profits

In a short-term equilibrium, the conventional Keynesian-Kaleckian relationship prevails, in which investment determines profits (and savings). This property is apparent in the model where a rise of investment, due, for example, to an exogenous increase of the money stock, is immediately followed by a rise of profits (as shown by the relationship $r_t = \rho_t / s$).[32] One should recognize here Kalecki's well-known aphorism: *capitalists earn what they spend*, or, put differently, *savings equal investment*, in a model in which investment is an exogenous function. Conversely, in a long-term equilibrium, it is the fraction of profits which is accumulated which determines the growth rate. The equilibrium profit rate, $\overline{r}$, can be first determined as a function of technology and the real wage rate; in a second step, one can compute the growth rate as a function of the profit rate, using the relationship $\overline{\rho} = s\overline{r}$. The classical approach to growth, in terms of *accumulation*, is based on this property.

These two views are quite compatible. In the short term, any amount of money exists in the economy, and its impact on profits is felt *via* investment (the channel by which the non-neutrality of money is expressed in the model). In the long term, the money stock is set at the particular equilibrium level that ensures that investment be equal to savings *for a normal capacity utilization rate*. In this situation, *i.e.*, in a long-term equilibrium the only ways of increasing investment and growth would be to increase the rate of savings or to diminish the real wage.

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31. This statement only refers to theory, not policies. Policy recommendations alternatively draw on short-term and long-term points of view. A recession is imputed to excess savings; but deficient growth rates are also blamed on deficient savings.
32. *Rates* or *amounts* of profits are equivalent in the short term, since capital stocks are given.

2.3.2 The Effect of Changing the Real Wage Rate on Activity and Growth

From equations 10, it can be shown that, in a short-term equilibrium, a larger real wage rate increases the capacity utilization rates in the two industries and, consequently, the profit rates, the average capacity utilization rate, and investment. In a long-term equilibrium, a larger real wage rate does not affect the capacity utilization rates, which have reached their target value; the profit rate is smaller and, consequently, so is the growth rate.

Again, there is no contradiction between these two properties. In the short-term the effect of a rising wage is investigated under the assumption of a given money stock, and investment rises due to the effect of larger capacity utilization rates associated with a larger demand from wage earners. This surge of demand will be followed by a gradual decrease of the money stock, as a result of the response to inflation. This latter effect will dominate, and investment will diminish to its new long-term equilibrium value, smaller than its initial value.

2.3.3 The Effect of a Variation of the Rate of Savings

In a short-term equilibrium, a lower saving rate of capitalists has the same effect as a larger real wage, *i.e.*, results in larger capacity utilization rates in the two industries and a larger growth rate, whereas, in a long-term equilibrium, the profit rate is not affected and a lower saving rate diminishes the growth rate, since $\overline{\rho} = s\overline{r}$.

3 - Long-Term Dynamics

The equilibrium values of the variables have been determined in section 2.2. The present section deals with the stability of this long-term equilibrium. (The stability of short-term equilibrium will remain beyond the limit of this study, see section 5.2.) As a preliminary to this investigation, section 3.1 determines the relation of recursion which accounts for the movement of long-term variables. Stability is then studied in section 3.2. The issue is whether Keynesian short-term equilibria will converge to classical long-term equilibrium, and under which conditions.

3.1 The Recursion

This section makes explicit the equations which account for the movement of long-term variables: x_t, k_t, j_t, and m_t. Consider, first, the relative price and capital stock:

- The price equation 1 allows for the dynamics of the relative price:

$$x_{t+1} = x_t \frac{1 + \delta(u_t^1 - \overline{u})}{1 + \delta(u_t^2 - \overline{u})}$$

- The capital-mobility equation 4 accounts for the dynamics of the relative capital stock:

$$k_{t+1} = k_t \frac{1 + \rho_t^1}{1 + \rho_t^2} = k_t \frac{1 + \rho_t + \gamma(r_t^1 - r_t)}{1 + \rho_t + \gamma(r_t^2 - r_t)}$$

The short-term equilibrium values of the other variables (u_t^i, r_t^i, ρ_t^i, and ρ_t) in these two equations are themselves functions of the long-term variables (see equations 6 and 10).

The equation for the issuance of money has already been introduced (equation 5):

$$m_{t+1} = m_t + \beta_0(U_t - \overline{u}) - \beta_1 j_t$$

We only need to specify here the exact definition of the average capacity utilization rate U_t. Since the capacity utilization rate is the ratio of actual output to maximum output, $u^i = Y^i/K^i b^i$, we can define U_t as the ratio of the total price of the actual output in the two industries to the price of the maximum output:

$$U_t = \frac{Y_t^1 p_t^1 + Y_t^2 p_t^2}{K_t^1 b_t^1 p_t^1 + K_t^2 b_t^2 p_t^2} = \frac{b^1 x_t k_t u_t^1 + b^2 u_t^2}{b^1 x_t k_t + b^2}$$

The inflation rate, j_t, can be defined as the growth rate of the price of output:

$$j_{t+1} = \frac{Y_t^1 p_{t+1}^1 + Y_t^2 p_{t+1}^2}{Y_t^1 p_t^1 + Y_t^2 p_t^2} - 1 = \delta\left(\frac{b^1 x_t k_t (u_t^1)^2 + b^2 (u_t^2)^2}{b^1 x_t k_t u_t^1 + b^2 u_t^2} - \overline{u}\right)$$

The set of four equations above for x_t, k_t, j_t, and m_t defines a relation of *recursion*. It is easy to show that the long-term equilibrium is a fixed point of this recursion.

3.2 The Stability of Long-Term Equilibrium: Proportions and Dimension

We now turn to the central issue in the present investigation, *viz* the stability of long-term equilibrium. The issue is *whether the sequence of short-term Keynesian equilibria, the traverse, will converge to the classical long-term equilibrium.*

The methodology is standard. First, the model must be linearized around its long-term equilibrium. In this form, the recursion can be represented by a matrix M. Then, one computes the polynomial characteristic, $P(\lambda) = det(\lambda I - M)$, and studies its zeros, the eigenvalues of matrix M. Stability is ensured if the moduli of all eigenvalues are smaller than 1.

The recursion for the model linearized around long-term equilibrium can be written:

$$\begin{pmatrix} x_{t+1} - \overline{x} \\ k_{t+1} - \overline{k} \\ j_{t+1} \\ m_{t+1} - \overline{m} \end{pmatrix} = M \begin{pmatrix} x_t - \overline{x} \\ k_t - \overline{k} \\ j_t \\ m_t - \overline{m} \end{pmatrix}$$

with:

$$M = \begin{pmatrix} 1 - \delta A & -\delta B & 0 & 0 \\ \gamma A' & 1 - \gamma B' & 0 & 0 \\ \delta A'' & \delta B'' & 0 & \delta D'' \\ \beta_0 A'' & \beta_0 B'' & -\beta_1 & 1 + \beta_0 D'' \end{pmatrix}$$

$$\textit{in which} \quad A = \overline{u}(1-s)(1+\overline{k}), \quad A' = \frac{\overline{u} l^1 \overline{w}(1+\overline{k})\overline{k}}{\overline{x}^2(1+\overline{\rho})}$$

$$B = \frac{\overline{u}\,\overline{x}}{\overline{k}}, \quad B' = \frac{\overline{r}}{1+\overline{\rho}}, \quad \textit{and} \quad D'' = \frac{\alpha_1 \overline{u}}{\overline{\rho} - \alpha_2 \overline{u}}$$

(The expressions of A'' and B'' are useless in the rest of this study.)

The above matrix exhibits the quite remarkable property of having a block of four zeros in the upper right corner. Consequently, its polynomial characteristic can be factorized:

$$P(\lambda) = det(\lambda I - M) = P_1(\lambda)P_2(\lambda)$$
$$with \quad P_1(\lambda) = \begin{vmatrix} \lambda - 1 + \delta A & \delta B \\ -\gamma A' & \lambda - 1 + \gamma B' \end{vmatrix} \quad and \quad P_2(\lambda) = \begin{vmatrix} \lambda & -\delta D'' \\ \beta_1 & \lambda - 1 - \beta_0 D'' \end{vmatrix}$$

This decomposition is susceptible to an economic interpretation. It means that two distinct types of phenomena, that we call *proportions* and *dimension*, can be distinguished. Proportions refer to the relative values of the variables among industries, relative prices, outputs, and capital stocks. Dimension designates the absolute or average value of the variables: the general levels of activity and prices, the money stock, total investment, and inflation. Among the four variables in the recursion, x and k concern proportions, and j and m relate to dimension. The successful factorization of $P(\lambda)$ means that the *conditions for stability in proportions and dimension are distinct*.

Stability in proportions is nothing other than the problem of convergence of prices toward prices of production, and outputs toward the corresponding equilibrium outputs (the well-known classical problem of "gravitation"), to which a large literature has been devoted in the 1980s and early 1990s.[33] The issue is to demonstrate that, for *any* technology, real wage rate, saving rate, target capacity utilization rate, and parameters in the investment function 6 and issuance of money function 5 (the structural parameters), equilibrium can be locally stable, *i.e.*, that a set of *reaction coefficients*, γ (capital mobility, equation 4) and δ (prices, equation 1), exists which ensures stability.

For any set of structural parameters, it is actually possible to determine the set of values of γ and δ for which stability obtains. It is described in panel (a) of figure 1.[34] (A sufficient condition can be simply defined: $0 < \gamma < \widetilde{\gamma} = 2A/a = 2(1-s)\overline{k}(1+\overline{\rho})/\overline{\rho}$ and $0 < \delta < \widetilde{\delta} = 2B'/a = 2\overline{r}/b^1(\overline{u})^2$.) The overall idea is that the two reactions must not be excessively large: the capitalist in the decision to allocate capital and enterprises in their modification of prices must not overreact.

Stability in dimension can be discussed within the same framework. For any given structural parameters, a set of reaction coefficients exists for which stability in dimension prevails. The relevant reaction coefficients here are: β_0 and β_1 (issuance of money, equation 5). The set for which stability is ensured is displayed in panel (b) of figure 1:

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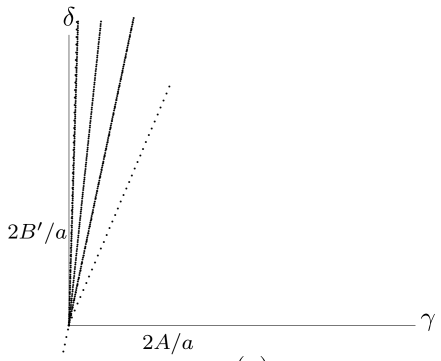
33. Prior to the debate which developed in the 1980s, and in relation to a paper by H. Nikaido (1977, published in 1983) and one by A. Medio (1978), a large segment of the profession thought that classical long-term equilibrium was actually unstable, or subject to unacceptable conditions, such as conditions on technology. A number of objections were made later, concerning, for example, the number of commodities (STEEDMAN I. 1984) or the instability of the "pure cross-dual" model (BOGGIO L. 1985 and 1990). These objections have now been refuted, and several models are available that convincingly show that the stability of long-term equilibrium in proportions can be obtained under various sets of intuitive conditions, such as conditions on reaction coefficients. The conditions are rather clearly set out (DUMÉNIL G., LÉVY D. 1990(b) and 1993(a), Appendix 6.A2), and many models exist (special issue of *Political Economy, Studies in the Surplus Approach*, 1990, VI, #1-2, DUTT A. 1988, FRANKE R. 1990,...).

34. The figure has been drawn for the following values of parameters: $l^1 = 1$, $l^2 = 2$, $b^1 = 0.2$, $b^2 = 1$, $\overline{u} = 0.8$, and $s = 0.5$. For the following figures, 1 (b), 2 (a) and (b), we also used $\delta = 1$, $\alpha_1 = 0.02$, and $\alpha_2 = 0.02$. Figures 2 (a) and (b) also utilize $\beta_0 = 1.4$. Last, $\overline{p} = 1$ in figure 2 (a).

Figure 1 Stability in Proportions (a) and Dimension (b)



1. A first condition is that β_0 must not be too large: $\beta_0 < 1/D''$. The issuance of money must not respond too strongly to the deviations of the capacity utilization rate.
2. For each given value of β_0, β_1 must be neither deficient nor excessive ($\beta_0/\delta < \beta_1 < 1/\delta D''$). The reaction of monetary authorities to inflation must be confined within a certain interval. The upper bound is constant, and the lower bound increases with β_1, the degree of the reaction to the capacity utilization rate.

Consider now the effects on stability of changing some of the structural parameters, in particular, the α_is in the investment function 6. These parameters only affect the value of D'' in the polynomial $P_2(\lambda)$ and, consequently, only impact on stability in dimension. A greater sensitivity of investment to the money stock or the capacity utilization rate is detrimental to stability (if α_1 and α_2 are larger, the region for which stability in dimension is ensured in panel (b) of figure 1 is diminished).

The expression of the formal conditions for stability should not be mistaken for a denial of the importance of *institutions*. Although we do not discuss the specific financial framework in which capital mobility is performed, it is, nonetheless, clear that institutions condition stability in proportions (*via* parameter γ in equation 4). The conditions for stability in dimension refer to both the issuance of money and investment (coefficients β_0 and β_1 in equation 5, and α_1 and α_2 in equation 6), and the behavior of enterprises (coefficient δ in equation 1). Economic agents (enterprises and the banking system) are complex institutions which cannot merely adopt any value of these coefficients. The variation of a parameter may often involve important institutional evolutions. Moreover, these changes are interdependent. A modification in the behavior of enterprises, for example, may require a corresponding transformation of the institutions in charge of the control of the stability of the general level of activity.

Finally, one can notice the quite distinct roles conferred on monetary mechanisms concerning stability in proportions and dimension. Monetary mechanisms, as modeled in this paper, have no direct impact on the stability in proportions of long-term equilibrium. However, these same monetary mechanisms play a prominent role concerning stability in dimension.

4 - Alternative Approaches to Monetary Mechanisms

In order to build a manageable model, many simplifying assumptions have been made in this paper (a single capitalist, two commodities, one enterprise in each industry, no circulating capital, no depreciation of fixed capital, a constant real wage, no money held by households, no hoardings, etc.). In our work on the stability of long-term equilibrium (the gravitation around long-term positions) many such assumptions have been relaxed (see, for example, DUMÉNIL G., LÉVY D. 1993(a), Ch. 8). Several models have been built embodying some of these elements, and more complex models have been studied using computer simulation. The purpose of these works was to show that additional complexity does not destroy the conclusions obtained within simpler models. Since such models are very close to the model in this paper, we will not repeat these investigations. Instead, we limit the investigation to several alternative approaches to the modeling of monetary mechanisms, which is crucial in the present analysis.

The purpose of the present section is to show that the role conferred on monetary mechanisms is not dependent on a specific framework. Section 4.1 is devoted to a model in which monetary policy is also targeted to an absolute value of the general level of prices, section 4.2 to a more general model for the issuance of money, section 4.3 to a consumption function in which money is considered (and a more general investment function) which allows for a new channel for the feedback of inflation on activity, and section 4.4 to the interest rate.

4.1 An Absolute Value of the General Level of Prices

In the model of equation 5, monetary policy responds to the general level of activity (which can also represents the unemployment rate), and the rate of inflation. This section considers a model in which monetary policy is also targeted to an absolute value of the general level of prices. A target general level of price can be meaningful for a country whose concern is to maintain its rate of exchange *vis-à-vis* another country. This was also the case in the early forms of the Gold Standard, in which the rise of the price of gold on the market above its official price was followed by the conversion of notes, and rates of exchange were rigid due to the definition of the unit of money in terms of gold.

The general level of prices, p_t, is defined by a numeraire (ω^1, ω^2):

$$p_t = \omega^1 p_t^1 + \omega^2 p_t^2 \qquad (12)$$

With $\overline{p}$ denoting the target level of prices, the influence of the general level of prices can be added to equation 5:

$$m_{t+1} - m_t = \beta_0(U_t - \overline{u}) - \beta_1 j_t - \beta_2(p_t - \overline{p})$$

The new term, $-\beta_2(p_t - \overline{p})$, indicates that a general level of prices, for example, larger than its target level will have a negative effect on the issuance of money.

With this model, the levels of nominal prices are determined in a long-term equilibrium, not only relative prices. The equilibrium general level of price is equal to the target,

$\overline{p}$. The equilibrium prices, $\overline{p}^1$ and $\overline{p}^2$, of the two commodities can be derived from $\overline{p}^1/\overline{p}^2 = \overline{x}$ and equation 12:

$$\overline{p}^1 = \frac{\overline{x}\,\overline{p}}{\omega^1\overline{x} + \omega_2} \quad \textit{and} \quad \overline{p}^2 = \frac{\overline{p}}{\omega^1\overline{x} + \omega_2}$$

The new equation for the issuance of money is responsible for a number of modifications in the model. The long-term variables are now x, k, p, and m. The dynamics of p follow directly from its definition (equation 12) and the dynamics of p^1 and p^2:

$$p_{t+1} = p_t + \delta\left(\omega^1 p_t^1(u_t^1 - \overline{u}) + \omega^2 p_t^2(u_t^2 - \overline{u})\right)$$

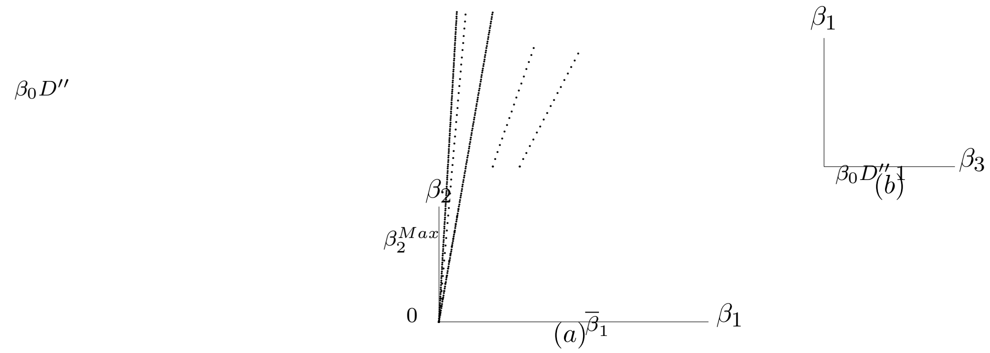
After linearization around long-term equilibrium and substitution of $U_t - \overline{u}$ and $u^1 - u^2$ for $u_t^1 - \overline{u}$ and $u_t^2 - \overline{u}$, one obtains:

$$p_{t+1} = p_t + \delta\overline{p}(U_t - \overline{u}) + \delta\overline{p}\omega(u_t^1 - u_t^2) \quad \textit{with} \quad \omega = \frac{\overline{p}^1}{\overline{p}}\,\frac{\omega^1 b^2 - \omega^2 b^1\overline{k}}{b^1\overline{x}\,\overline{k} + b^2}$$

In the analysis of stability, the polynomial characteristic can still be factorized, and only the second factor is modified (this is due to the fact the equations of x and k are unchanged): $P(\lambda) = P_1(\lambda)P_2'(\lambda)$. As a result of the simultaneous appearance of j_t and p_t and, thus, of p_{t-1} and p_t in equation 12, the polynomial $P_2'(\lambda)$ is now of the third degree. The variables being ordered as p_t, p_{t-1}, and m_t, the polynomial $P_2'(\lambda)$ can be written as:

$$P_2'(\lambda) = \begin{vmatrix} \lambda - 1 & 0 & -\delta\overline{p}D'' \\ -1 & \lambda & 0 \\ \beta_2 + \frac{\beta_1}{\overline{p}} & -\frac{\beta_1}{\overline{p}} & \lambda - 1 - \beta_0 D'' \end{vmatrix}$$

Figure 2 Stability in Dimension in the More General Models for the Issuance of Money of Sections 4.1 and 4.2



Because $P_2'(\lambda)$ is of the third degree, a new condition for stability in dimension is obtained (as above, the structural parameters, technology, etc., are assumed given). The set of values of β_1 and β_2 (with δ and $\beta_0 < 1/D''$ given) for which stability is ensured is displayed in figure 2 (a). For each degree of response to inflation, β_1, a maximum value,

$\overline{\beta}_2 = (1 - \delta D''\beta_1)(\delta\beta_1 - \beta_0)/\delta\overline{p}$, of the reaction to the deviation of the general level of prices exists. The largest possible value of these upper bounds is:

$$\beta_2^{\text{Max}} = \frac{(1 - \beta_0 D'')^2}{4\overline{p}D''\delta}$$

Thus, it appears that, for any set of structural parameters, stability is ensured under certain conditions on reaction coefficients.

4.2 A Model for the Issuance of Money Compatible with Structural Change

Equation 5, which accounts for the issuance of money, is based on rather specific assumptions, coherent with the general framework of analysis in this paper, but incompatible with the consideration of structural change (for example, technical change or financial innovations). The problem is that the equality between the capacity utilization rate and its target value and the absence of inflation on the steady state will necessarily coincide with a growth rate of the money stock equal to that of the fixed capital stock $\rho(m) = \rho(M/Kp^1) = 0$ or $\rho(M) = \rho(K)$.

It is possible to relax this assumption by using, in place of equation 5, a model in which the *growth* of the normalized money stock is adjusted to ensure a normal utilization of productive capacity and zero inflation:

$$\Delta m_{t+1} - \Delta m_t = \beta_0(U - \overline{u}) - \beta_1 j_t - \beta_3(j_t - j_{t-1})$$

where $\Delta m_t = m_t - m_{t-1}$. $U_t = \overline{u}$ and $j_t = 0$ coincide with a constant growth rate of m. With this function for the issuance of money, classical long-term equilibrium is compatible with any growth rate of money corresponding, for example, to an exogenous variation of the speed of monetary circulation. Stability can be obtained if a term of derivative control, $-\beta_3(j_t - j_{t-1})$, is included in the equation, as shown above, meaning that monetary institutions are also responsive to the acceleration or deceleration of inflation. The set of coefficients for which stability is obtained is illustrated in figure 2 (b).

4.3 More General Consumption and Investment Functions

In the model used in this paper, money is only considered in relation to investment. The purpose of this section is to show that the results obtained are not predicated on this simplifying assumption. To this end, the money stock will be included as a new argument in the consumption function. By the same token, we will also consider slightly more general consumption and investment functions.

Three changes are made concerning consumption: (1) It is now a function of the money stock, as stated above, (2) It is also a function of the value of the total product, $Y_t p_t = Y_t^1 p_t^1 + Y^2 p_t^2$, and (3) Wage earners can save:

$$C_t = \frac{\sigma_0 W_t + \sigma_1 \Pi_t + \sigma_2 Y_t p_t + \sigma_3 M_t}{p_t^2}$$

Since $\Pi_t = Y_t p_t - W_t$, the three first terms in this function can be written: $\sigma_4 W_t + \sigma_5 Y_t p_t$ (with $\sigma_4 = \sigma_0 - \sigma_1$ and $\sigma_5 = \sigma_2 + \sigma_1$). Concerning investment, we assume that it is also a function of the profit rate:

$$\rho_t = \alpha_0 + \alpha_1 \frac{M_t}{K_t^1 p_t^1} + \alpha_2 U_t + \alpha_3 r_t$$

With such functions, a long-term equilibrium exists if the three following conditions are satisfied:

- *Either* $\alpha_1 \neq 0$ *or* $\sigma_3 \neq 0$ $\quad (H0)$
- $b^2 - \dfrac{\sigma_4}{1-\sigma_3} l^2 \overline{w} > 0$ $\quad (H1')$
- $\alpha_0 + \alpha_2 \overline{u} + \alpha_3 \overline{r} < \dfrac{\sigma_4 \overline{r} + (1-\sigma_4-\sigma_5) b^2 \overline{u}/\overline{x}}{1-(1-\sigma_4-\sigma_5)\overline{w}(l^1-l^2)/\overline{x} b^1}$ $\quad (H2')$

Assumption $H0$ is susceptible to an important economic interpretation. It means that, although monetary mechanisms are crucial, their impacts can be felt *via* various channels: investment, consumption, or both.

The model studied in sections 2 and 3 corresponds to the particular case: $\alpha_3 = 0$, $\sigma_0 = 1$, $\sigma_1 = 1 - s$, and $\sigma_2 = \sigma_3 = 0$ (from which it follows that $\sigma_4 = s$ and $\sigma_5 = 1 - s$). Conditions $(H1')$ and $(H2')$ generalize conditions $(H1)$ and $(H2)$. For simplicity we will not discuss the stability of long-term equilibrium in this framework.

Finally, one can notice that the consideration of monetary mechanisms independently of investment within the productive system, as in the consumption function above, allows for the consideration of government expenses and, consequently, demand policies. The deficit of the budget is one of the mechanisms by which money is issued. The first term, $\beta_0(U_t - \overline{u})$, of equation 5 models the response of monetary institutions to levels of activity (a large issuance of money being associated with large capacity utilization rates). However, this first term can as well account for a countercyclical feedback of the general level of activity on the issuance of money. What is important is, finally, the overall variation of money, including both the effects of the general level of activity (procyclical and countercyclical) and inflation.

4.4 The Interest Rate

There would be no difficulty to write a model avoiding the reference to the money stock and, instead, in referring to the interest rate. Such a model would be closer to the Keynesian tradition:

1. Instead of equation 6 accounting for investment, one could write:

$$\rho_t = \alpha_0 - \alpha_1 i_t + \alpha_2 U_t \qquad (13)$$

in which i denotes the interest rate.[35] If the interest rate is large, investment is discouraged. This equation expresses the *decision* of the capitalist to invest.

35. We will not discuss here whether i should be the nominal or real rate of interest.

2. Instead of equation 5 accounting for the issuance of money, one could model the reaction of monetary institutions as:

$$i_{t+1} = i_t + \beta_1 j_t$$

meaning that inflation leads to larger interest rates. For simplicity, we do not consider an influence of the capacity utilization rate, as in equation 5.

3. Concerning capital mobility, it is still possible to use equation 4. The interpretation is that it is a single capitalist who *decides* the growth rates of each enterprise in two steps: the capitalist first determines the average growth rate of fixed capital (equation 13), and then modulates it for the two enterprises depending on their relative profitability.

The model is identical to the model with the stock of money, for $\beta_0 = 0$. All results can, therefore, be extended to this model. In particular, the conditions for stability are still valid: there is no modification for stability in proportions, and $0 < \beta_1 < 1/\delta D''$ ensures stability in dimension.

5 - The General Level of Activity and its Fluctuations

The model introduced in the previous sections analyzes the movements of the general level of activity as a sequence of *short-term equilibria*. It adopts the two fundamental assumptions underlying Keynesian macroeconomics: (1) The level of demand can be considered as given in the short term, or at least some exogenous component which determines total demand, and (2) The short-term equilibrium is stable and the economy converges rapidly to a level of activity corresponding to this total demand.

The model in this paper qualifies the Keynesian view in a first important respect by developing a *monetary theory* of the exogenous component of demand. Therefore, the dynamics of the sequence of short-term equilibria mirror that of money. Section 5.1 discusses this role conferred on money in the determination of the general level of activity. Section 5.2 qualifies the Keynesian analysis in a second equally important respect, concerning stability of short-term equilibrium. In our opinion, *short-term equilibrium is not always stable* and periods of stability and instability follow one another in the course of business-cycle fluctuations. A synthesis is presented in section 5.3, where we contend that the fluctuations in the general level of activity should be analyzed as the combination of a slow component, corresponding to the sequence of temporary equilibria, and a rapid component, corresponding to the very short-term dynamics around short-term equilibrium.

5.1 A Monetary Theory of the General Level of Activity

The analysis in this paper emphasizes the role of monetary (and financial) mechanisms, in particular with respect to *dimension* (the macroeconomy), and confers a prominent role on inflation.

The impact of monetary mechanisms can be discussed in the short and long terms:

1. In a short-term equilibrium, the money stock (considered given) impacts on the general level of activity. The sequence of short-term equilibria reflects the influence of the dynamics of money on the macroeconomy.
2. Long-term equilibrium can be defined independently of money[36], but monetary mechanisms are responsible for the convergence of short-term equilibria to long-term equilibrium: they are crucial *vis-à-vis* the stability in *dimension* of long-term equilibrium. They are simultaneously *destabilizing*, since the issuance of money responds procyclically to disequilibria on capacity utilization rates, and *stabilizing*, since this issuance also reacts countercyclically to inflation (respectively, parameters β_0 and β_1 in equation 5). The stability condition, $\beta_0/\delta < \beta_1$, states that the countercyclical aspect must dominate over the procyclical aspect.

Obviously, the contention that the economy "gravitates" around a long-term equilibrium with a normal utilization of productive capacity must be qualified in several important respects. These qualifications have, in our opinion, significant bearings on the debate between Keynesians and classicals. The basic Keynesian point of view (Keynes or Kalecki) emphasizes the erratic movement of the general level of activity; Keynesian growth models and post-Keynesian models acknowledge the relevance of long-term equilibrium, but the full or normal utilization of productive capacity is not assumed along this steady state. The model in this paper simultaneously accounts for the centripetal forces pulling the economy toward a long-term equilibrium with a normal utilization of productive capacity, and *provides a basis for the analysis of the actual deviations from target capacity utilization rates*, the focus of Keynesian analysis.

It is, first, true that the deviations around long-term equilibrium may be large, and that the general level of activity can stray away from equilibrium for considerable periods of time; second, systematic deviations of long-term equilibrium from normal capacity utilization rates, that we call *shifts*, are possible:

1. The stabilizing capability of monetary mechanisms is limited and the convergence toward long-term equilibrium is *slow*. This property corresponds in the model to the fact that the money stock is a long-term variable and that its dynamics are particularly slow.[37] Formally, the modulus of the dominant eigenvalue of matrix M (*cf.* section 3.2) is close to 1 (as shown empirically in DUMÉNIL G., LÉVY D. 1993(a), Ch. 11), expressing that the stability condition $\beta_0/\delta < \beta_1$ is never far from being violated. This means that countercyclical feedback mechanisms tend to be inadequate. Note that the limit case of an eigenvalue strictly equal to 1, corresponding to a *random walk*, is very close to the basic Keynesian contention that the position of the general level of activity has no reason to converge to a normal utilization of capacity.
2. The stabilizing capability of monetary mechanisms is also *imperfect*. It is well known that monetary institutions are very complex and evolve over time. A huge pyramid of banks and other financial intermediaries is involved; enterprises themselves influence the level of transactions by the use of flexible amounts of trade credits; there is also a very strong impact from international financial relationships; last, financial innovations are a permanent feature of the system and may also be destabilizing. This means, for

36. Following Davidson, this is a crucial difference between the classical and post-Keynesian perspective (DAVIDSON P. 1996).
37. Sometimes the distinction between the two views concerning *weak centripetal forces* and a simple *theoretical reference* is difficult to draw (see, for example, KURZ H. 1986).

example, that parameters α_0, α_1, and α_2 in equation 6 or parameters β_0 and β_1 in equation 5 are not constant.

3. Economic policies may direct the system toward targets other than the stability of the general price level. Examples of such targets are full employment, the balance of foreign trade and payments, the repayment of the public debt, etc. It would be easy to show in the model that, if such targets are defined, long-term equilibrium will be shifted to another position deviating from the normal utilization of capacity.
4. Symmetrically, the behavior of enterprises as price-makers may be more complex than the straightforward response to the disequilibria between potential supply and demand, as in equation 1. Expectations come into play in this respect. As in the 1970s, enterprises may develop *stagflationist* behaviors in response to diminished profitability levels, which create considerable problems for the central bank. Under such circumstances, equation 1 should be modified, and the relationship between a zero inflation and target capacity utilization rates would be altered.

5.2 The Stability of Short-Term Equilibrium and the Business Cycle

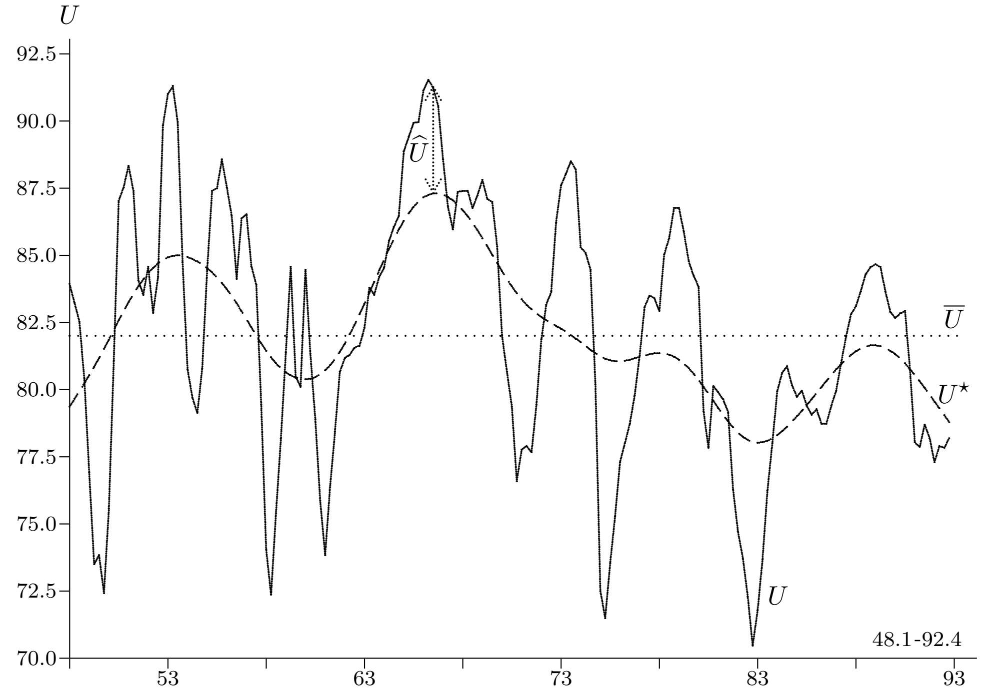
Traverse models actually raise two stability problems, which must be carefully distinguished:

1. *The stability of long-term equilibrium.* The issue is that of the convergence of the sequence of short-term equilibria to a long-term equilibrium (steady state). This was the object of section 3.2.
2. *The stability of short-term equilibrium.* This issue is not treated in this paper. The reason for this omission is not that this problem is of minor interest. On the contrary, the importance of the stability of short-term equilibrium is not really acknowledged within Keynesian economics, and the stability conditions of short-term equilibrium are always assumed.[38] The stability of short-term equilibrium is, in our opinion, a crucial aspect in the explanation of the business cycle (see DUMÉNIL G., LÉVY D. 1993(a), 1993(b), and 1994(b)). The occurrence of a recession, *i.e.*, a sudden collapse of the general level of activity[39] can be interpreted as a switch from an upper to a lower position related to the *destabilization of short-term equilibrium.*

The analysis of the stability of short-term equilibrium requires a *disequilibrium* framework, in which the very short-term dynamics of the variables can be expressed.[40] Since production takes time and prices are rigid, supplies differ from demands and, consequently,

38. Consider the simplest multiplier model with exogenous investment. Equilibrium is defined by $Y = cY + I$ and its stability is that of the recursion $Y_{t+1} = cY_t + I$. Equilibrium is stable if the propensity to consume, c, is smaller than 1. Within more complex models, the condition will be more complicated, but similar and also assumed without discussion. This lack of interest in the stability of equilibrium is common to the Keynesian and Walrasian perspectives. (In the Walrasian train of thought, the *tâtonnement* is not considered as factually relevant.)
39. The capacity utilization rate within manufacturing industries in the US recurrently fell by about 10 percent, *i.e.*, about 12 percent of its average value, within about two quarters: from 90.0 percent in the third quarter of 1953 to 80.8 percent in the first quarter of 1954, from 83.9 percent in the third quarter of 1957 to 74.1 percent in the first quarter of 1958, and from 84.5 percent in the third quarter of 1974 to 72.5 percent in the first quarter of 1975.
40. The debate on the convergence to classical equilibrium with prices of production has led to the construction of several such models (DUMÉNIL G., LÉVY D. 1990(a), 1991, FLASCHEL P., SEMMLER W. 1987, SEMMLER W. 1990,...). These models are what we call *general disequilibrium models.* The

Figure 3 The Twofold Gravitation of the General Level of Activity Around the Average Capacity Rate, $\overline{U}$ (········): The Capacity Utilization Rate, U (——) and the Sequence of Short-Term Equilibria, $U^\star$ (– –), (USA, 1948-1992)



inventories of unsold commodities exist. In such models, a genuine *supply behavior* must be described. Savings differ from investment and, therefore, (dis)hoarding is observed. Monetary mechanisms (bank loans, trade credits) must also be considered. Since equilibrium can be unstable, nonlinearities are important.[41]

5.3 A Twofold "Gravitation" Process

The explanation of the overall fluctuations of the general level of activity should, in our opinion, combine the two aspects considered in the above sections:

1. The slow movement corresponding to the sequence of short-term equilibria, *i.e.*, the gravitation around long-term equilibrium.
2. More rapid fluctuations around the sequence of short-term equilibria, corresponding to a succession of periods of stability and instability of these equilibria.

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natural framework in this debate is that of a multi-commodity model, but it is also possible to build macroeconomic models in which disequilibrium may prevail in the short term (see DUMÉNIL G., LÉVY D. 1993(a) Ch. 11, where a model close to a macroeconomic version of the model in this study is presented).

41. Because of the existence of such nonlinearities, several temporary equilibria may exist. The overall phenomenon of business cycles is actually very complex, and more work will be needed to put the various pieces of the puzzle together into a coherent whole.

Figure 3 displays the movement of the capacity utilization rate, U, within manufacturing industries in the US, as a measure of the general level of activity. An examination of this figure reveals the constant fluctuations of the capacity utilization rate, which rarely stabilizes. It also shows that the center around which these fluctuations occur is slowly displaced. This becomes more evident by drawing a trend line as suggested in the figure (– –).[42] Although such a trend line is obviously not sufficient to separate the movements of the sequence of temporary equilibria, $U^\star$, and the dynamics around temporary equilibria $\widehat{U} = U - U^\star$, it does provide a first approximation of this decomposition.

The identification of a slow component, such as the trend line in figure 3, in the movements of the general level of activity provides the empirical basis for the reference to a short-term equilibrium, the Keynesian component of the analysis of business fluctuations. It is the empirical basis for the synthesis contemplated in this paper.[43]

With the representation, in figure 3 the rare periods of stabilization around short-term equilibrium are reflected in the gravitation of the general level of activity at a small distance from the trend. Overheating appears as rather sharp departure from the trend line, and recessions are sudden switches from large to low capacity utilization rates (see DUMÉNIL G., LÉVY D. 1993(a), Ch. 11). Within this interpretation, the level of the general of activity during overheating or recessions cannot be described as Keynesian positions. This difficulty refers actually to a basic ambiguity within the Keynesian paradigm, beginning with Keynes himself. It is not clear whether Keynesian equilibria explain durable shifts of the general level of activity or sudden collapses of the general level of activity (the 1920s in England or the Great Depression in the US, for example). The core Keynesian analytical device seems to account for durable shifts, whereas Keynes' analysis of the business cycle (KEYNES J.M. 1936, Ch. 22) emphasizes the extreme volatility of the marginal efficiency of capital, which determines investment.

The profile of temporary equilibria in figure 3 (– –) should, in our opinion, be interpreted as follows:

1. A first fluctuation upward in the 1950s corresponds to the succession of the Korean war and the restrictive policy of the Eisenhower administration.
2. The following movement upward in the early 1960s is the expression of the Keynesian shift imparted to the macroeconomy by Kennedy's and Johnson's advisors.
3. The modification of firm behavior in relation to the declining profit rate in the late 1960s and the 1970s, and the corresponding tightening of monetary policy — in various stages — explain the following decline.
4. From the *recovery* after the 1982-83 recession, one can surmise a return to more "normal" investment and price setting behaviors.

As far as the upward shifts of the general level of activity are concerned, this interpretation stresses the large impact of public expenditures on the issuance of money, or what is traditionally called *demand policy* (see section 4.3). It also emphasizes the importance of

42. We use the Whittaker filter. The flexibility of the trend is controlled by a parameter λ (a large λ yields a rigid trend, and a small λ a flexible trend). The trend displayed in figure 3 corresponds to $\lambda = 3000$.

43. A similar approach is implied in Ciccone's analysis (1992), where he describes a framework which is very similar to that of the *twofold gravitation* above. He distinguishes, within disequilibrium, between "*transitory disequilibria*" and "*more lasting disequilibria than those produced by other transitory circumstances* (p. 14)".

firms' pricing behaviors, in relation to monetary policy. We will not, however, attempt to further justify this interpretation. It corresponds to what has been called in this paper, in a rather cursory manner, a *"monetary" theory* of the sequence of temporary equilibria.

References

AMADEO E. 1986, "The Role of Capacity Utilization in Long-Period Analysis," *Political Economy*, Vol. 2, #2, pp. 147-160.

ARENA R. 1987, "L'école internationale d'été de Trieste (1981-1985): vers une synthèse classico-keynésienne?," *Économie et Sociétés*, Vol. XXI, #3, pp. 205-238.

ARENA R., FROESCHLE C., TORRE D. 1990, "Gravitation Theory: Two Illustrative Models," *Political Economy*, Vol. 6, #1-2, pp. 287-307.

ARESTIS P., CHICK V. 1992 (eds.), *Recent Developments in Post-Keynesian Economics*, Edward Elgar, Aldershot, England.

ASIMAKOPULOS A. 1988, "Reply to Garegnani's Comment," *Political Economy*, Vol. 4, #2, pp. 259-262.

BERNSTEIN S. 1988, *Investment, Profitability, Demand, and Interest Rates: A Study of the Cross-Sectional and Time Series Determinants of Investment for U.S. Manufacturing Industries*, New School for Social Research, PhD, New York.

BEWLEY T. 1982, "An Integration of Equilibrium Theory and Turnpike Theory," *Journal of Economic Theory*, Vol. 10, pp. 233-267.

BLINDER A.S. 1987, "Credit Rationing and Effective Supply Failures," *The Economic Journal*, Vol. 97, #386, pp. 327-352.

BOGGIO L. 1985, "On the Stability of Production Prices," *Metroeconomica*, Vol. 37, #3, pp. 241-267.

BOGGIO L. 1990, "The Dynamic Stability of Production Prices: A Synthetic Discussion of Models and Results," *Political Economy*, Vol. 6, #1-2, pp. 47-58.

CARTELIER J. 1990 (ed.), *La formation des grandeurs économiques*, Nouvelle Encyclopédie Diderot, Presses Universitaires de France, Paris.

CARVALHO F. 1984, "Alternative analyses of short and long run in Post Keynesian economics," *Journal of Post Keynesian Economics*, Vol. VII, #2, pp. 214-234.

CESARATTO S. 1995, "Long-period method and analysis of technological change: is there any inconsistency?," *Review of Political Economy*, Vol. 7, #3, pp. 249-278.

CHESNAIS F. 1996 (ed.), *La mondialisation financière. Genèse, coût et enjeux*, Syros, Paris.

CICCONE R. 1986, "Accumulation and Capacity Utilization: Some Critical Considerations on Joan Robinson's Theory of Distribution," *Political Economy*, Vol. 2, #1, pp. 17-36.

CICCONE R. 1992, Classical and Neoclassical Short-Run Prices. A Comparative Analysis of their Empirical Content, Universita' Degli Studi di Roma "La Sapienza", Working Paper, num. 14.

COMMITERI M. 1986, "Some Comments on Recent Contributions on Capital Accumulation, Income Distribution and Capacity Utilization," *Political Economy*, Vol. II, #2, pp. 161-186.

DAVIDSON P. 1996, "What revolution? The legacy of Keynes," *Journal of Post Keynesian Economics*, Vol. 19, #1, pp. 47-60.

DUMÉNIL G., LÉVY D. 1990(a), "Stability in Capitalism: Are Long-Term Positions the Problem?," *Political Economy*, Vol. 6, #1-2, pp. 229-264.

DUMÉNIL G., LÉVY D. 1990(b), "Convergence to Long-Period Positions. An Addendum," *Political Economy*, Vol. 6, #1-2, pp. 265-278.

DUMÉNIL G., LÉVY D. 1991, "Micro Adjustment Toward Long-Term Equilibrium," *Journal of Economic Theory*, Vol. 53, #2, pp. 369-395.

DUMÉNIL G., LÉVY D. 1993(a), *The Economics of the Profit Rate: Competition, Crises, and Historical Tendencies in Capitalism*, Edward Elgar, Aldershot, England.

DUMÉNIL G., LÉVY D. 1993(b), "Why does Profitability Matter? Profitability and Stability in the U.S. Economy since the 1950s," *Review of Radical Political Economy*, Vol. 25, #1, pp. 27-61.

DUMÉNIL G., LÉVY D. 1994(a), The Three Dynamics of the Third Volume of Marx's Capital, Contribution to the conference *Karl Marx's Third Volume of "Capital": 1894-1994*, Bergamo, December 15-17, Cepremap, Modem, Paris.

DUMÉNIL G., LÉVY D. 1994(b), The Real and Monetary Determinants of Macro (In)stability, pp. 118-140, in GLICK M. 1994.

DUMÉNIL G., LÉVY D. 1995(a), "Structural change and prices of production," *Structural Change and Economic Dynamics*, Vol. 6, pp. 397-434.

DUMÉNIL G., LÉVY D. 1995(b), "A Post-Keynesian Long-Term Equilibrium with Equalized Profit Rates? A Rejoinder to Amitava Dutt's Synthesis," *Review of Radical Political Economy*, Vol. 27, #2, pp. 135-141.

DUTT A. 1987, "Competition, Monopoly Power and the Uniform Rate of Profit," *Review of Radical Political Economics*, Vol. 19, #4, pp. 55-72.

DUTT A. 1988, "Convergence and Equilibrium in Two-Sector Models of Growth, Distribution and Prices," *Zeitschrift für Nationalökonomie, Journal of Economics*, Vol. 48, #2, pp. 135-158.

DUTT A. 1992, Rentiers in Post-Keynesian Models, pp. 95-122, in ARESTIS P., CHICK V. 1992.

EICHNER A.S., KREGEL J.A. 1975, "An Essay on Post-Keynesian Theory: A New Paradigm in Economics," *Journal of Economic Literature*, Vol. 13, #4, pp. 1293-1321.

FLASCHEL P., SEMMLER W. 1987, "Classical and Neoclassical Competitive Adjustment Processes," *The Manchester School*, Vol. LV, #1, pp. 13-37.

FRANKE R. 1987, *Production Prices and Dynamical Processes of the Gravitation of Market Prices*, Peter Lang, Frankfurt am Main, Bern, New York, Paris.

FRANKE R. 1990, Un modèle bisectoriel du processus de gravitation avec apurement continuel des marchés, pp. 263-284, in CARTELIER J. 1990.

GAREGNANI P. 1988, "Actual and Normal Magnitudes: A Comment to Asimakopulos," *Political Economy*, Vol. 4, #2, pp. 251-258.

GLICK M. 1994 (ed.), *Competition, Technology and Money: Classical and Post-Keynesian Perspectives*, Edward Elgar, Aldershot, England.

HAGEMAN H. 1992, Traverse Analysis in a Post-Classical Model, pp. 235-263, in HALEVI J., LAIBMAN D., NELL E.J. 1992.

HALEVI J., KRIESLER P. 1991, "Kalecki, Classical Economics and the Surplus Approach," *Review of Political Economy*, Vol. 3, #1, pp. 79-92.

HALEVI J., LAIBMAN D., NELL E.J. 1992 (eds.), *Beyond the Steady State, A Revival of Growth Theory*, Macmillan, Basingstoke, London.

HERRERA J. 1990, *La différentiation des taux de profit dans la concurrence, l'exemple des États-Unis*, Thèse de Doctorat, Université de Paris X-Nanterre.

HICKS J. 1965, *Capital and Growth*, Clarendon Press, Oxford.

HICKS J. 1973, *Capital and Time, A Neo-Austrian Theory*, Clarendon Press, Oxford.

KALECKI M. 1971, *Selected Essays on the Dynamics of the Capitalist Economy, 1933-1970*, Cambridge University Press, Cambridge, UK.

KEYNES J.M. 1936, *The General Theory of Employment, Interest and Money*, Macmillan, London, Melbourne, Toronto, 1967.

KUBIN I. 1990, "Market Prices and Natural Prices: A Model with a Value Effectual Demand," *Political Economy*, Vol. 6, #1-2, pp. 175-192.

KURZ H. 1986, "'Normal' Positions and Capital Utilisation," *Political Economy*, Vol. 2, #1, pp. 37-54.

KURZ H. 1994, "Growth and distribution," *Review of Political Economy*, Vol. 6, #4, pp. 393-420.

LAVOIE M. 1992(a), "Towards a New Research Programme for Post-Keynesianism and Neo-Ricardianism," *Review of Political Economy*, Vol. 4, #1, pp. 37-78.

LAVOIE M. 1992(b), *Foundations of Post-Keynesian Economic Analysis*, Edward Elgar, Aldershot, England.

LAVOIE M. 1995, "The Kalekian model of growth and distribution and its Neo-Ricardian and neo-Marxian critiques," *Cambridge Journal of Economics*, Vol. 19, #6, pp. 789-818.

LAVOIE M., RAMIREZ-GASTON P. 1993, Traverse in a Two-Sector Kaleckian Model of Growth with Target Return Pricing, University of Ottawa, Ottawa.

LEE F.S. 1994, "From post-Keynesian to historical price theory, part 1: facts, theory and empirically grounded pricing model," *Review of Political Economy*, Vol. 6, #3, pp. 303 -336.

LOWE A. 1976, *The Path of Economic Growth*, Cambridge University Press, Cambridge, UK.

MAINWARING L. 1977, "Monopoly Power, Income Distribution and Price Determination," *Kyklos*, Vol. 30, #4, pp. 674-690.

MAINWARING L. 1990, "Towards a Post-Sraffian Economics," *The Manchester School*, Vol. LVIII, #4, pp. 395-413.

MARGLIN S.E. 1984, "Growth, Distribution, and Inflation: a Centennial Synthesis," *Cambridge Journal of Economics*, Vol. 8, #2, pp. 115-144.

MARX K. 1862, *Theories of Surplus Value*, Progress Publisher, Moscow, 1971.

MARX K. 1894, *Capital, Volume III*, First Vintage Book Edition, New York, 1981.

MEDIO A. 1978, "A Mathematical Note on Equilibrium in Value and Distribution," *Economic Notes*, Vol. 7,*.

NELL E.J. 1996, "Transformational Growth and the Long-period Method," *Review of Political Economy*, Vol. 8, #4, pp. 379-401.

NIKAIDO H. 1977, Refutation of the Dynamic Equalization of Profit Rates in Marx's Scheme of Reproduction, Department of Economics, University of Southern California.

NIKAIDO H. 1983, "Marx on Competition," *Zeitschrift für Nationalökonomie*, Vol. 43, #4, pp. 337-362.

ROBINSON J. 1962, *A Model of Accumulation*, Essays in the Theory of Economic Growth, Macmillan, pp. 34-59.

ROBINSON J. 1969, *The Accumulation of Capital*, MacMillan St Martin's Press, London.

ROBINSON J. 1979, *The Generalisation of the General Theory and Other Esays*, MacMillan Press, London.

RONCAGLIA A. 1996, "The Classical Approach and Long-period Positions: a comment on Cesaratto," *Review of Political Economy*, Vol. 8, #4, pp. 403-408.

SEMMLER W. 1990, "On Composite Market Dynamics: Simultaneous Microeconomic Price and Quantity Adjustments," *Political Economy*, Vol. 6, #1-2, pp. 193-220.

SKOTT P. 1989, *Conflict and Effective Demand in Economic Growth*, Cambridge University Press, Cambridge, UK.

STEEDMAN I. 1984, "Natural prices, Differential Profit Rates and the Classical Competitive Process," *The Manchester School*, Vol. LII, #2, pp. 123-140.

STIGLITZ J.E., WEISS A. 1981, "Credit Rationing in Markets with Imperfect Information," *The American Economic Review*, Vol. 71, #3, pp. 393-410.

VIANELLO F. 1985, "The Pace of Accumulation," *Political Economy*, Vol. 1, #1, pp. 69-87.

WOLFSON M.H. 1996, "A Post Keynesian theory of credit rationing," *Journal of Post Keynesian Economics*, Vol. 18, #3, pp. 443-470.

Référence non trouvée : BERN 1992 (a)

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