In *Economie Appliquée*, tome LII, 1999,
n° 1, p. 119-125

Investment Functions in Sraffian and Kaleckian Models *

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Dans un article de la présente revue, Graham White a proposé une fonction d'investissement qui lui paraît plus cohérente que la fonction d'investissement utilisée par Duménil et Lévy et de nombreux auteurs kaléckiens. L'objet de la présente note est de montrer que la fonction d'investissement proposée par White est en définitive très similaire à celle des kaléckiens, sauf qu'elle s'appuie explicitement sur des valeurs moyennes.

In an article of this journal, Graham White has proposed an investment function which he believes to be more coherent than the one suggested by Duménil and Lévy and several Kaleckian authors. The purpose of the present note is to show that the investment function proposed by White is ultimately no different from that of Kaleckians, except that it explicitly relies on average values.

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* I am grateful to Graham White and an anonymous referee for providing useful comments.

THE KALECKIAN INVESTMENT FUNCTION

In a recent paper of this journal, Graham White (1996) objects to an investment function often to be found in the work of Gérard Duménil and Dominique Lévy [1]. An essentially similar investment function has also been suggested by several Kaleckian authors who have followed the tracks set by Steindl (1952: 128). This investment function, in its most simplified form, ignoring in particular multi-sectoral complications associated with sectoral profit rate differentials, is the following:

$$g^i = \gamma + g_u(u - u_n) \tag{1}$$

where $g^i = I/K$, g being the rate of capital accumulation which firms desire to pursue, with I the level of investment and K the existing stock of capital; u is the current rate of capacity utilization (or it could be the *average* of the rates of capacity utilization experienced over the most recent set of short-run periods); u_n is the normal rate of capacity utilization (a target rate or a rate considered to be the standard one); g_u is a reaction parameter, and γ is some parameter reflecting the autonomous rate of accumulation. It should be noted that while the latter parameter is often vaguely depicted as reflecting the animal spirits of entrepreneurs (see for instance Amadeo 1986, 151), it is also sometimes interpreted as the secular rate of sales growth, or the growth rate of sales which is expected by entrepreneurs (Committeri 1986, 173; Caserta 1990, 152; Lavoie 1995, 807). When the γ parameter is depicted as a measure of animal spirits, investment function (1) is usually justified on the grounds that firms that experiment high rates of utilization would be induced to accumulate faster, on account of the favourable impact that high current rates of capacity utilization ought to have on cash flows. When the γ parameter is linked to future demand growth, the justification for a function such as equation (1) is that entrepreneurs will set a rate of accumulation of capital in response to future (expected) demand, while allowing some (partial) adjustment of the rate of accumulation in the hope of reducing the discrepancy between the actual and the normal rate of utilization [2].

[1] See, for instance, Duménil and Lévy (1993, 119) and Duménil and Lévy (forthcoming).

[2] There is a discussion in Lavoie (1996) and also in Duménil and Lévy (forthcoming) of the means by which the discrepancy between the actual and the normal rates of capacity utilization could be reduced.

White (1996, 28-29) disagrees with investment functions based on equation (1), arguing that "the use of divergences between actual and normal utilization rates as the appropriate quantity signal seems problematic". He adds that this divergence is inappropriate "as an indicator of the degree of divergence between actual and fully-adjusted capacities and hence as the relevant indicator of the degree of maladjustment of capacity in relation to long-run demand conditions". Objections in a similar vein have been put forth by some other Sraffian authors such as Ciccone (1987, 106) and Serrano (1996, 86), but what these authors had in mind as a replacement for equation (1) had never been formally specified. In contrast, White (1996) provides a formalized alternative. It will be shown that the investment function that he suggests is ultimately no different from the one proposed by Kaleckians or Duménil and Lévy, except that it explicitly relies on average values.

WHITE'S INVESTMENT FUNCTION

Instead of equation (1), White proposes his own investment function, based on the notion of a "fully-adjusted capacity level", which he defines as the future capacity level that will allow entrepreneurs to respond to expected future demand while operating *on average* at the normal rate of capacity utilization. This normal rate of capacity utilization is the average of the "cost-minimizing pattern of planned rates of capacity utilization", as defined by White (1996, 22) and as elaborated in more details in Kurz (1990) and in White (1996b). Thus, in the context of a "cyclically-disturbed system", the expected rate of capacity utilization will not be equal to this normal rate at all time, but it should be so *on average*, if expectations are verified. The level of investment required X the fully-adjusted investment level X is thus:

$$I = K^F - K^A$$

where K^F is the capital stock corresponding to the fully-adjusted capacity level, while K^A is the actual capital stock X the presently available capital stock. In growth terms, White's investment function is thus:

$$g^i = (K^F - K^A)/K^A = (K^F/K^A) - 1 \tag{2}$$

which is White's (1996) equation (6), from which capital depreciation has been omitted for simplification.[3] This equation can now be rewritten in terms that will allow a comparison with equation (1). First note that the capital to output ratio can be written as:

$$K/q = (K/q_{fc})(q_{fc}/q) = v/u \quad (3)$$

where u is the rate of utilization of capacity, v is the capital to capacity ratio, *i.e.*, the capital to output ratio when output is given by full-capacity output (when $u = 1$ and $q = q_{fc}$). In a set of short periods dominated by cyclical behaviour, we can also redefine q as the average output during the cycle, while u is the average rate of capacity utilization realized through the cycle. Using this definition, White's capital stock corresponding to the fully-adjusted capacity level can be written as:

$$K^F = q^e v/u_n$$

where q^e is the level of output demand which is expected on average for the next periods. K^F is the capital stock that will allow to respond to this expected demand while producing on average at the normal degree of capacity utilization, given by u_n. It is assumed that production changes respond precisely to demand changes. It follows that White's investment equation X my equation (2) X can now be rewritten as:

$$g^i = (q^e u/q u_n) - 1$$

The average level of expected future output demand can be rewritten in terms of a growth rate. We have:

$$q^e/q = (q + \Delta q^e)/q = (1 + g^{es})$$

where g^{es} is the expected rate of growth of sales, from the set of present short-run periods to the set of future short-run periods. Putting

[3] To be more precise, White makes a distinction between the *fully adjusted investment* of a sector, which is here denoted by the variable I, and its *planned investment*, which he calls I^P, with $I^P = \phi I$, where ϕ is a function of the differential between the profit rate of the sector and the average profit rate of the economy. In a one-sector model, however, where such profit differentials do not exist by assumption, we can assume that $\phi(0) = 1$. As White (1996b, 295) says elsewhere, "the simplest case where individual producers' concerns about ... alternative investment opportunities ... are ignored would imply that planned and fully-adjusted capital stocks are equal".

together the above two equations, White's investment function thus becomes[4]:

$$g^i = g^{es}(u/u_n) + (u - u_n)/u_n \quad (4)$$

Now equation (4), which is White's investment equation when transformed to make it compatible with the notations used by Duménil and Lévy and by Kaleckians, looks remarkably similar to the investment equation proposed by these authors. There is much similarity between equation (4) and equation (1), the former being proposed by White while the latter is being rejected by him! This similarity is particularly obvious if indeed we interpret the autonomous growth component, γ, in equation (1), to represent the secular or expected growth rate of sales, a variable similar to the g^{es} variable of equation (4). It is clear, in contrast to what White seems to believe, that his own formulation of the investment equation ends up making investment a positive function of the discrepancy between the actual and the normal rates of capacity utilization, where the *actual* rate of utilization u can here be reinterpreted as the *average* rate of capacity utilization over the most recent set of short-run periods.

Also, whether one relies on equation (1) or equation (4), the relationship between the desired rate of capital accumulation and the expected growth rate of sales remains the same. Take for instance the case where the actual rate (or the current average rate) of capacity utilization exceeds the normal rate. In both equations (1) and (4), this will induce a rate of accumulation (g^i) that exceeds the expected growth rate of sales (g or g^{es})[5]. Reciprocally, in both equations, if the actual rate of capacity utilization is below its normal value, it will lead to a growth rate of capacity that is below the expected growth rate of sales. Finally, when the current and the normal rates of capacity are equal ($u = u_n$), capital accumulation and the expected trend rate of growth are equal ($g = \gamma = g^{es}$)[6]. The two equations thus describe an entrepreneurial behaviour which is qualitatively similar.

[4] As an intermediary step, one gets: $g^i = [(u/u_n) + g^{es}(u/u_n)] - [(u/u_n) + (u_n ! u)/u_n]$

[5] The first term of equation (4) is greater than g^{es} and the second term is positive.

[6] As White (1996b, 295) says, in "the simplest case ... the rate of accumulation ... matches the expected trend rate of growth of demand".

CONCLUSION

The above equations show that modelling investment decisions as a result of the divergence between actual and fully-adjusted capacities is no different from modelling investment as a result of the divergence between actual and normal rates of capacity utilization. There is no qualitative difference between the Kaleckian investment function and the new investment function proposed by White.

The only true difference might be that Kaleckians tend to treat the actual rate of utilization as an equilibrium value, whereas Sraffians such as White tend to take into account *average* values (see Park (1995) and (1997) for instance). This is due, in my opinion, not so much to differences in theoretical beliefs, but rather to the fact that Kaleckians endeavour to give a fully specified depiction of how actual values could be achieved (*e.g.*, the rate of capacity utilization and the rate of capital accumulation), for a given normal rate of utilization, whereas Sraffians take average and expected values as unexplained given variables, trying to figure out how normal rates of utilization are actually determined[7].

What is important is that both Kaleckians and Sraffians believe, as does Garegnani (1992, 59) for instance, that "even correct foresight of future output will not eliminate average utilization of capacity at levels other than the desired one", where the desired rate is the normal rate of utilization. Even though the entrepreneurs are able to correctly forecast what the rate of growth of sales would be if firms were operating at their normal rate of capacity utilization, in general they will not be able to achieve such a position, unless they already happen to operate at normal output. As firms, overall, modify their investment decisions in the attempt to achieve a normal rate of capacity utilization relative to future (average) expected sales, these decisions lead in the aggregate to a realized rate of capacity utilization that continually stays away from the normal rate. This has surprised some commentators (Tutin 1993, 90; Serrano 1996, 86), but on reflection, it is just another instance of the paradox of thrift, where macroeconomic laws just cannot be deduced from what would occur if a single firm were to modify its behaviour[8].

[7] This point is made by Dutt (1997, 449-450).

[8] In the Kaleckian model, the g_u parameter is usually assumed to be small enough (relative to the savings propensity) to insure stability. With White's investment equation, stability requires that the weight attached to the most recent short-period value of the rate of capacity utilization, when computing the *average* value, be small enough.

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