Accumulation, Finance, and Effective Demand in Marx, Keynes, and Kalecki

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This chapter develops a new approach to the theory of effective demand. The familiar relationships between aggregate demand, supply, and capacity are linked to a corresponding relationship between finance and debt. These cross-links provide a natural foundation for a macroeconomic model of internally-generated cyclical growth. The scenario which results from the model will be very similar to the classical and Marxian descriptions of normal accumulation, with supply and demand fluctuating erratically around a cyclical growth path with an endogenous trend. Moreover, whereas current theories of effective demand generally need to resort to exogeneous factors such as technical change, population growth, or bursts of innovation in order to explain economic growth (Mullineaux 1984, 87–89), this classical/Marxian approach will be able to explain growth endogenously through the normal rate of profit.

The framework developed in this chapter is grounded in Marx’s schemes of reproduction, in Chipman’s (1951) illuminating treatment of Keynesian flows, and in the pioneering elaborations of the Marxian schema by Duménil (1977) and Foley (1983). The results are distinct from either of the two major traditions in modern macroeconomics, since neither Say’s Law (aggregate production generates a matching demand) nor Keynes’s/Kalecki’s Law (aggregate demand induces a matching supply) is assumed. On the contrary, as in Marx, both aggregate supply and demand are found to be themselves regulated by more basic factors (Kenway 1980; Foley 1983). Because capitalist production is fundamentally anarchic, this regulation process is always characterized by constant shocks and discrepancies. Nonetheless, the inner mechanisms of the system continue to operate. The end

The framework used in this paper was first presented at the International Conference on Competition, Instability, and Nonlinear Cycles at the New School for Social Research, New York, March, 1985.
result is a turbulent and erratic pattern in which supply and demand cycle endlessly around an endogeneously-generated growth trend (Bleaney 1976, ch. 6; Shaikh 1978, 231–2; Garegnani 1979, 183–5).

It is important to note that the present analysis is concerned solely with the relationship between effective demand and accumulation in the absence of any changes in technology or potential profitability. These themes are central to Marx’s schemes of reproduction, to Keynes’s theory of output, employment, and effective demand, and to Kalecki’s theory of effective demand and cycles. More importantly, such considerations are a necessary prelude to the analysis of factors which may modify the path of accumulation and even transform it into a general crisis.

A Framework Linking Aggregate Demand, Supply, and Finance

This section will develop a general framework linking aggregate demand, supply, and capacity to their duals in finance and debt. The aim is to make this framework broad enough to encompass the basic approaches in Marx, Keynes, and Kalecki, while still keeping it manageable. Therefore, the price level, money wages, and the rate of interest will be held constant, since their variations are not central to the above approaches. Similarly, we assume that the aggregate consumption of workers’ equals their wages, so that aggregate personal savings derive only from capitalist personal income. However, there is no assumption of any a priori balance between aggregate demand and supply in the short run (as in Keynes and Kalecki), nor between aggregate capital disbursements and internal finance (as in Marx’s schemes of reproduction). Indeed, it is one of the central themes of this paper that the linked imbalances in the above two domains play a crucial role in regulating the overall reproduction process.

Aggregate Demand, Supply, and Capacity

Following Marx, the period of production is taken as the basic unit of time, and it is assumed that the difference between inputs purchased and used in each period is small enough to be treated as a relatively small random variable (which will be reintroduced in the simulations). Inputs entering production at time $t - 1$ lead to output at time $t$. By definition, potential profit on production (the money form of aggregate surplus value) in period $t$ is the difference between the money value of aggregate supply $Q_t$ in period $t$ and the sum of materials costs $M_{t-1}$, labor costs $W_{t-1}$ and depreciation $DEP_{t-1}$ on inputs used to produce current output. The money value of aggregate supply in period $t$ can be written as

$$Q_t = M_{t-1} + W_{t-1} + DEP_{t-1} + P_t$$

(1)
Current aggregate demand $D_t$ is composed of the current demand for materials $M_t$ and for new plant and equipment (gross fixed investment) $IG_t$, for desired additions to final goods inventories $CINV_t$, and for workers’ and capitalists’ consumption $CONW_t$ and $CONR_t$, respectively. All of the above items require actual expenditures, except for $CINV_t$ which represents the portion of output which capitalists would like to retain in final goods inventories in order to attain some desired inventory level. When supply and demand do not balance, the actual change in final goods inventories—which equals the difference between gross output (additions) $Q$ and gross sales (deductions) $M + I + CONW + CONR$—will differ from the desired change $CINV$.

\[
D_t = M_t + IG_t + CONW_t + CINV_t + CONR_t
\]

Excess demand $E_t$ in any period $t$ can be defined as the difference between aggregate demand and aggregate supply. Note that when excess demand is positive, realized profits will be greater than potential profits.

\[
E_t = D_t - Q_t
\]

Combining equations (1) - (3), recalling that workers’ consumption $CONW_t$ equals their wages $W_t$, and grouping like terms, yields

\[
E_t = A_t + I_t + CINV_t + CONR_t - P_t
\]

where

- $A_t = (M_t - M_{t-1}) + (W_t - W_{t-1}) = \text{accumulation of circulating capital}$
- $I_t = IG_t - DEP_{t-1} = \text{net accumulation of fixed capital}$
- $CINV_t = \text{desired accumulation in final goods inventories}$

Equation (4) could be expressed in terms of the more familiar balance between total accumulation expenses (“ex ante investment”), $A + I + CINV$, and total nonconsumed surplus product (“ex ante savings”), $P - CONR$; but, this would be misleading for several reasons. First, the so-called total investment would then be a hybrid of actual accumulation in circulating capital $A$ (investment in inventories of raw materials and goods-in-process) and desired accumulation in final goods inventories $CINV$, both of which tend to be ignored in conventional accounts. Second, the so-called total savings would then merely represent the excess of the surplus product over and above the personal consumption demand of.
the capitalist class, which in no way corresponds to any quantity of money revenue withdrawn from immediate expenditures ("saved"). Indeed, the accounting device of representing the money value of this nonconsumed surplus product as the sum of the personal savings of capitalists (which do represent money withdrawn from immediate expenditure [Keynes 1964, ch. 16]) and the "retained earnings" of the business sector (which do not necessarily correspond to any money revenue withdrawn from expenditure [see equation 8 below]) simply conflates the relation between the supply/demand for commodities and the sources/uses of funds. This conflation obscures important connections between these two domains and are, therefore, treated separately.

Since we are abstracting from changes in technology, wages, and working conditions, aggregate capacity (normal capacity output) $N_t$ will be proportional to the aggregate fixed capital stock $K_f$: $N_t = vK_f$, where $v =$ the constant capital-capacity ratio (as in Harrod). Defining capacity utilization $u_t$ as the ratio of output to capacity (so that $u > 1$ implies above normal capacity utilization), we can write

$$u_t = Q_t/N_t = v(Q_t/K_f)$$

The last step is to consider the effects of circulating and fixed investments on output and capacity, respectively. Given the constant fixed capital-capacity ratio $v$ assumed above, the change in capacity is proportional to the level of fixed investment (since this is the change in the fixed capital stock).

$$N_t - N_{t-1} = (1/v)I_{t-1}$$

On the other hand, given some real period of production which will be taken as the unit of time, current output $Q_t$ and current potential profit $P_t$ are the results of inputs $M_{t-1}$ and $W_{t-1}$ purchased and used in the previous period. Given a constant profit margin on costs, $m = P_t/(M_{t-1} + W_{t-1})$, the change in current potential profits is proportional to the change in past inputs. Since the latter is simply the circulating capital investment in the last period (see equation 4), it can be written

$$P_t - P_{t-1} = mA_{t-1}$$

Equation (7) expresses the connection between circulating investment and the expansion of production. This relation is often neglected these days, even though it has always been an integral part of classical and Marxian schema. Modern national income accounts tend to lose sight of circulating investment because they adopt the convention of treating current expenditures for materials and labor ($M_t + W_t$) as the production costs (intermediate inputs) of current output $Q_t$ (BEA 1980, 6–9). This implicitly assumes a zero time of production, which is
tantamount to assuming away the production process altogether.

Equations (4)–(7) define the fundamental equations of aggregate production and effective demand. It is important to note that any a priori balance between demand, supply, or capacity is never assumed.

**Aggregate Finance and Debt**

In treating finance, assume that firms pay dividends $R$ to capitalists, who in turn consume a portion, $\text{CONR}$, and save the remainder, $\text{SAVR}$. Also assume, as does Kalecki (1965, 97) that firms borrow these personal savings of capitalists, $\text{SAVR}$, by issuing stocks or bonds to that amount. This is more or less equivalent to Marx’s assumption that capitalists draw their personal consumption directly out of profits, leaving the rest available for use by the firm (Marx 1967, vol. 2, ch. 21). Any borrowing or lending above this amount is then assumed to be mediated by the banking sector. Additionally, assume that this banking sector is willing and able to fulfill the needs of its borrowers or depositors without having to change the interest rate. This assumption is made merely in order to duplicate the Keynesian and Kaleckian assumption that bank finance can be freely acquired (or lending be freely accepted) at some given rate of interest below the potential rate of profit. In an important and insightful paper, Asimakopulos points out that Keynes and Kalecki justify their treatment of planned investment as unconstrained by (i.e., independent of) the current flow of savings precisely through the assumption of “freely gotten finance” (Asimakopulos 1983, 222–27). By adopting the very same assumption, hopefully it will be clear that the basic differences between Marxian and conventional theories of effective demand have nothing to do with the presence or absence of credit.²

The need for external finance arises because the projected expenditures of firms may exceed the projected internally available sources of funds. Borrowing must, therefore, precede the actual expenditures it aims to finance (Robinson and Eatwell 1973, 218–19). In general, this borrowing will be assumed to consist of two parts: direct borrowing of current capitalist savings $\text{SAVR}_t$ through the issue of new stocks or bonds and bank borrowing $B_t$ for any needs beyond this level.

$$\text{Total Borrowing} = \text{Total Planned Uses} - \text{Total Internal Sources}$$

$$\text{Bank Borrowing} + \text{Stock/Bond Issues} = \text{Planned Uses} - \text{Sources}$$

$$B_t + \text{SAVR}_t = \text{Planned Uses} - \text{Sources}$$

The output $Q_t$ forthcoming over any period $t$ is determined by the materials and labor set into motion in the previous period. Of this current projected output, the amount $\text{CINV}_t$ represents the desired additions to inventories of final goods, so that it is the remainder which is projected for sale. Since any financial receipts
of principal and interest on past lending by firms are treated as negative finance charges on the side of uses of funds, the total projected internal sources of funds of the business sector in period $t$ simply equals projected sales, $Q_t - CINV_t$. Over the same period, the total planned uses of funds must encompass five basic categories: circulating capital expenditures for materials $M_t$ and wages $W_t$ to be purchased in this period (in order to produce output for the next period), fixed capital expenditures for gross investment in plant and equipment $IG_t$, the payment of finance charges $F_t$ which represent currently due principal and interest charges on past borrowing (or when negative, the current receipt of principal and interest revenues on past lending), disbursements of dividends $R_t$ to capitalists for whom they will serve as current income, and any planned changes in money reserve levels $CMR_t$. It should be noted that since the money reserves of firms may be fed by past borrowing, government increases in the money supply, or even by increases in the supply of a money commodity such as gold (as in Marx), the term $CMR_t$ represents any desired adjustments over and above these other sources of changes in money reserves. Thus equation (8) becomes

$$B_t + SAVR_t = M_t + W_t + IG_t + F_t + R_t + CMR_t = (Q_t - CINV_t)$$

Combining equations (1) and (9) results in

$$B_t + SAVR_t = M_t + W_t + IG_t + F_t + R_t + CMR_t - (Q_t - CINV_t)$$

$$= [M_t - M_{t-1}] + [W_t - W_{t-1}] + [IG_t - DEP_{t-1}] + [F_t - CMR_t - (P_t - R_t)]$$

$$= [A_t + I_o + CINV_t] + [F_t + CMR_t - (P_t - R_t)]$$

(10')

The second term in brackets on the right side of equation (10') is the difference between financial uses $F_t + CMR_t$ and retained earnings $P_t - R_t$. Therefore, retained earnings correspond to financial leakages from expenditures only when all "investment" ($A_t + I_t + CINV_t$) is deficit financed (i.e., financed entirely through borrowing, $B_t + SAVR_t$). Since this will not generally be the case, it is incorrect to treat retained earnings as a form of business savings.

Finally, noting that capitalist revenue $R = consumption CONR + saving SAVR$, equation (10') can be rewritten

$$B_t = (A_t + I_t + CINV_t + CONR_t - P_t) + F_t + CMR_t$$

All of the above quantities represent planned expenditures and projected revenues, as anticipated at the beginning of period $t$. But if it can be assumed that short-run expenditure plans are revised between periods, not within them, and
that short-run revenue estimates are relatively accurate (in a stochastic sense), then from equation (4) the first term in parenthesis on the left hand side of equation (10) is simply excess demand $E_t$ plus a small random variable (which is reintroduced during the simulation process). Thus,

$$(11) \quad B_t = E_t + F_t + CMR_t,$$

where,

- $B_t$ = bank borrowing by firms
- $E_t$ = excess demand
- $F_t$ = finances charges (principal due + interest due)
- $CMR_t$ = desired changes in money reserves

Note that all these terms may be either positive or negative, with corresponding interpretations.

Equation (11) is the fundamental equation of finance. It says that the bank borrowing of the business sector must cover its own planned deficit finance of current expenditures (which will then show up as excess demand $E_t$), plus finance charges due on past borrowing, plus any funds needed to adjust money reserves to desired levels. The terms $F_t$ and $CMR_t$ play a particularly important role here, because they reflect the feedback of past events on current borrowing.

Equation (11) above can also be read in another way.

$$E_t = (B_t - F_t) - CMR_t \quad (11')$$

The term in parentheses on the right side is the net bank borrowing of the business sector, since it is the difference between current new borrowing $B_t$ and current repayments of principal and interest $F_t$. Equation (11) then reveals that when excess demand is zero, any desired adjustments in money reserves (in light of any direct injections of new money) must be covered by net bank borrowing. In a growing system, this implies a growing level of net borrowing, though this may well be a constant proportion of total profits or total output. More importantly, any excess demand $E$ must therefore be fueled by an injection of bank credit over and above the amount required for money reserve adjustments. But any such additional borrowing implies future finance charges. Thus episodes of excess demand carry the seeds of their own negation, because the net injections of credit which fuel them also carry over into the future as accelerated leakages. This feedback will play a vital role in bounding the growth cycles of the system.

It is interesting to note that the above feedback effect was essentially ignored by both Keynes and Kalecki when they formulated their respective theories of effective demand. What is more, even after criticisms of their work led them to admit that they had implicitly relied on "credit inflation" (Kalecki) or increased "bank finance" (Keynes) as the crucial foundation of their explanation of in-
creases in business activity (Asimakopoulos 1983, 223-26), neither author ever really analyzed the impact of this "credit inflation" on the level of business debt. Instead, both ended up focusing on its impact on the level of the interest rate, thus deflecting attention away from the magnitude of business debt associated with it. This left the interest rate as the principal regulator of investment decisions, as is evident in Keynes. This same emphasis on the interest rate has been revived recently by several authors (Taylor 1985; Foley 1987) as a means of breaking out of the impasse generated by the apparent instability of growth within conventional theories of effective demand. But while the influence of interest rate movements is clearly important, it is not necessarily the central factor regulating accumulation. It will be seen that even when the interest rate is assumed to be held constant, say through some "appropriate" set of state policies, the feedback between finance, debt, and accumulation will turn out to be sufficient to stabilize accumulation. The resulting theory of effective demand is very much in the classical/Marxian tradition, with the internal profitability of the system driving accumulation and the consequent debt burden constraining it. Any such construction vitiates all claims that there is an inherent contradiction between theories of effective demand and classical and Marxian theories of growth. The next section will therefore develop a simple model embodying the above principles.

A Macro Model of Internally Generated Cyclical Growth

The model developed below focuses on profits, investment, savings and finance, because these are the critical variables in the debate surrounding the relationship between effective demand and accumulation. The adjustment of inventory and money reserve stocks will not be treated here, because they play a relatively secondary role in the basic analysis in Marx, Keynes, and Kalecki, and because space limitations preclude the necessary development.

An important aspect of the approach is the distinction between fast and slow variables. Slow variables are assumed to have decision periods longer than those of corresponding faster variables (e.g., years instead of months), so slow decisions are effectively cast in terms of moving averages of the faster variables. Although one can conceive of many different sets of variables with each set operating at its own intrinsic speed, the present analysis is confined to just two speeds. The basic fast variable will be the proportion of potential profit (surplus value) which is invested in circulating capital. In Marxian terminology, this is the rate of accumulation in circulating capital, and it regulates the relation between supply and demand. The corresponding slow variable will be the rate of accumulation in fixed capital, which regulates the relation between supply and capacity.

In what follows, the (relatively) fast adjustment process is modeled first and then the (relatively) slow one. They may be thought of as "short-run" and "long-run" adjustments, provided that two things are understood. First, the corre-
sponding time horizons are defined within this framework and may not corre-
spond to those implicit in other frameworks. Second, the short- and long-run
balance points are not equilibrium points in the conventional sense, but rather
centers of gravity around which the system cycles.

The (Relatively) Fast Adjustment Process

The relationships between aggregate excess demand, bank borrowing, and in-
vestment in circulating capital in equations (4), (7), and (11), respectively, form
the core of the fast adjustment process. Noting that we are abstracting from stock
adjustments, we can write

\[ E_t = A_t + I_t + \text{CONR}_t - P_t \]

\[ (P_t - P_{t-1}) = mA_{t-1} \]

\[ B_t = F_t + E_t \]

The next step is to define the interrelationships among the terms of the above
equations. Assume that the ratio of capitalist consumption to potential profits is a
constant \( c \) (on the grounds that dividends are proportional to profits and capitalist
consumption is in turn proportional to dividends), and that the rate of accumula-
tion in fixed investment \( k \) is a constant in the short-run, since it is a slow variable.
Finally, the essential link between past borrowing and present debt service is
captured by assuming that all borrowing or lending by firms must be paid back at
a constant interest rate \( i \) within one period. Accordingly,

\[ \text{CONR}_t = cP_t \]

\[ I_t = kP_t \]

\[ F_t = (1 + i)B_{t-1} \]

The remaining step is to model the behavior of the rate of accumulation in
circulating capital \( a = A/P \). This ratio expresses the strength of the tendency to
expand production and is generally determined by various factors ranging from
the level and trends of past profits to various expected gains and costs. There need
be no specific assumption about the determinants of the level of the rate of
accumulation. Instead, simply assume that firms attempt some arbitrary rate of
accumulation, which they then modify based on the results of their attempt.
Specifically, assume that if any arbitrary initial attempted accumulation rate
results in a level of internally available finance above potential profit (surplus
value), then the accumulation rate in the next period will be higher. The opposite
holds when internal finance falls below potential profit. In this way, the rate of change in the rate of accumulation becomes linked to the financial strength of the firm.

At the beginning of any period \( t \), firms must assess their internally available finance and formulate their borrowing and expenditure plans for the period. As the internally available and borrowed funds are actually expended, the resulting demand serves to realize a particular level of aggregate profit. Thus, realized profits in period \( t \) are themselves the result of expenditures undertaken in period \( t \) (Kalecki 1965, 45–46). It follows that only the profits realized in period \( t-1 \) can enter into finance which is internally available at the beginning of period \( t \).

Actual internally available finance at the beginning of period \( t \) is defined as profits realized in the previous period \( t-1 \) minus any debt service payments which firms are obligated to pay over the coming period \( t \). Aggregate profits in \( t-1 \) are realized by aggregate purchases \((A+I+\text{CONR})_{t-1}\), and from equation (4) these equal the sum of potential profits and excess demand \((P+E)_{t-1}\). Debt service payments over period \( t \) are given by equation (7). Thus at the beginning of period \( t \), the internally available internal finance is

\[
X_t = (\text{Realized Profits in } t-1) - (\text{Debt Service in } t) = (P+E)_{t-1} - F_t = (P+E)_{t-1} - (1+i)B_{t-1} \]

The accumulation reaction function then states that the change in the rate of accumulation in circulating capital is proportional to the percentage of the excess of internally available finance over potential profit (surplus value).

\[
\frac{(A/P)_t - (A/P)_{t-1}}{P} = h(E - (1 + i)B/P)_{t-1} \tag{18}
\]

Equations (12)-(18) describe the complete short-run model. At this point, it is useful to consolidate the above equations, express all terms as proportions of potential profit, and write them in their continuous time equivalents, so as to facilitate subsequent proofs. Combining (12), (15), and (16), letting \( e = \) excess demand as a proportion of potential profit, \( a = \) the rate of accumulation in circulating capital, recalling that \( c \) and \( i \) are constant and \( k \) is constant in the short-run because it represents the slowly changing rate of accumulation in fixed capital, and using the notation \( P \) to signify the instantaneous rate of change of \( P \), etc., it follows that

\[
e = a + k + c - 1 \tag{19}
\]

\[
\dot{P}/P = ma \tag{20}
\]

\[
\dot{a} = h[e - (1+i)b] \tag{21}
\]

Combining equations (14) and (17) gives \( B_t = (1+i)B_{t-1} + E_t \). Translating
into continuous time, \( \dot{B} + B = (1+i)B + \dot{E} + E \), where \( i \) now stands for the instantaneous interest rate. Dividing through by potential profit \( P \), letting \( b = B/P \), and noting that \( \dot{b} = \dot{B}/P - (P/P)b \) and \( \dot{e} = \dot{E}/P - (P/P)e \), the equation of finance can be expressed as

\[
\frac{\dot{B}}{P} + b = (1+i)b + \frac{\dot{E}}{P} + e
\]

Adding \( \dot{b} \) to both sides,

\[
\dot{b} + (\frac{\dot{P}}{P})b + b = b + \dot{b} + e + (\frac{\dot{P}}{P})(e - b)
\]

Equations (19) - (21) can be reduced still further. Since \( c \) is constant, and \( k \) is constant in the short-run, (19) implies \( \dot{e} = \dot{a} \), which can then be substituted into (21). On the other hand, \( \frac{\dot{P}}{P} = ma \) from (20) and \( a = e + d \) from (19), where \( d = 1 - (c + k) \), all of which can be used to rewrite (22). On this basis, the result is two nonlinear differential equations which describe the essential mathematical structure of the fast adjustment process.

\[
\dot{e} = h(e - (1+i)b)
\]

\[
\dot{b} = \dot{e} + (1+i)e + (md - i)(e - b) + me(e - b)
\]

where \( e, b \) represent excess demand and borrowing as fractions of potential profit, respectively, and

- \( c \) = the constant propensity to consume out of profits
- \( k \) = the rate of accumulation in fixed capital (constant in the short run)
- \( d = 1 - (c + k) \)
- \( m \) = the constant profit margin on costs
- \( i \) = the constant rate of interest

The short run adjustment process summarized above has several remarkable properties (proofs are in the Appendix). First of all, it has only one stable critical point at \( e = 0 \) and \( b = 0 \), which implies that the system automatically converges around a generally growing path on which supply and demand balance (\( e = 0 \)) and accumulation is self-financing (\( b = 0 \)). This path is none other than the aggregate equivalent of the Marxian expanded reproduction path implied by the parameters \( c, k \) (of which simple reproduction is a special case). Second, the stability of this model is assured by the simple and plausible economic requirement that in the vicinity of expanded reproduction, the funds reinvested by firms be capable of earning an incremental rate of return which is greater than or equal to the rate of interest. In other words, active capital should be capable of earning at least as much passive capital. Third, subject to the above condition, the model is extremely robust, because it is stable for all positive values of the reaction coefficient \( h \) and is cyclically convergent for all plausible values of \( h \).

The above properties imply that from any arbitrary initial situation, the model will converge in a cyclical fashion towards aggregate expanded reproduction. But this does not imply that the system will ever be in expanded reproduction, because
once the effects of the anarchy of capitalist production are simulated by subjecting
the model to recurrent random shocks, the system cycles endlessly around ex-
panded reproduction without ever coming to rest upon it. The simulation results
are shown in Figure 1 in which excess demand, e, and the debt burden, b, cycle
erratically around the balance point of zero. Figure 2 shows how this translates
into the fluctuation of actual profit (realized surplus value) around potential profit
(produced surplus value). Taken as a whole, these figures exemplify Marx's
conception of expanded reproduction as the inner tendency—the regulating aver-
age—of the erratic path of the actual system.

The short-run model has several other interesting properties. To begin with,
since excess demand e is approximately zero in the short-run, equation (19)
implies that

$$a = 1 - (c+k) = d$$

When averaged over short-run fluctuations, the rate of accumulation in circu-
lating capital, a, is inversely proportional to the propensity to consume, c, and to
the fixed investment accumulation rate, k. This means that even though an
exogenous rise in either c or k may initially stimulate the system, the financial
drag created by the additional debt will end up lowering $a$ by the same amount, at least over the average short-run cycle.

The average short-run rate of return on fixed investment is also inversely proportional to $c$ and $k$. Defining this as

$$r = \frac{\dot{P}}{P} \cdot \frac{K}{f} = \frac{\dot{P}}{P}/(I/P)$$

where $I/P = k$, $\dot{P}/P = ma$ from equation (18) and $a$ is given by (25), so that

$$r = \frac{md}{k} = \frac{m(l - c - k)}{k} = \frac{m(l - c)}{k} - m.$$ 

Once again, an exogeneous rise in $c$ or $k$ may initially raise the short-run rate of return on fixed investment by initially stimulating $a$, but will end up actually lowering it as the new short-run average level is established.

Lastly, it can be shown that the rate of capacity utilization will be roughly constant over the average short-run cycle at some level which will, in general, be
different from normal capacity utilization. While this is reminiscent of the standard Keynesian and Kaleckian conclusion that there is no short-run mechanism which will make actual output equal "full employment" (i.e. normal capacity) output, it is worth noting that our results hold for a growing system, whereas those of Keynes and Kalecki hold solely for a static level of output. To derive our result, note that from equation (5) the fixed capital/capacity ratio \( v = \frac{Kf}{N} \) is constant, while from equation (7), the constant profit margin on costs \( m \) implies a constant profit margin on output \( n = \frac{P}{Q} \). The levels of capacity, output, and capacity utilization, respectively, can be written as

\[
N = \frac{Kf}{v} \\
Q = \frac{P}{n} \\
u = \frac{Q}{N} = \frac{(1/r_n) P/Kf}{n} 
\]

where \( r_n = \frac{n}{v} \) = the normal-capacity rate of profit on fixed capital.

To analyze the short run behavior of \( u = \frac{Q}{N} \), note that

\[
\dot{N} = \frac{Kf}{v} = \frac{I}{v} = \frac{(k/v)P}{\text{and}} \\
\dot{Q} = \frac{P}{n} = \frac{(P/P)P}{n} = \frac{mP}{n} = \frac{m(1 - c - k)P}{n} 
\]

Thus \( \dot{Q} = pN \), where

\[
p = \frac{mv[(1 - c)/k - 1]}{n} 
\]

is constant in the short run. Integrating both sides, \( Q = pN + (Q_0 - pN_0) \), where the term in parentheses is the constant of integration evaluated at some time \( t_0 \). Rewriting,

\[
u = \frac{Q}{N} = p + (u_0 - p) \frac{N_0}{N} 
\]

from which it is clear that as the system grows and \( N \) rises over time, \( u \) approaches \( p \). A rise in \( c \) or \( k \) will, therefore, tend to lower the average short-run level of capacity utilization by lowering its asymptote \( p \).

**The (Relatively) Slow Adjustment Process**

In the analysis of the short-run, the rate of accumulation in fixed capital \( k \) is taken as given on the grounds that it represents a slow variable. But since the short-run level of capacity utilization will generally differ from the normal level of capacity utilization, it is to be expected that \( k \) will slowly react to any such discrepancy. Defining a longer unit of time \( T \) (e.g., years instead of months) to accommodate this slow adjustment process, the reaction function for the rate of accumulation in fixed capital \( k \) is written as

\[
\frac{\dot{k}}{k} = g(u - 1) 
\]
where $u =$ the level of capacity utilization (normal level = 1) 
$g =$ the reaction coefficient (a positive constant)

The effects of such a reaction function depend on the counter-response of capacity utilization to $k$. Now, from equation (25) it is known that the fast adjustment process will lead to the rough equality $a + k = 1 - c$. Suppose the short-run level of capacity utilization is above normal, so that $k$ begins to slowly rise. From the point of view of the short-run adjustment process, $k$ has risen to a new higher level. This rise may initially stimulate effective demand and raise $a$. But as the new short-run center of gravity is established, $a$ will fall to accommodate the new higher short term level of $k$. Thus, an acceleration in the growth of capacity will end up decelerating the growth of actual production, so that the capacity utilization level will tend to fall back toward normal (or even past it). This tendency is in striking contrast to the knife-edge instability usually found in conventional effective demand models. It is, on the other hand, implicit in most classical and Marxian analyses of accumulation. To formalize it, differentiate the expression $u = (1/r_n) P/Kf$ given in equation (26), recalling that $P/P = m(1 - c - k)$ from equations (6) and (25), respectively, while by definition $Kf = I$ and $I/P = k$,

\[
\dot{u}/u = \frac{\dot{P}}{P} - \frac{\dot{Kf}}{Kf} = ma - (1/P)(P/Kf) = m(1 - c - k) - (r_n)ku
\]

Equations (27) and (28) define a system of two nonlinear differential equations representing the slow adjustment process through which the level of capacity utilization reacts back on the rate of accumulation in fixed capital, and vice versa.

The above long-run adjustment process has the striking property that it is stable around the normal capacity utilization level $u = 1$ (see proofs in the Appendix). This critical point is the only stable one. Its stability holds for all positive values of the reaction coefficient $g$ and is oscillatory for all plausible values of $g$, as long the system is at all profitable. This means that for any single displacement, the system tends to oscillate back toward the normal level of capacity utilization. More importantly, in the face of random shocks representing a multitude of concrete factors and disturbances, the system tends to cycle endlessly, alternately overshooting and undershooting the normal level of capacity utilization. Note that since the adjustment of the fixed investment share is denominated in time units $T$, while that of the circulating investment share is denominated in some shorter time unit $t$, it follows that the period of the fixed investment cycle is likely to be greater than that of the circulating investment cycle. Figure 3 below shows the simulation results for capacity utilization $u$ in relation to the normal level $u = 1$. Figure 4 shows the corresponding behavior of profit on actual production and of profit on normal capacity production (profit on "warranted" output).

* * *
Figure 3. **Capacity Utilization.**

Figure 4. **Normal Profit and Actual Profit.**
The aim of this chapter has been to present a new approach to the question of the role of effective demand in accumulation. The first step in this direction was an attempt to create a simple framework which was general enough to encompass the essential differences between Marxian, Keynesian and Kaleckian approaches to this issue. Issues which are not central to the above approaches (such as the effects of workers' savings, of the adjustments in inventory and money stocks, or of the difference between short-term and long-term debt) were ignored, while others which did play a central role in one or the other of the main approaches (such as the constancy of prices, wages, and interest rates in Keynesian and Kaleckian [KK] theory, or the link between investment in circulating capital and output growth in Marxian theory) were retained. Since Marx's schemes of reproduction abstract from aggregate borrowing or hoarding (Bleaney 1976, 106–7), while KK theories are crucially dependent on the assumption that finance is "freely available" at a constant rate of interest (Asimakopulos 1983), it was particularly important to retain this latter assumption in order to establish that it was not a decisive factor in distinguishing the two sets of approaches. What did turn out to be decisive were the crucial links between accumulation expenditures, finance, bank credit, and the burden of debt.

But the question of credit is only half of the story. An equally important difference arises in the analysis of accumulation. Dynamic analysis, as in Marx and Harrod, tends to see growth as an inherent aspect of production and investment plans, so that it is their trend which is seen as reacting to market feedback. In contrast to this, both Keynes and Kalecki adopt a notion of essentially passive firms aiming at attaining a given level of output. Production plans are implicitly static, and it is the level of production (rather than its trend) which is taken to respond to feedback. Mathematically speaking, Marx's (and Harrod's) reaction functions tend to be formulated in terms of proportions or rates of growth, whereas those of Keynes and Kalecki tend to be cast in terms of absolute levels of variables. This is a difference which becomes quite crucial in the analysis of macroeconomic growth.

In latter part of this chapter, the above considerations were used to develop a simple but powerful macroeconomic model of cyclical growth. The proportion of potential profit devoted to expansion of output was assumed to respond positively to the level of excess demand and negatively to the burden of debt service payments. This was shown to give rise to persistent short-run cycles centered around expanded reproduction in the Marxian sense. Over the longer run, the proportion devoted to expansion of capacity was assumed to rise when capacity utilization was above normal (and fall in the opposite case); this simple assumption was found to lead to persistent long-run cycles centered around normal capacity utilization (the Harrodian warranted path). The overall model thus generates two distinct cycles which oscillate around a growth trend ultimately regulated by the intrinsic profitability of the system. Unlike most modern approaches, no recourse is made to external factors such as technological change.
or population growth in order to explain the basic growth trend, and there is no presumption that the system tends to achieve the full employment of labor (as opposed to the normal utilization of fixed capital). In this sense, the model presented here is a concretization of the theory of effective demand implicit in the classical/Marxian tradition (see Shaikh 1978).

Many aspects of this approach remain to be developed. For instance, the introduction of sustained government deficit spending introduces a new factor, in that it seems to give rise to a corresponding sustained excess demand. This seems to suggest a formal basis for a link between deficit spending and inflation, at least under conditions of normal growth. Similarly, a falling potential rate of profit seems to produce qualitatively new behavior, in that the stable growth cycles analyzed here are eventually undermined and turn unstable at the point where the mass of profit-of-enterprise becomes stagnant. Both of these results are very suggestive of classical and Marxian arguments. Lastly, it is possible to generate deterministic limit cycles instead of the stochastic ones explored here by specifying slightly different functional forms for the two accumulation reaction functions. The important thing is that the general approach adopted in this paper seems to provide a very fruitful and dynamic alternative to traditional theories of effective demand.

Appendix: Analysis of Stability

Stability of the Fast Adjustment Process

The fast adjustment process is characterized by equations (23)-(24) above. Defining \( z = e - b \), they can be rewritten as

\[
\begin{align*}
\dot{e} &= -hie + h(l+i)z \\
\dot{z} &= -(1+i)e - (md - i)z - mez
\end{align*}
\]

where \( m = \) the constant profit margin
\( i = \) the interest rate
\( d = 1 - (c + k) \), in which \( c = \) the constant propensity to consume out of profits
\( k = \) the constant-in-the-short-run rate of accumulation in fixed capital
\( h = \) the reaction coefficient for the circulating capital accumulation function and \( m, i, c, k, \) and \( h \) are positive by definition, and \( d \) is positive as long as the average short-run rate of return on fixed investment, \( r = md/k, \) is positive (see the discussion following equation [25]).

The above system has two critical points:
Linearizing around the second critical point shows that its determinant reduces to 
\[ \text{Det } J_2 = -h(l + 2i + mdi) < 0, \] 
since \( i, m, d \) are all > 0. This means that the second critical point is unstable. On the other hand, linearizing around the first critical point \( e = z = 0 \), gives

\[ \text{TR } J_1 = -[hi + (md - i)] \]
\[ \text{DET } J_1 = hi(md - i) + h(1 + i)(1 + i) = h[1 + 2i + mdi] \]

Since \( h, m, d \) and \( i > 0 \), \( \text{DET } J_1 > 0 \). Then a sufficient condition for (local) stability is \( md \geq i \), because this ensures that \( \text{TR } J_0 < 0 \) (Hirsch and Smale 1974, 96). What is more, it can be shown that the discriminant of this system is negative for all plausible values of the reaction coefficient \( h \) (e.g., for \( i \) between .02 and .20 and \( md \) between \( i \) and \( 3i \), any value of \( h \) between .027 and 144 will yield a negative discriminant), so that convergence will generally be oscillatory. Lastly, the phase diagram of our system of equations (omitted for brevity) indicates that the basin of attraction of the stable point is very large, since it encompasses both the positive \( e \)-space and the positive \( z \)-space. Only for initial points in which both \( e \) and \( z \) are sufficiently negative will the model exhibit instability.

Now consider the economic content of the stability condition \( md \geq i \). From equation (25), the short-run regulating rate of accumulation \( a = d \) and from equation (20) \( ma = \frac{P}{P} \), thus the stability condition becomes \( \frac{P}{P} > = i \). Now consider the funds that businesses reinvest in their own operations. It has been assumed that dividends \( R \) are proportional to potential profits (surplus value) \( P \), so that retained earnings \( RE = P - R = P(1 - x) \), where \( x \) = the dividend payout rate. The corresponding net incremental return to these reinvested funds is the increase in profits \( \dot{P} \) minus the increase in payouts of dividends \( R \) and finance charges \( F \). But since \( b = 0 \) at the critical point in question, accumulation is self-financing on average, and \( \dot{F} = 0 \) at the critical point. Thus the incremental rate of return on reinvested funds is

\[ r^* = (\dot{P} - \dot{R})/(P - R) = \dot{P}(1 - x)/P(1 - x) = \dot{P}/P \]

It follows that the stability condition \( md \geq i \) is equivalent to the basic economic
requirement that the funds reinvested in business earn a rate of return greater than or equal to the interest rate.

Stability of the Slow Adjustment Process

The structure of the slow adjustment process is given by equations (27)-(28). These are reproduced below in slightly different form.

\[
\begin{align*}
\dot{k} &= -gk + gku \\
\dot{u} &= m(1 - c)u - mku - (r_n)ku^2
\end{align*}
\]

Here, \( k \) and \( u \) are the variables, and all the others are positive constants:

- \( g \) = the reaction coefficient for the rate of accumulation in fixed capital
- \( m \) = the profit margins on costs
- \( r_n \) = the rate of profit on fixed capital at normal capacity (the normal fixed capital rate of profit)
- \( c \) = the capitalists' propensity to consume out of potential profits < 1

Once again, there are two critical points:

\[ u = 1, \quad k = k^* = \frac{m(1 - c)}{m + r_n} > 0 \text{ and } u = 0, \quad k = 0. \]

Forming the Jacobian of this system,

\[
J = \begin{bmatrix}
g(u - 1) & gk \\
-[m + r_n]u & m(1 - c - k) - 2(r_n)ku
\end{bmatrix}
\]

Linearizing around the second critical point \( u = k = 0 \), the system is found to be locally unstable, since \( \text{Det } J_2 = -gm(1 - c) < 0 \). On the other hand, in the vicinity of the first point \( u = 1, \quad k = k^* \), since \( k^*[m + r_n] = m(1 - c) \), the Jacobian, its trace and its determinant reduce to

\[
J_1 = \begin{bmatrix}
0 & gk^* \\
-[m + r_n] & -r_nk^*
\end{bmatrix}
\]

\[ \text{TR } J_1 = -r_nk^* < 0, \quad \text{DET } J_1 = gk^*[m + r_n] > 0 \]

which implies that the first critical point is locally stable. Moreover, the convergence
implied by this stability is generally oscillatory, because plausible values of m, c, and rₙ yield a negative discriminant for all but the very smallest values of the reaction coefficient g (e.g., for all m, c, rₙ between .1 and .5, a reaction coefficient g > .05 is more than sufficient to guarantee oscillatory behavior).

Since capacity utilization cannot be negative, u ≥ 0. The corresponding phase diagram of this system (omitted for brevity) shows that any trajectory in the positive quadrant will converge on the first critical point u = 1, k = k*. The slow adjustment process is then stable around the warranted path.

Notes

1. Strictly speaking, net investment is the difference between gross fixed investment and current retirements IRₙ, rather than current depreciation allowances DEPₙ. But the difference between the latter two is not important here.

2. Bleaney points out that Marx abstracts from all credit and hoarding, which means that an increase in investment must be financed by a corresponding decrease in some other form of demand, such as capitalist consumption. This explains why there is no multiplier in Marx’s analysis of the schemes of reproduction, even when investment changes to accommodate the transition from simple to expanded reproduction, etc. From this, Bleaney leaps to the conclusion that the introduction of credit into the Marxian schema would “lead logically to the Keynesian solution” (Bleaney 1976, 107). Our analysis makes it clear that his conclusion is quite unwarranted.

3. In Marxian expanded reproduction, supply equals demand and borrowing equals zero for each of the departments of production, and hence also for the aggregate. Here, we focus solely on the aggregate.

4. Only in an aside on Harrod does Kalecki modify his basically static focus to try to account for “an expanding economy.” But the analysis is very awkward and seems largely designed to support Kalecki’s earlier conclusions concerning the inherent static tendency of accumulation in the absence of external factors such as technical change (Kalecki 1962).

5. Kalecki (1965) relies on technical change and external markets to explain growth; Goodwin (1986) relies on exogeneous population growth and technical change; while Foley (1985) relies on the growth in the exogeneous money supply.

References


