TESTING THE RATE OF PROFIT
by an alternative measure of the value of the produced assets.

There are five primary obstructions that need to be overcome before it is possible to determine an accurate rate of profit. The first two apply to measuring constant capital or more precisely its fixed component. Firstly, the misuse of depreciation which undervalues fixed assets. The second relates to the periodic neo-liberal revaluation of the stock of capital to reflect changing market conditions. Thirdly, re-invoicing by the multinationals and wholesalers to avoid taxes by means of altering input prices (import prices) which reduces profits in the home country thus making national rates of profit unreliable. Fourthly, the inclusion of high end wage compensation which correctly belongs on the side of surplus. Finally, the inclusion not only of fictitious profits as profits, but the inclusion of imputed income which limits the range of industries that can be included in determining the rate of profit. This article does not test all these obstructions, limiting itself to evaluating depreciation and the revaluation of the stock of fixed capital in order to evaluate the quality of the estimates provided by the BEA relating to the Net Stock of Produced Assets.

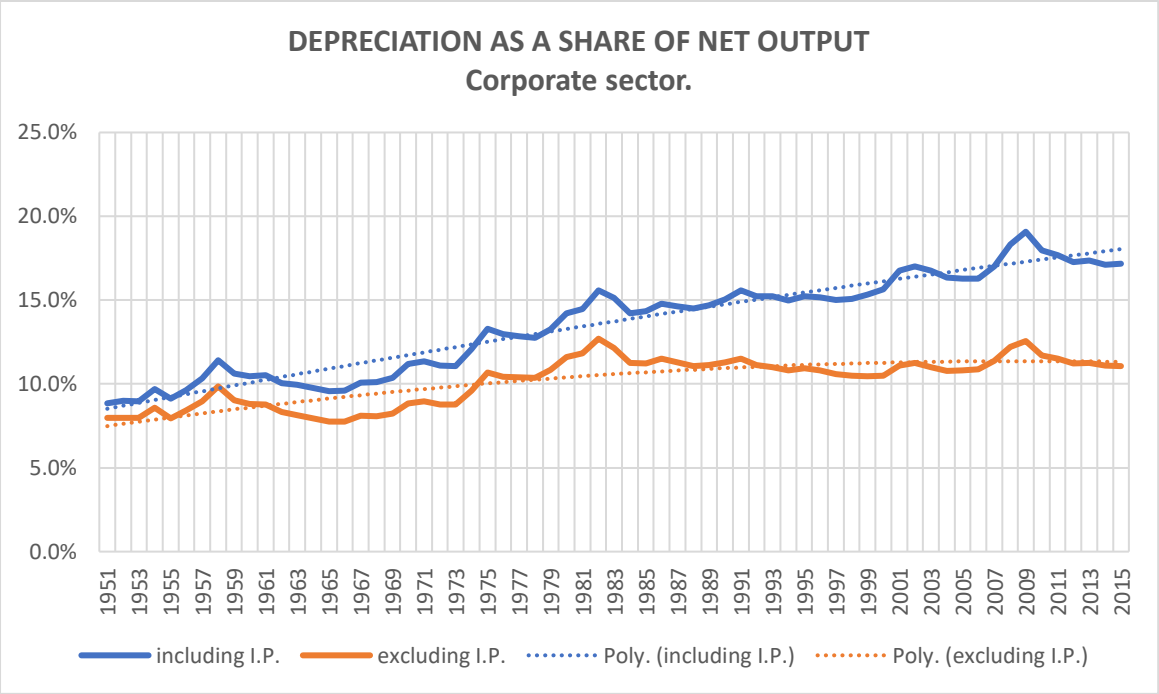
The starting point of this article is to test the reliability of the stock of fixed capital in its value form. Much attention has been concentrated on the use of the neo-liberal method of valuing capital in terms of its future discounted cash flow. This is the equivalent, for example, of valuing a ship not by what it costs to produce but by the number of passengers it will carry in future. If the economy enters an upturn and passenger occupancy is high, then the "value" of the ship appreciates compared to when the economy is in a downturn and the occupancy rate is low, at which point its "value" depreciates.

This is a symptom of the chaotic capitalist market which forces a subjective interpretation of the value of assets because fundamentally they are commodities. Market conditions therefore stretches the relation between book value and market value, just as it does any other commodity that is in stock but not yet sold. The BEA attempts to compensate for market conditions by revaluing the Net Stock of Produced Assets through nominal holding gains or losses. In this article, the effect of revaluations is not quantified as much as it is eliminated.

While the discounted cash flow model is circular and thus a tautology, there is an overlooked element of truth in the revaluation of the stock of fixed. Marx noted that fixed capital, whose life often extended beyond the seven to eight-year business cycle did undergo a cyclical appreciation and depreciation. It tended to appreciate in the intensive final up-phase of the business cycle and this was one of the causes for the rate of profit to fall, or at least, the expected rate of profit on new investment, and to depreciate in the recession which conversely helped the rate of profit to rise. Hence the rhythm of appreciation and depreciation is mirrored crudely by the discounted cash model, though the latter is based on the reified assumption that fixed capital itself is one of the sources of profit, not only labour.

The over-looked issue to do with the valuing of capital is depreciation. Depreciation has increased significantly when measured either against investment or national income. Viewing Graph 1 below, which covers the Corporate Sector, we note this is due primarily to the effect of Intellectual Property or I.P. This distortion begins with the 2013 revision when Research and Development together with in-house software are capitalised allowing it to be depreciated. Whereas depreciation has flat lined since 1983, this changed in the second half of the 1990s, culminating in a spike in I.P depreciation, which together with its growing weight, caused overall depreciation to increase significantly.

Graph 1.



(Sources: BEA Table 4.4 for depreciation and Table 1.13 for net income.

Depreciation forms part of corporate cash flow together with corporate profits. Depreciation does not increase cash flow on average except where it forms a component of monopoly price. It follows that if a rise in depreciation does not increase cash flow except in the case of monopoly pricing, then it must be depress corporate profits by the degree of its overstatement. The capitalist owners are no poorer, but the valuation of their capital is effected and so too the enterprise rate of profit.

It is also important to point out that the rise in depreciation has not been due to a reduction in the life span of fixed capital. As science and technique develops, equipment and structures should be more durable not less. Better alloys, better ball bearings, better controls should lengthen the life of productive assets not reduce it. Whereas cars clocking up 150,000 kilometres were a rarity, now more cars clock up 300,000 kilometres. Indeed, the BEA in its explanatory notes on depreciation increased the service life of aircraft from 20 to 25 years (BEA_depreciation_2013.pdf) because of their increased durability. Hence while it is important not to confuse economic life with service life it is the latter which should inform the former. The increase in the current service life of assets suggests that increases in durability are more important than changes in obsolescence resulting from changing technology and more episodically, recessions.

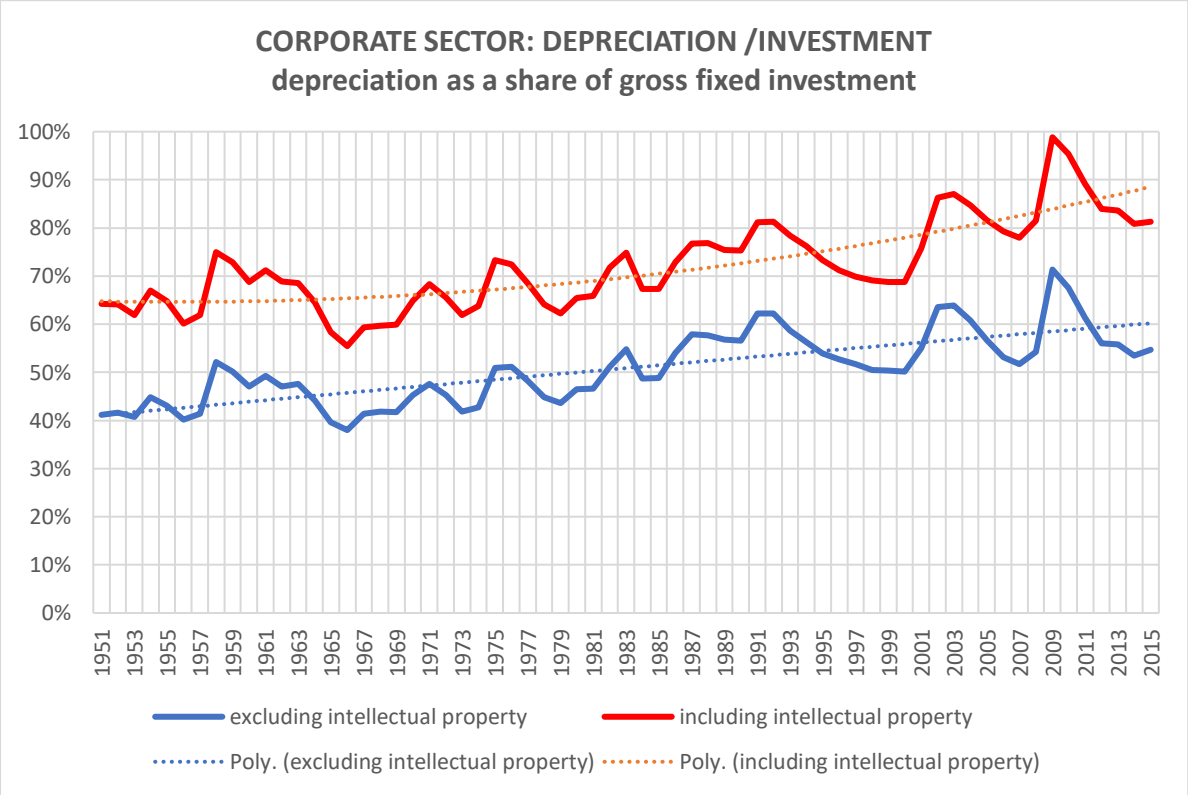
Capital consumption or depreciation forms part of the Perpetual Inventory Method (PIM) of valuing the stock of capital. Depreciation is one of the more robust elements of PIM, especially for non-residential fixed assets where over 50% of the estimate for depreciation is derived from Type A surveys. While geometric depreciation yields service life, clearly a failure to do so accurately, will affect the determination of average age of assets. Any overstating of depreciation will shorten service lives and vice versa despite the BEA's commitment to deriving depreciation from the length of service lives.

Looking at the matter more closely, it is useful to contrast depreciation to gross fixed investment. This avoids issues associated with the growth in the technical composition of capital. The growth in the physical means of production together with its cheapening, should have a comparable, though time

lagged effect, on both the quanta of depreciation and investment, because the former is based on the latter.

However, as Graph 2 below shows, there has been a 50% increase in the ratio of depreciation to gross investment from the early 1950s. This applies to both series. This phenomenon would be expected if there were a sharp decline in current asset lives yielding a higher rate of depreciation which is not the case. Even with higher write offs and obsolescence average age has risen over the last ten years. While depreciation has risen 50%, average age has fallen by only half that amount.

Graph 2.



(Source: BEA Table 4.4. for depreciation and 4.7 for investment.

In both cases there is a 50% increase in the ratio of depreciation to investment. Two series are provided to isolate and measure the effect of I.P. whose rate of depreciation is much faster and whose weight has grown over the last twenty years. Its effect can be seen by the divergence between the two series over the last twenty years.

Net investment is the product of gross investment less depreciation. Clearly if corporate depreciation is rising as a share of gross fixed investment net investment will be falling unless gross investment is rising exponentially. As it is not, then rising depreciation is leading to falling net investment. It is conceivable, that with the current rapid cheapening of the new means of production, depreciation which is based on prior and more expensive means of production, may cover more than replacement means of production. In this case it will pay for some of the new and additional investment that traditionally was covered by net investment. If this hypothesis is correct, then new and additional corporate investment has been actually stronger than net investment suggests.

Furthermore, as both gross and net investment tends to be measured against GDP, this measure has become increasingly elastic because GDP is itself inflated. (GDP is the sum of national income plus

depreciation.) If inflated depreciation has inflated GDP by nearly 10% over the last decade, then the same quanta of investment will appear to have fallen relatively, because of this inflated GDP. However, when comparing corporate net investment to national income, the share of net investment has not fallen to the same degree because corporate income is more reliable. (We exclude Total Private Industry because it has been significantly inflated by duplication and imputation particularly in the household and institutional sectors.)

How then to exclude the confounding effect of revaluation and premature depreciation? The method below sets out an alternative method of valuing fixed assets. The BEA assumes a weighted average age for assets: "*The average age is derived as the weighted average of the ages of all depreciated investment remaining in the stock as of yearend. The weight for each age of investment is based on the proportion of its value as part of the total net stock. Under the PIM, the average age of the net stock depends on the time patterns of past investment and the rate of depreciation*." Hence if the weight of investment is recent, the average age will be younger and if the weight of investment is less recent it will have an older average age.

The use of weighted averages is useful. It allows the elimination of over-inflated depreciation which deflates the value of assets, and on the other side, the reflation of these assets by periodic revaluations. To achieve this, the average age of produced assets based on historical cost is used (Table 4.9) to provide the real rate of depreciation. However, the average age for a given year is not used because of the presence of pre-existing investment made prior to that year. For example, in 1951 the average age was 12.2 years most of which would relate to investments prior to 1951.

Instead 1957 is chosen as it is the mid-point in the 12.2 year longevity of these assets projected from 1951. By 1957 most of the pre-1951 investments will have been consumed so that the average age in 1957 is more representative of the age of the investments actually made in 1951. The same applies to following years. At the end of the series the average age is extrapolated. However, this does not present a significant statistical problem as between 2011 and 2015 the average age did not fluctuate by more than 0.1 years. Accordingly, from 2011 to 2015 the average age is set at 8.6 years.

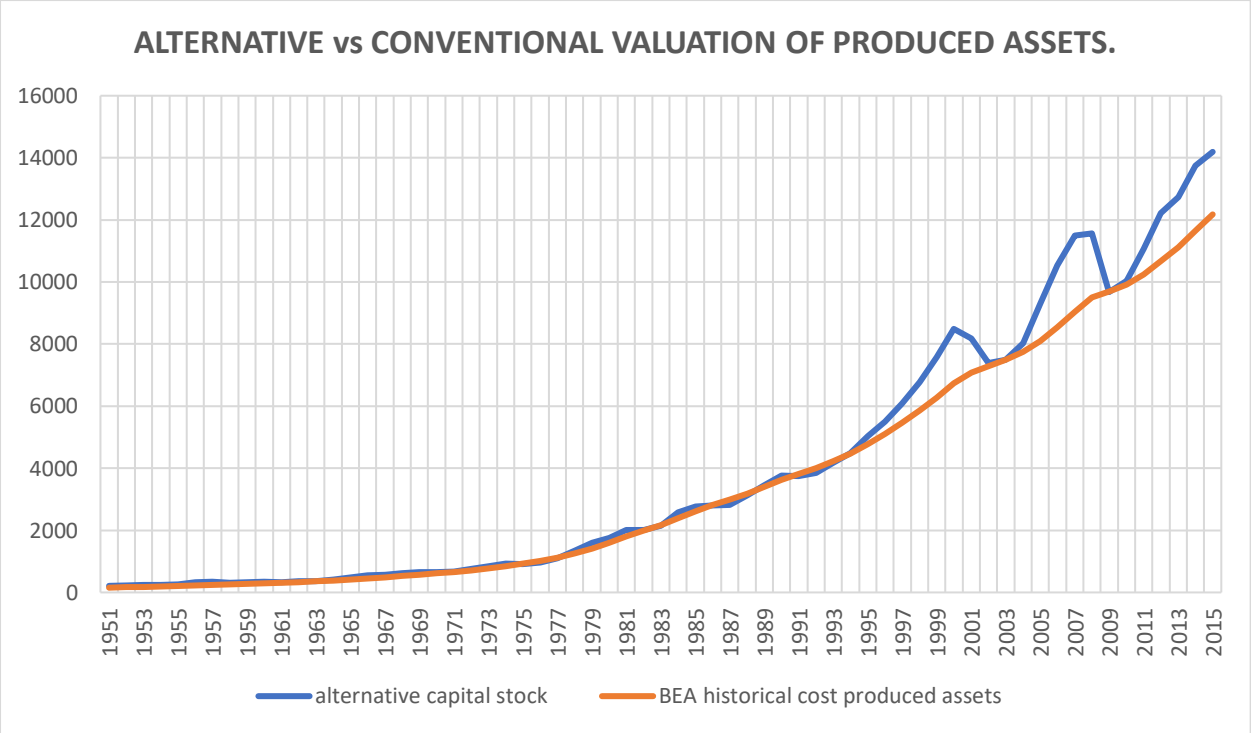
The adjusted average age is now used to determine the rate of depreciation. In 1951 this is no longer 12.2 years but 10 years (the average age for 1957). Accordingly, the rate of depreciation is set at 10% (10 x 10% = 100% depreciation). The rate of depreciation used by the BEA is ignored although it is implicit in the average ages provided. The same methodology is used for subsequent years. This provides the net investment for any year which when multiplied by the number of years provides the alternative value of the net fixed produced stock. Turning back to 1951, gross investment of $23.6 billion is reduced by 10% to $21.24 billion which when multiplied by 10 years yields a produced asset stock of $212.4 billion.

Finally, the alternative valuation of the produced assets is compared to the BEA's own estimation of the historical cost of produced assets as found in Table 4.3. Historical cost is used because the average age is based on the historical cost series and not the current cost series. The average age measured

by current cost is longer. Using this series would require contrasting the alternative measure to Table 4.1. which is more difficult because average ages are so much longer.

The correspondence between the alternative and conventional historical valuation of produced assets is reproduced in Graph 3 below. As expected the alternative valuation of the fixed means of production is higher than the conventional valuation because over-depreciation is compensated for. The fact that the alternative value of the stock of capital is higher than the conventional series shows that depreciation trumps revaluation. The critics of the BEA's use of PIM should direct their criticisms at depreciation rather than revaluation. In contrast to depreciation which lowers the stock, revaluation tends to increase the stock. Had revaluation been the primary cause of the discrepancies, the conventional estimate would be higher than the alternative estimate, rather than lower.

Graph 3.



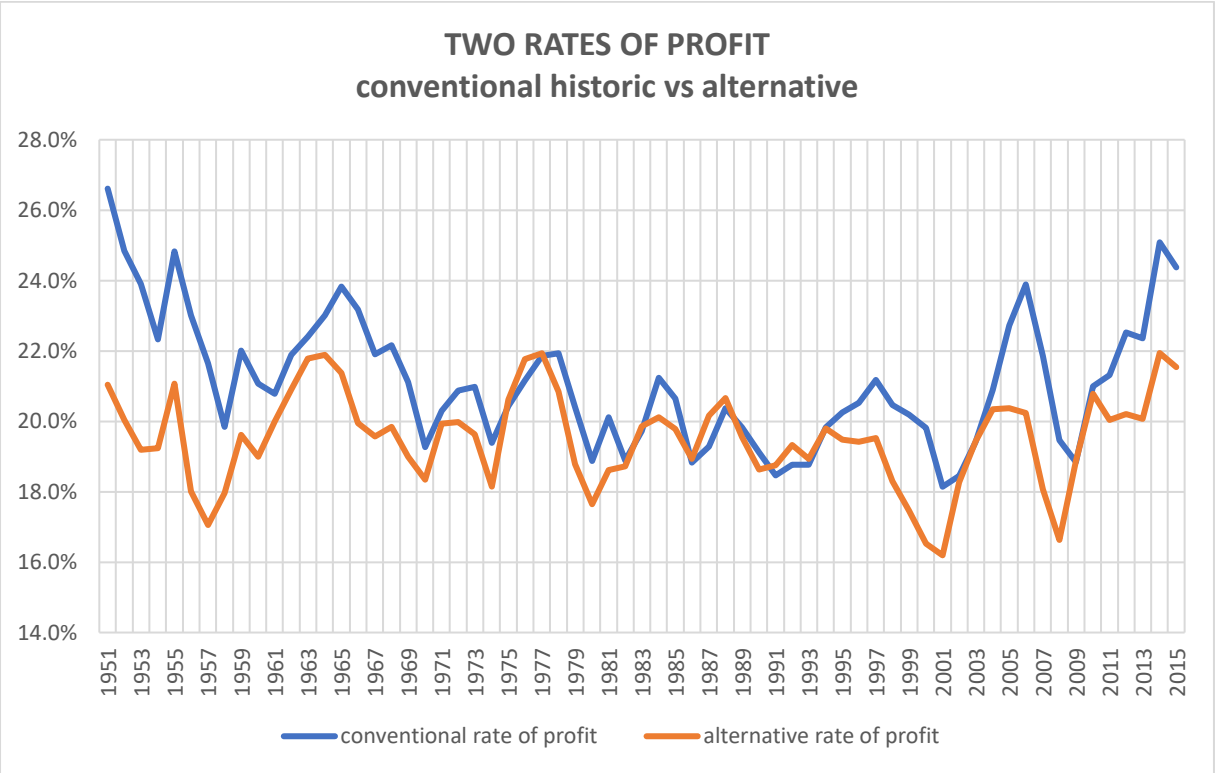
(Sources: BEA Table 4.7 for investment, 4.10 for average age, 4.3 for historical cost of produced assets.)

The divergence in the two valuations from the mid-1990s onwards coincides with the growth in depreciation as found in Graph 1. It is not coincidental. It is this accelerated depreciation which is responsible for the deflation of the conventional estimate of the value of the produced assets. The other major observation is that the alternative measure of the produced assets is livelier. It rises faster during upturns and falls faster during downturns. This is an expected result consistent with the pattern of investment during the life of the business cycle.

Finally, the all-important question is this: what is the effect on the rate of profit using these two valuations? In determining the rate of profit in Graph 4 below, only the stock of fixed capital is different. Inventory is the same as is the undivided surplus which is obtained by deducting adjusted compensation (the top 1% is moved to the surplus side) from net value added (Table 1.13). Finally, the

adjusted compensation is reduced to variable capital using the turnover formula which means the same variable capital is applied to both series.

Graph 4.



(Additional Sources: Inventories BEA Tables 5.8.5A&B, Adjustment to compensation: Saez-Zucman 2014 Appendix Data, Table B28 up to 2012. Thereafter *Office of the Chief Actuary,* Annual Wage Statistics issued 17 May 2017.)

On balance, the rate of profit as measured by the alternative valuation of fixed capital is lower than the conventionally measured rate. Only in 1977 and 1989 do the peaks in profitability coincide. From the 1970 mini- recession to the mid-1990s, there is a stronger correlation between the two rates than at other times due to average ages being at their lowest. During the 1980s the average age of around 6.5 years was only 55% that of the 1950s or only 75% that of the 2010s.

The alternative series also indicates that the 1990s was less profitable that hitherto thought. Average age of assets began to increase and much of the new investment went into the service sector. It is also the period immediately prior to globalisation kicking in together with the emergence of the "knowledge based" industries that came to dominate the corporate sector.

The restructuring of the corporate sector thereafter results in a surge in profitability as the benefits of the new technologies and globalisation stream in. To this must be added the emergence of the new high-tech monopolies which secure the commanding heights of the international value chain. There are two more observations worth noting. The first is that the alternative rate of profit tends to fall earlier than does the conventional rate. This is important to connect falling profitability and investment. Secondly, that in this century, the conventional rate of profit has become more volatile when measured from trough to peak. This is primarily due to the peaks being higher. The conventional measure overstates the peaks more than it understates the troughs.

The intention of this paper is not to suggest that the alternative method for producing the rate of profit is more accurate. Rather it is to test the accuracy of the conventional method and to establish the effect of over-depreciation. It is instructive to contrast the cumulative total stock of capital between the two measures. The alternative measure values the aggregate stock of capital over these 64 years at $259.6 trillion compared to Table 4.3's total of $235 trillion, a difference of only 9.5%. If we adjust the alternative measure so that depreciation is based on the current year, not the mid-point year, that difference is reduced to a mere 7%. Therefore, discounting hurricanes and other natural calamities, the suggested underestimation of the capital stock by the BEA over time lies in the range 7% to 9.5%. Much of this discrepancy has emerged in the last twenty years due to the treatment of depreciation. From this two facts emerge. Overall confidence in the BEA's estimation of the value of the produced assets (Table 4.1 and Table 4.3) should be higher than its critics allow. Secondly, that while true overall, in the last twenty years they have become less reliable.

Depreciation is of course a double-edged sword. If it is overstated then not only does it reduce the value of capital over which profits are measured, but it reduces the profits themselves. If the selling price of a commodity is c + v + s = p and c is overstated (because of inflated wear and tear) then it is s that is reduced by c. Therefore, while deflated assets raises the rate of profit, deflated enterprise profits reduces the rate of profit.

Accordingly, it is one sided to concentrate on how depreciation deflates capital without considering how it deflates profits as well. Here another consideration presents itself. Before R&D and in-house software was capitalised they were treated as a cost. Hence part of the new-found depreciation would have been formerly a cost which would have reduced profits in the same manner as depreciation does. Therefore, the effect of inflated depreciation on capital and profits is asymmetrical. As a result, the real rate of profit is likely to reside between the two measures. The use of Tables 4.3 or 4.1 provides an acceptable estimate of the rate of profit and its trend, provided variable capital is estimated correctly and the surplus adjusted for the top +1% of wage earners.

The link between the rate of investment and the rate of profit.

These comments are confined to the business cycle and not the international restructuring of capital. It has a shorter perspective. Most Marxian theoreticians have sought to link profit to investment via its effect on fixed capital investment. This is most unsatisfactory. Fixed capital investment is sticky. The gestation period for large fixed investment covers the years from the time the board approves the venture, to when contracts are signed, building works commence and the new plant is commissioned. These investments tend to lag on the one side when profits fall and to lag on the other side, when profits rise.

The correct connection between profits and investments lies in the sphere of circulating capital. Circulating capital is directly responsive to changes in profitability and business conditions. The reason it has been ignored, is that hitherto, no reliable formula has been found to measure the circuit of capital and its duration. As a result, the expansion and contraction of the cycle of capital could not be seen and what cannot be seen tends to be ignored.

The capitalists are however aware of this rhythm which they superficially describe as the inventory cycle. Any insensitivity to this rhythm risks insolvency. "*Alan Blinder, a former Governor of the Federal Reserve System, famously remarked that 'the business cycle, to a surprisingly large degree, is an inventory cycle'."* During upturns, the sales to inventory ratio increases and during downturns it falls. In the upturn, the fall in inventories provokes increased fixed investment to increase production and

in the downturn, when inventories build up, production contracts to reduce this build-up. Hence a recession as seen by our Mr Blinder, is a period when an "inventory correction" takes place.

Of course, this simplistic model does not account for the interaction of sales and inventories. It does not explain why today's inventories suddenly become bloated, when yesterday they were ideal. It is an investigation purely of the superficial. However, it does open the door to a more fundamental analysis, and that is the analysis of the circuit of capital itself. Marx defined this circuit thus:

$$M.C\ldots P\ldots C^{+}M^{+}$$

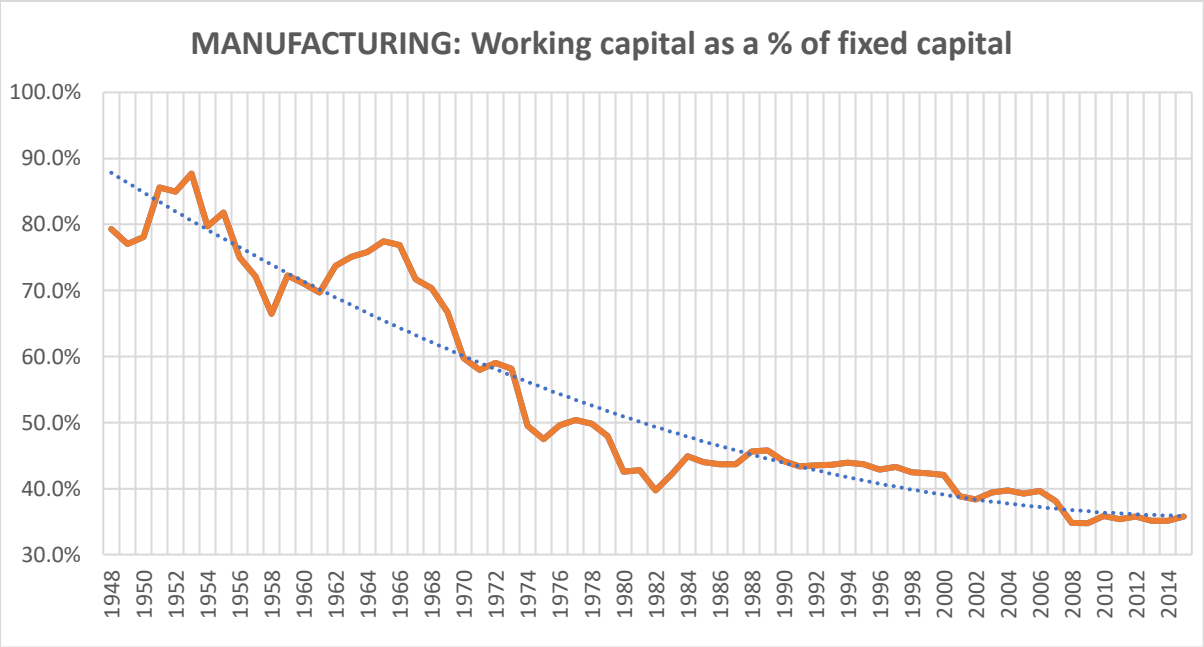
It is a double-sided relation marked on the one side by the purchase of the factors of production and on the other by the sale of the resulting commodities. The circuit is defined from the moment money goes out to the moment money comes back in its + form. This cycle is measured by its duration - days. Let us say for argument sake it is 50 days. To ensure they remain solvent, a capitalist must have sufficient working capital for at least 50 days. This includes sufficient variable capital to pay wages and fund inventories. At the end of the 50 days, when paid, new and additional money returns allowing the capitalist to realise his or her profit and to fund the next cycle of production.

But what happens, when for undisclosed reasons, the circuit slows down, so that it now takes 60 days rather than 50 days to sell and be paid. Everything else being equal, the working capital needs to increase, because 50 day's capital will no longer cover 60 days. Unless workers are fired, 20% more wages must be paid. On the other side, the same amount of profit which took 50 days to realise now takes 60 days. This leads to a fall in the all-important annual rate of profit. It falls because there are fewer profit producing circuits per annum. When it was 50 days it allowed for 7.3 circuits each year but when that rose to 60 days, the cycles reduced to only 6.1 cycles. In the former case, the same amount of profit was produced on 7.3 occasions but when the cycle expanded to 60 days there were only 6.1 opportunities to produce this profit.

In addition, the issue of credit becomes crucial as turnovers slow down. If this slow-down is generalised, it is likely to affect both producer and customer (buyer) simultaneously. Under these conditions, buyers tend to demand an extension to the credit given to them to compensate for the extra time the commodities stay on their hands. Thus, the producer must find extra capital to provide more credit to the buyer. Finally, the producer must also find more capital to fund the extra inventory being held because of the slowdown in sales. The capitalist therefore experiences the extension in the time of circulation as the requirement for more capital measured against less profit. There is thus immediate pressure on them to reduce wages and cut back on production to remain solvent.

The two graphs below examine shows that working capital oscillates more than fixed capital. Graph 5 plots the long-term fall in the weight of working capital compared to fixed capital. This is another expression of the rise in the technical composition of capital. For the first time, the turnover formula allows us to reduce Gross Output to working capital. Here we examine the manufacturing industry because its data is the most accurate. In 2015 gross output (total sales) amounted to $5940.3 billion and turnovers amounted to 4.48 circuits per annum (Note 1.). This produced an estimate for working capital of £1326 billion. This was 80% more than the amount for inventory on its own. Graph 5 uses working capital derived in this manner and then divides it by the current cost net stock of fixed assets in manufacturing.

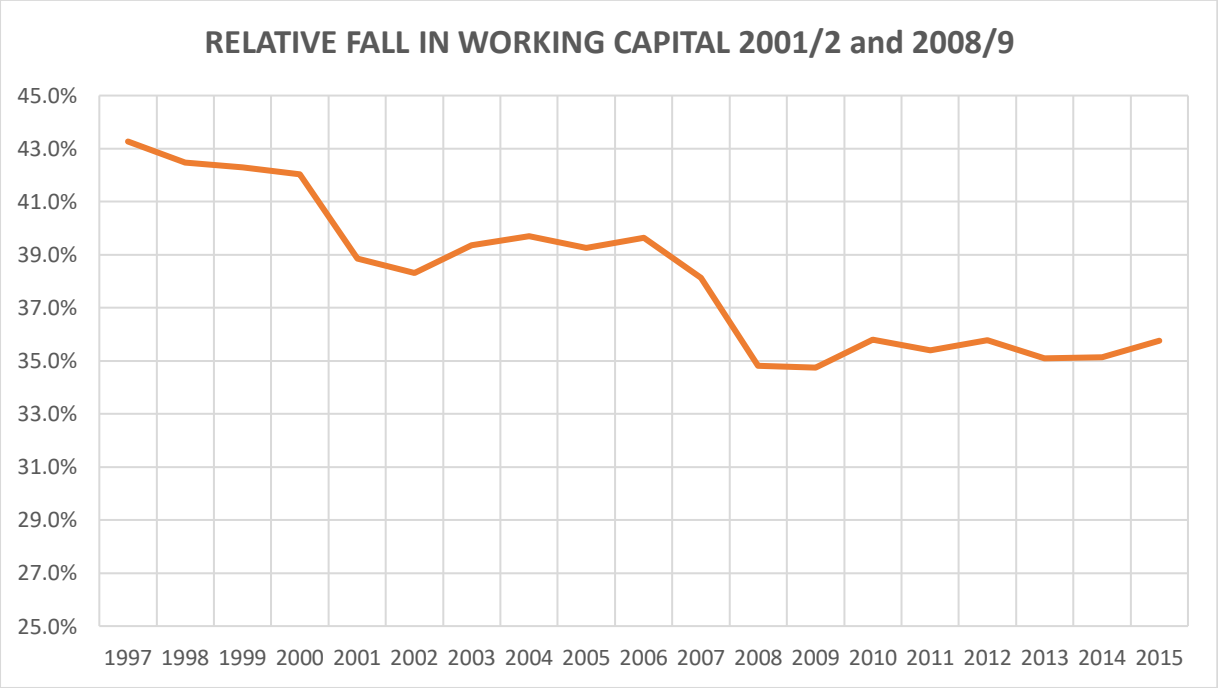
Graph 5.



(Sources: Table 3.1 ESI for stock of fixed capital. GDP by Industry, Gross Output and Value added for working capital.)

Working capital has fallen sharply from over 70% to under 40% over 64 years. This represents the long-term trend. What graph 6 shows is the cyclical trend. It shows that working capital responds more cyclically than does fixed capital.

Graph 6.



This is an expanded portion of the graph found in Graph 5. It shows the sharp falls in working capital during the 2000 recession and the 2008 recession. This is an anticipated result. An inventory correction, a reduction in the work force and a contraction in production always takes place under

these circumstances aimed at conserving working capital. This confirms the hypothesis that a crisis of profitability first affects working capital before it does fixed capital.

Of course, there is no internal reason why turnovers should slow. As Graph 5 shows, turnovers speed up and the amount of working capital is reduced relatively because of an improvement in the technical conditions of production. One of the reasons why working capital fell from its high point in the 1950s was the amount of inventory held prior to the adoption of "just in time" inventory management.

But why should this working capital, which tends to speed up over time, suddenly slow down in a generalised manner from time to time. The answer lies elsewhere and is given by the evidence in Graph 5. It is the growth in fixed investment. Working capital does not have a life of its own. It is the fixed investment in machinery, computers, trucks etc. that enables the production and circulation process to not only expand but to shorten. The all-important total capital over which profits are measured is the sum of this fixed and working capital.

Graph 5 shows an additional feature which is predicted once again. It is not only fixed capital that expands during the upturn. Coming out of the recession, working capital increases more quickly than does fixed capital as it responds to the new market conditions. That is why working capital's share increases from 2002 onwards. Each of its future pre-recessionary peaks is higher than the trough of the previous recession showing that during a given cycle it expands relatively faster than does fixed capital.

So, both fixed capital and working capital add to the amount of capital over which profits are to be measured. At some point the growth in the total capital exceeds the growth in the mass of profits. When that occurs, there is a relative fall in the rate of profit. This discourages investment in those parts of the economy worst affected. The reduction in investment is experienced as a fall in demand by the rest of the economy. Turnover times which were shrinking now start elongating and credit becomes stretched. This elongation in turnover times now leads to a fall in the mass of profits because profits take longer to be realised. At this point, there is an absolute fall in the rate of profit and with it the probability of a generalised contraction in production ("an inventory correction").

In many ways, working capital is the missing link between falling profitability and investment. At the onset of any recession working capital spikes upwards as the rate of turnover falls. Capitalists have no option but to reduce production in order to reduce inventories that have built up unexpectedly. If today's contractions are more gradual, this is due to better management of inventories and the supply chain. Nevertheless, even gradual reductions in inventories or pre-emptive measures impact production, though less convulsively than in the past.

(Note 1.) Manufacturing turnovers have been reduced artificially by the treatment of I.P. in the national accounts. Removing the computer sector (where I.P. is highest) results in turnovers now rising to over 5 per annum. Under these circumstances working capital exceeds inventory capital by less than 60%.