AN INTRODUCTION TO THE TURNOVER FORMULA.

This updates an article which appeared many years ago when I first established and described the turnover formula based on the relationship between duplicated and actual value.

The Bureau of Economic Analysis, hereafter referred to as the BEA is the US statistical bureau. In preparing the National Accounts, the BEA prepares two series - Gross Output (GO) and Gross Value Added (GVA) with the former series tending to be neglected by Marxist researchers. Gross Output is the estimate of the $ price of total sales in a given period which is a mixture of Intermediate Sales (IS) and Final Sales (GVA). Final Sales are defined as those sales which result in a product being consumed rather than being worked up or passed on. For example, if water is drunk from a bottle, it is a final product, if bottled water is used to prepare a drink in a pub, it is an intermediate product. Before being finally consumed, an emerging use-value may change hands many times as it is worked-up by this or that private company. This is the nature of disconnected private production.

GVA is the category of Final Sales. In terms of the chain of production it is a single sale, the end sale. On the other hand, GO represents many sales including the Final Sale. The question arises, if GO is based on many sales, is its embodied value greater than the value found in the Final Sale? This would be the case if it was sales which produced value. But unlike the likes of Heinrich we know that value is produced only in production. This means that as the product is worked up within the chain of private production, its value increases incrementally. It was Marx's great discovery in Volume 2, that these additions of value turned out to be equal to the value of the Final Sale, but not total sales. And it was this revelation which forms the cornerstone of the SNA (System of national Accounts) today. To explain this, I have included a table at the bottom of this page.

The difference between the GVA and GO figure is elegantly explained by the BEA in one of its pamphlets, obtainable on the web and entitled *Measuring the Economy: A Primer on GDP and the National Income and Product Accounts* (2014: 3/4). We will use its examples to explain the problem and the solution. A farmer grows wheat, the first intermediate sale, then sells it to a miller to convert into flour, the second intermediate sale, who then sells it to the baker who produces and sells the final use-value, bread which is then bought and eaten with not a crumb left behind.

Assuming for the sake of simplicity that all three producers add £10 of value to their product; then the farmer sells the wheat to the miller for £10. The miller sells the flour to the baker for £20 made up of £10 value added and £10 for the cost of the wheat. The baker finally sells the bread for £30, £10 value added and £20 for the cost of the flour. The Final Sale of £30 is equal to the £10 of value added in turn by the farmer, the miller, and the baker or 3 x 10 yielding the GVA value (ignoring wear and tear). On the other hand, GO or the price of total sales come to £60 or double the value added by the three producers (clearly the issue of duplicated value has arisen). The farmer sells the wheat for £10; the miller sells the flour for £20 (the miller's £10 plus the farmer's £10); and the baker sells the bread for £30. Gross Output is twice as large, equal to Intermediate Sales plus the Final Sale, or 30 plus 30. What has emerged is 30 of actual value and 30 of duplicated value making up the 60 in GO.

Table 1.

Sale number	Value added	Intermediate Sales	Total sale value	Nature of the sale
1 wheat	10	0	10	intermediate
2 flour	10	10	10 + 10 = 20	intermediate
3 bread	10	20	10 + 20 = 30	final
TOTALS	**10+10+10 = 30 = GVA**	**30**	**10+20+30 = 60 = GO**	

Thus, we can see that GO is double the size of GVA due to Intermediate Sales adding up to 30. We may reinterpret the value of intermediate sales as being equal to the duplicated value when using total sales to determine value. (Yellow highlighted in the table above.) It was this dynamic but defined relationship between Intermediate Sales, Final Sales, and total sales which was first described by Marx (although he used different terminology to categorize these sales). Thus, GVA is equal to the value produced by workers in a given period, normally a calendar year. When adjusted for inventories it provides the product side or GDP. And when this value is converted into revenue, it forms the income side comprising annual worker compensation and gross profits. Two classes, two forms of revenue.

It is now time to turn to the formula. What we are trying to solve with the turnover formula is the number of sales which links GVA to GO. These sales initiate the circuit of capital and end it. Sales mark the alpha and omega of turnover. We follow Marx in defining the dominant circuit of capital as the one which begins and ends with money, hence:

M.C. ..P…C^{+}.M^{+}. (where **M** = money, **C** = commodities, and **P** equals production.)

Thus, the circuit begins with a purchase - money is spent on purchasing the factors of production (inputs and labour power) in their commodity form - and it ends with money being received from the resulting sale of the newly produced commodities. So, sales on either end. While it appears to be two sales with the former taking the form of a purchase, we need to remember that at the grand scale, one capitalist's purchase is always another capitalist's sale when viewed from within the spheres of production and commerce. Put another way, one capitalist's output is another capitalist's input. Accordingly, we are describing a single sale when viewing sales in the aggregate.

In our example we are aware of the number of sales, but when later we turn to the national statistics, the number of sales is not provided. They may be known to the statisticians, but they are not made public. All we are given are the combined prices of; (a) GO, (b) GVA, and (c) Intermediate Sales. However, all is not lost as we know there can only be a finite number of sales that can reconcile GVA with GO. We may correctly assume that when GO is bigger than GVA, there has been at least two sales otherwise GO cannot be bigger. And further, we may correctly assume that the larger GO is comparatively, the more sales will have occurred.

In our example above the range is likely to be at least 2 but no more than 3. It would still be possible to have only 2 sales or turnovers instead of 3 while yielding 30 in GVA. But what would happen to GO in this case? For example, the miller could buy out the farmer or vice versa so that 3 sales reduce to 2. The answer lies below.

Table 2.

Sale number	Value added	Intermediate Sales	Total sale value	Nature of the sale
1 farming/milling	10 +10	0	20	intermediate
2 bread baking	10	20	10 + 20 = 30	final
TOTALS	**10+10+10 = 30 = GVA**	**20**	**20+30 = 50 = GO**	

As a result of the fall in the 'value' of Intermediate Sales from 30 to 20 due to fewer sales, Gross Output falls from 60 to 50 confirming that the gap between the two is influenced by the number of sales. It also confirms the essential component of the formula, namely that fewer sales mean less duplication which closes the gap between GO and GVA. The number of sales however does not affect the amount of labour expended which remains at 30. This buyout must be considered an unusual case. The more usual case could occur when value is added in unequal amounts rather than in equal amounts of 10.

This effect can be seen in Note 1 at the end. The regular case is best explained if we increase the number of sales to 4 by adding in a sandwich maker. In this case the baker sells bread to the sandwich maker who uses it to make sandwiches and who also happens to add 10 in value. This 10 added by the labour of the sandwich maker brings the value added up to 40 (4 x 10) and total sales or GO up to 100.

Table 3.

SALES	GVA	+ I.S.	= GO	
1	10	0	10	
2	10	10	20	
3	10	20	30	
4	10	30	40	
TOTAL	**40**	**60**	**100**	

I have chosen 4 sales because annualised turnovers in the major economies within their non-financial non-household sector tends to range between 4 to 5.

Uncovering the turnover formula.

We are now in a position to solve for the turnover formula. When I set out to uncover the formula inspired by the knowledge that Marx's method led to the SNA, I thought it was simply GO divided by GVA (ahh, if life was only so simple). But this would be wrong because 100GO/40GVA yields only 2.5 not 4 sales.

It took me 3 days and the willing sacrifice of dozens of sticky notes to finally arrive at the correct formula**:**

$$\frac{GO}{GVA} + \frac{(GO - GVA)}{GVA}$$

It turned out to be a two-part formula. The secret lay in the second element of the formula; the contribution made by the Final Sale. The more I thought about it the more I realised why it had taken nearly 70 years for the formula to emerge. The Final Sale is quite peculiar. Not only can it add to the total value, but it simultaneously incorporates the value added to it from the earlier stages of production. But there the formula lay, and it worked, as we can see below.

Table 4.

Example	GO/GVA	+ (GO-GVA)/GVA	= TOTAL TURNOVERS
1	100/40 =**2.5**	(100-40)/40 = **1.5**	2.5 + 1.5 = **4**

The question is, what happens in reality; are the contributions equal or unequal as in our case of 10? Remember we are dealing with large industries or sectors. In the case of the United States, sectorial output is often measured in tens of billions of Dollars implying millions of individual sales. And we know statistically, that the bigger the set of transactions, the more they tend to average out. Therefore, assuming each contribution to be roughly equal is just as valid as assuming they are not. (See Note 1 at end for the effect of disproportionate additions which deviate from 10.)

But in the end, this does not really matter. What we are primarily concerned with is the aggregate amount of the Intermediate Sales together with the aggregate amount of the Final Sale for that industry or sector. We are not that interested in the *composition* of the Intermediate Sales. Together these two classes of sales not only yield the Gross Output needed to complete the formula, but their proportions make up the structure of the sector. This is our ultimate objective. Each industry structure

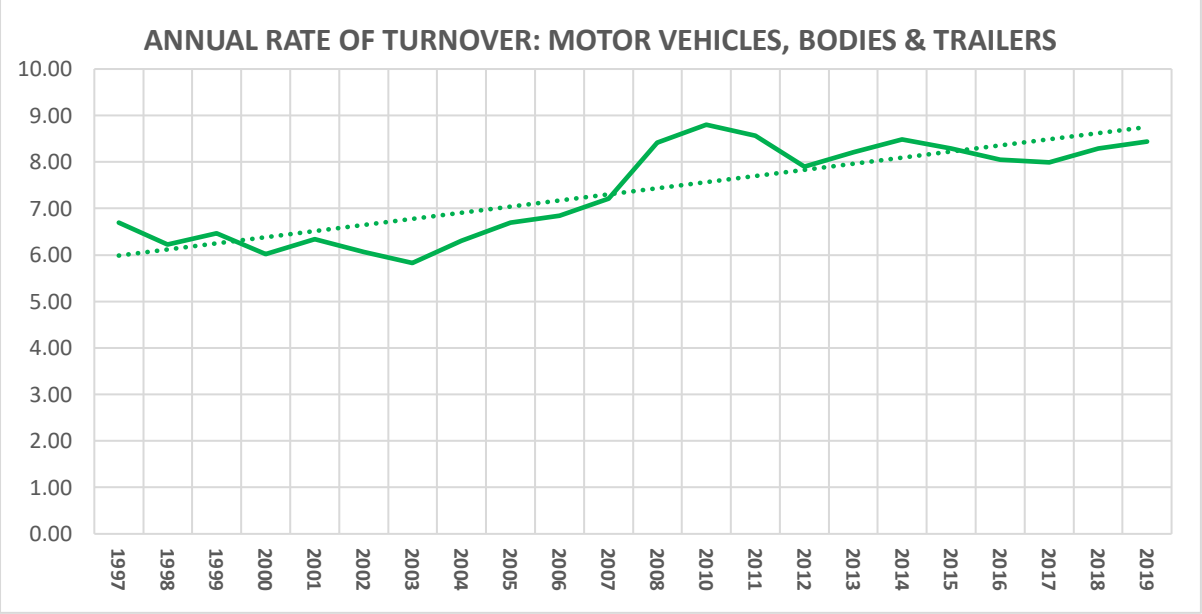
is defined by the specific relationship between the Intermediate Sales and the Final Sales found therein, providing the specific rate of turnover which distinguishes it.

To prove this point, there can be no better example than the auto industry populated by the likes of G.M., Ford and Toyota. Over the years each has boasted about how they have managed to reduce the time taken to produce a car. What took weeks now takes days. How have they achieved this miracle? Is this the result of the rise in labour productivity brought about by harnessing the power of tens of thousands of industrial robots? Well, that is part of the story. The other part, and probably the bigger part, is that they no longer *produce* cars. Instead, they *assemble* cars.

In the past the bulk of the cars would have been produced in-house. For example Ford's used to have its own steel mill and tyre factory. Nowadays most of what was produced in-house, with the exception of the engine block and car shell, is bought in from component manufacturers around the world using just-in-time purchasing techniques. In other words, most cars now share many common components. (This merely expresses the increased socialisation of production.) The result is that the number of Intermediate Sales (inputs) has increased while the reduction in the share of production by the auto companies themselves has meant they have added less value to the Final Sale.

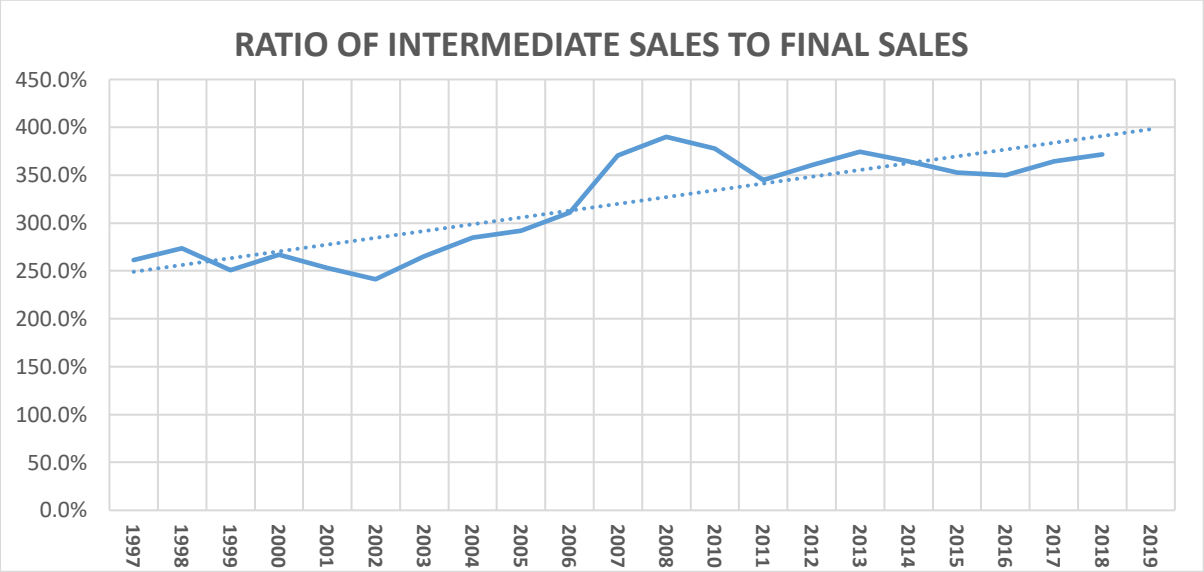
Accordingly, there is now an extended chain of production, involving many more private producers, therefore many more sales. This means each producer is spending less time on production because it is now more fragmented. As a result, the turnover rate of capital in that industry must have increased.

Graph 1.



And it has, by nearly 40%, up from a range of 6 turnovers p.a. in the late 1990s and early 2000s to over 8 today. Or in terms of days, the turnover period which was 60 days has now reduced to 45 days, a saving of over two weeks (365/6 & 365/8). This is the result of the restructuring of this industry captured by the turnover formula. More production is taking place in the component chain, less in the motor vehicle plants themselves, more value is being added in aggregate by the intermediate chain, less value by the final producer. This changing structure can be seen in the graph below which shows the relative rise in Intermediate Sales or inputs relative to the total value added by the industry.

Graph 2.



Measuring circulating capital.

And it follows that if the motor vehicle corporations are producing a smaller share of the car, then clearly the amount of circulating capital in the sector will be diminished. For example, wages, the biggest component of working capital will reduce as the turnover period reduces from 85 days down to 60 days. In this case the corporations will only be issuing two monthly pay cheques instead of nearly three before their sales revenue replenishes their wages fund. They will not need to keep a wage fund equal to 365 days on hand, which would mean 305 days of wages lying idle not earning them anything. Corporate cost accountants, unlike many Marxists I know, are aware of cash flow. They are tasked with minimising cash flow, which means they know how much they need in reserve to meet their costs until new cash flows in from expected sales. There is no need to wait for Father Xmas at year end.

The next question is how to measure the amount of circulating capital. Once again, the system of National accounts allows for this. Here the preferred formula is:

Annual Gross Output less annual Net Surplus = Cost of annual Gross Output ÷ turnover = circulating capital

The net surplus is arrived at by deducting annual Compensation from annual Net Value Added which excludes depreciation. Of course, the other way of measuring circulating capital could be:

Annual Intermediate Sales plus annual compensation divided by turnover.

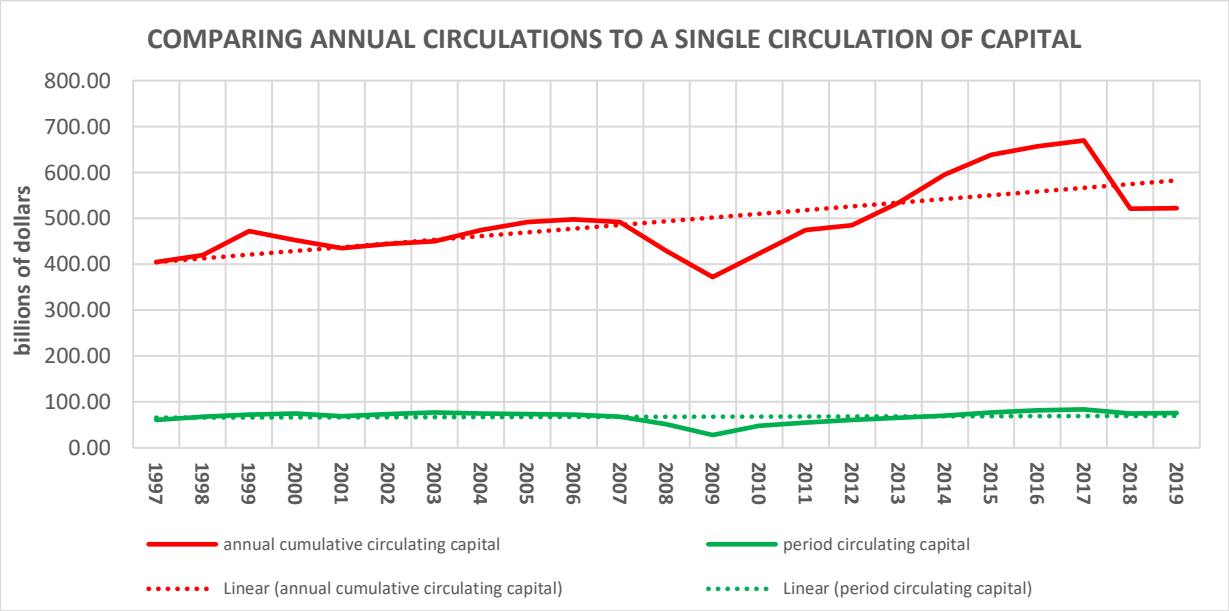
Once the second formula is adjusted for production taxes, it yields the same figure as the first formula. To prove this I have crunched the numbers which can be found here. The results must match because annual inputs plus annual net surplus plus annual compensation must equal Gross Output.

Having factored for circulating capital we can now compare the movement of actual circulating capital to the annual figure for the motor vehicle sector. The difference is remarkable as can be seen in the graph below. Both graphs are denominated in current dollars, and both graphs are accompanied by trend lines. Thus, despite inflation the actual circulating capital has not increased in 22 years. This is entirely due to the acceleration in turnovers which have offset wage increases. On the other hand, the annual circulating capital based on a fixed 365/6 day has risen by almost 50%.

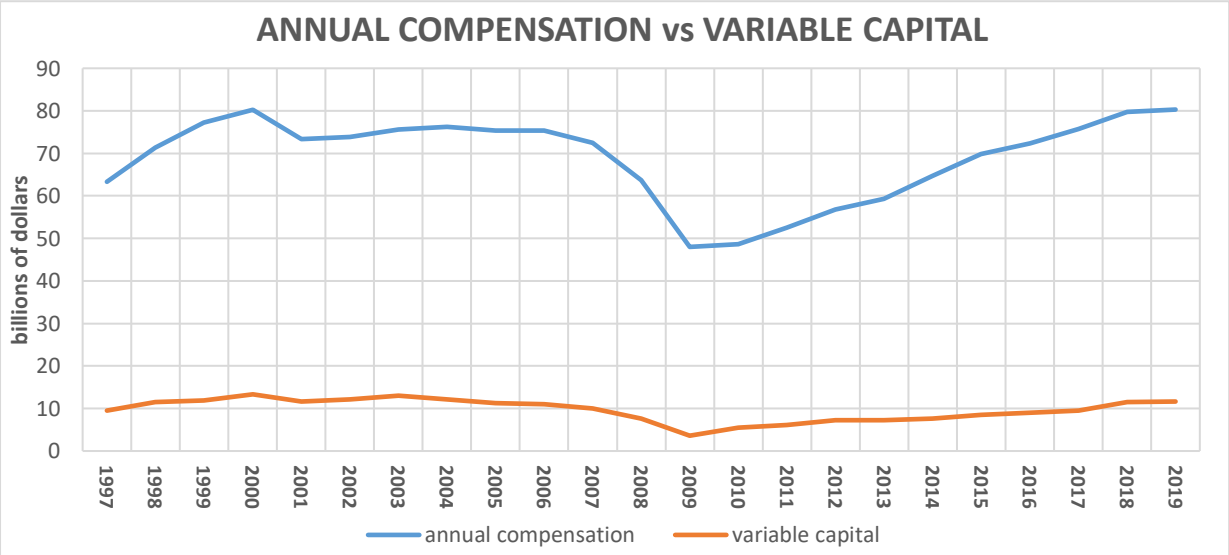
Once more the point is made; it is impermissible to use the annual figure for circulating capital as this implies a single circuit rather than multiple circuits, nor is it permissible to substitute annual

compensation for variable capital as Graph 4 shows. The importance for this is confirmed by the three key formulas; composition of capital or c/v; rate of surplus value or s/v, and the rate of profit or s/(c+v). We note that v is found in every denominator. Were we to use annual compensation instead of v (variable capital), all the results will be wrong because the denominators would be overlarge due to annual compensation being at least 4 times bigger than variable capital.

Graph 3.



Graph 4.



Testing the turnover formula.

The formula is only as good as the data on which it is based. As long as value is not duplicated in the System of National Accounts and as long as intermediate and Final Sales are not juxtaposed the data is reliable. Unfortunately, these failures of accounting are common in the broader economy. I find the largest sector of the economy which has reliable data to be the non-financial corporate sector or in the case of China, its Industrial Sector. However, even within the SNA sector the 2012 revisions to the SNA which converted Research & Development as well as in-house software from a cost into capital

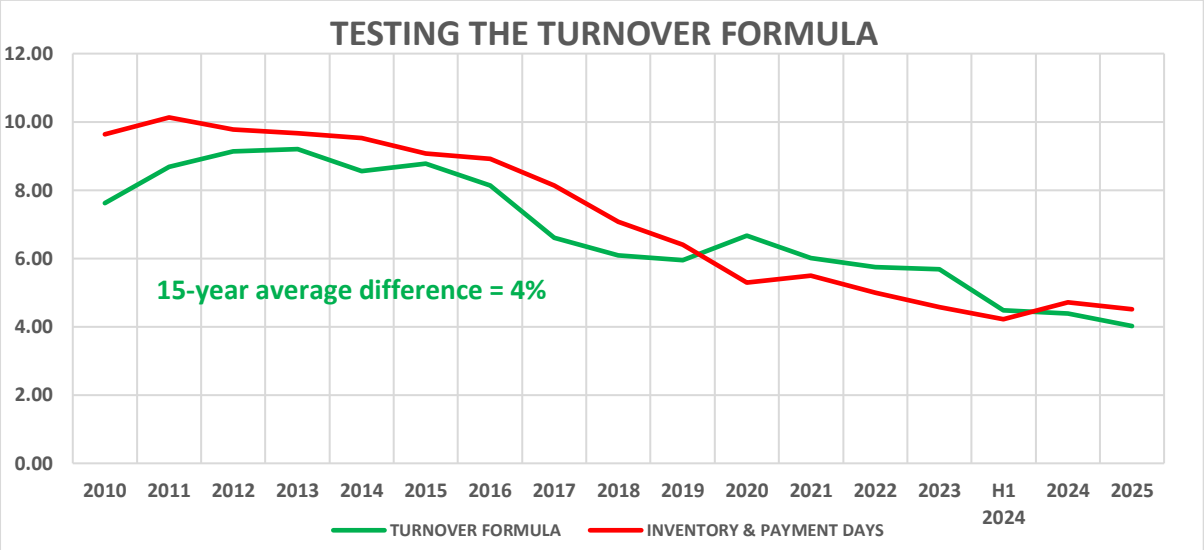
by means of an imputed (fictitious) sale has caused turnovers to slow down. For more follow this link: http://theplanningmotive.com/2015/12/16/duplicated-value-and-its-effect-on-the-turnover-formula/

When I originally uncovered the formula, I tested it against empirical evidence. I used a pay to view site which analysed the top 100 corporations on Wall Street and which inter-alia provided working capital and its annual turnover. The results corroborated the turnover formula. Then I turned to China. Because of its 'Marxist' heritage it is more focused on turnover. The metric I use most times is the days of final inventory plus the days of payment. Marx in Volume 2 (Chapter 12 -14) discusses at length the difference between the production period and the subsequent circulation period and how they interact. (The circulation period should not be confused with the circuit of capital which also includes the production period.)

We may define the circulation period as the time taken to move the commodity from the point of production to the point of sale plus the time taken for the buyer to pay up. Each month the National Bureau of Statistics of China publishes a report on inventory and payment periods, the former a proxy for the production period and the latter a proxy for the circulation period. When added together and divided by 365 days they provide a useful estimate of turnover.

How does this stack up against the turnover formula. Quite well in fact as the graph below shows. Over the 13-year period the average deviation is 3% but annually it is more like 10%. Setting this aside, the primary question is whether the trends tend to follow each other. They do. Both reveal when turnovers are accelerating and when they are decelerating. The only time they deviated was in 2020 when the pandemic first hit, and when lockdowns disrupted production and circulation.

Graph 5.



(Source: Chinese Statistical Year Book Tables 3.6 and 13.3 for GO & GVA – green graph)

There is another important change. Since the pandemic the graphs have become inverted. The reason for this is that the payment period has grown significantly, always a bad sign of the financial health of the Chinese economy. For example, in the link above, the report shows that the collection period has grown to 63 days compared to the production period of 20 days. This adds up to 83 days for capital to complete its circuit equal to an annual rate of turnover of 4.4. Were the collection period to revert back to the more usual 37 days, then the circulation of capital would be 57 days, and the rate of turnover would accelerate to 6.4.

As long as this crisis of payment endures, the graphs will be inverted. However, should market conditions improve due to an improvement in demand and liquidity, then the graphs will revert once more to their traditional pattern, and as such, this could be the prelude to turnovers accelerating once more.

Which brings us to the important issue of what limits circulation times. Clearly, the limiting factor is the production period. The circuit of capital, with very few exceptions, cannot be faster than the production period, because in this case there would be nothing to sell, and when there is nothing to sell, cash cannot be obtained. That said, many Marxists, actually too many Marxists, confuse the production period with the circuit of capital itself. After all, a burger bar may take just five minutes to grill a burger, hand it over and be paid. Therefore, the turnover rate of burgers should be in the thousands per annum. But this ignores the other costs that accompany grilling, such as the inventory of burgers and boxes, payment for gas and electricity, rent, wages and so on all of which add to circulating capital and in doing so necessarily reduces the rate of turnover in burger bars.

But there is a bigger mistake when confusing the production period with the entire circuit and that is how the circulating period itself can limit production. Here we are not considering technical implications but market conditions. If production continues at the same rhythm but the pace of payments slows down, then capitalists continue to pay out the same amount of capital for the factors of production, aka inputs and labour power, but they must wait longer for money to come back in to compensate them. Accordingly, those capitalists must increase their working capital to compensate for the absent cash if they wish to remain solvent. This same observation is found in Volume 2. The greater the gap which emerges between the production period and the circulation period, the greater the financial strain on the company.

Or to put it a different way; less profit in but more capital out, therefore a reduced rate of profit when measured over time. In the end this will impact production itself as the capitalist is forced to reduce production in order to conserve capital. Thus, the overall turnover period and the production period are joined by the same dance. That is why the graph above works. In the end, a lengthening of the payment period will reduce sales and sales will reduce the turnover of capital.

Conclusion.

For more data and graphs please follow this link: http://theplanningmotive.com/2019/05/25/a-brief-explanation-of-the-turnover-formula/ One of my favourite graphs in this linked article is Graph 4 which proves that only the rate of surplus value predicts the course of gross profits, because it, unlike the rate or degree of exploitation, includes turnover which regulates the realisation of profits.

The period of circulation has nothing to do with the calendar year. Each industry has a unique turnover rate, some faster some slower. The only reason statisticians use a calendar year to calculate capital and renumeration is to provide an equal time standard by which to compare unequal industries. One industry may produce its annual profit in more rapid bursts than the other due to its faster turnover, but in the end they both produce x amount of profit each year. By being knowledgeable about how much profit differing industries and companies produce at the same time - a year - each capitalist is able to judge how worthwhile their investment is and whether it is in the right place.

But we are not investors seeking to measure our share portfolio. We are Marxists seeking to measure the economy itself and its inner workings precisely, recognising that only turnover provides that precision. We seek to use a scalpel not an axe to dissect capitalism, because an axe reveals far less. That means we must use turnover, for without it too much is lost. We end up with out-of-focus results which makes our analysis less precise and less predictable.

So why avoid using turnover? Is the reason subjective, is it because of ingrained habits of long duration, and as we know, bad habits are the most difficult to break. We expect this from economists and professors seeking to protect jobs and reputations, but not from Marxist scholars who owe fidelity only to the class and to history. It's time to change.

Note 1. Introducing disproportion. In the table below variable amounts of value are added in each step rather than a constant 10 per producer. It alters the rate of turnover but by less than 10%. In the end what is important is the total intermediate sales not the contributions to it because it is the ratio of intermediate sales in total compared to final sales that establishes the structure of the industry being examined.

SALES	GVA	+ I.S.	= GO	GVA	+ I.S.	= GO	GVA	+ I.S.	= GO
1	10	0	10	8	0	8	13	0	13
2	10	10	20	9	9	17	9	13	22
3	10	20	30	13	17	30	8	22	30
4	10	30	40	10	40	40	10	30	40
TOTAL	40	60	100	40	66	106	40	65	105
Turnover			4.0			4.3			4.3

Brian Green, 6th January 2023.