INFLATION, MONEY AND THE TEMPORAL SINGLE SYSTEM.

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Introduction.

To many economists, not to mention all Central Bankers, inflation is public enemy number one. My paper seeks to understand why inflation should be so despised. To escape from simultaneous restrictions I use a Temporal Single System (TSS) approach. Firstly I consider Alan Freeman's, see Freeman (1998), simple illustration of the TSS approach. In order to focus on distributional issues I build in a positive wage. Price changes seem to only imperfectly hide/counteract changes to the underlying hours rate of labour exploitation**.** Next I add money as a stock of past value. I assume money is held by rentiers, who lend to productive capitalists. Once we allow for the 'real' existence of money appropriate price increases not only hide the effect of reduced exploitation, they can actually transfer the cost of reduced exploitation from productive capitalists to rentiers. Finally I conclude.

Alan Freeman's Simple System.

The key feature of the TSS approach is a simple recognition of time. Capitalists must assemble their inputs, produce and then sell their output, the process takes time. We need to view Capitalism as a continual process of circuits of money capital, productive capital and commodity capital, see Desai (1979) chapter five.

M - C ...P...C' - M'

The above temporal relationship can best be represented by a difference equation in time rather than by a simultaneous equation. Freeman (1998) explains how the mainstream Marxist approach, as pioneered by Bortkiewicz (1906-7) and (1907), employs a simultaneous approach. The value of a unit of input must equal the value of an identical unit of output in each period. We must have simultaneous balance/equilibrium. Freeman (1998) explains how such an equilibrium approach, in his opinion, departs from Marx's original scheme and most crucially appears to invalidate Marx's prediction of a falling rate of profit (if capital is accumulated). Let us leave aside this crucial issue, which is beyond the scope of this paper.

The TSS approach recognises that the value of inputs and outputs may change over the production period. In general, assuming maximum extended reproduction, where O^I_1 = period 1 physical inputs, O^O_1 = period 1 physical outputs and v is the hours value of a unit of physical input or output,

$O^I_1 v_0$ + S (surplus hours this period) = $O^O_1 v_1$

As, with a temporal approach, we have a difference equation we need an initial condition, a value for v_0, the initial hours value of a unit of input in period 1, as determined at the end of period 0. For period 1 and 2, assuming $v_0 = 5$, $O^I_1 = 10$, $O^O_1 = 12$, $O^I_2 = 12$, $O^O_2 = 10$ and S

=10 in both periods,

Period 1 $10*5 + 10 = 12v_1$ so $v_1 = 5$
Period 2 $12*5 + 10 = 15v_2$ so $v_2 = 4.67$

Our simple example illustrates how inputs transfer their value, as determined in the previous period, to this periods output. The hours value of a unit of input does not have to equal the hours value of a unit of output.

Table 1 illustrates the simple system presented in Freeman (1998). We have one good and no fixed capital, the value of all inputs entirely transfer into the value of output in each period. Maximum extended reproduction is assumed, each period's final output is entirely applied as input for the next period's production. Capitalist purely invest their profits, consuming nothing. The hours value of a unit of output is calculated in the temporal manner as illustrated above. C represents constant capital, inputs of means of production purchased from other capitalists. S represents surplus labour, all labour is surplus labour, no variable capital V is applied. C' represents end of period output. All end of period output is assumed to be sold at price P and is applied as input in the next period. At the end of each period capitalists realise M' money capital, which they entirely invest in productive capital for the next period (maximum extended reproduction ie maximum growth of the capital stock).

Table 1. The Temporal Value Concept.

Period	*v* end	P	Melt end	C			S			M'	C'		Money profit rate	Hours profit rate	Output profit rate	C/C+L in hours
				£	h	O	£	h	O	£	h	O				
0	5.00	5								50	50	10				
1	5.00	5	1.00	50	50	10	10	10	2	60	60	12	0.20	0.20	0.20	0.83
2	4.67	5	1.07	60	60	12	15	10	3	75	70	15	0.25	0.17	0.25	0.86
3	4.00	5	1.25	75	70	15	25	10	5	100	80	20	0.33	0.14	0.33	0.88
4	3.21	5	1.56	100	80	20	40	10	8	140	90	28	0.40	0.13	0.40	0.89

Our initial conditions are that in period 0, P = 5, v = 5, O = 10, C' = 50 and M' = 50. Output and price are arbitrarily/exogenously entered for each period to complete the system. The organic composition of capital, defined by Freeman (1998) as C/C+L, appropriately rises in hours terms as the hours profit rate falls, unaffected by the assumed process of productivity/ technological improvement our arbitrary choice of output implies. Note we could not use Marx's own definition of the organic composition of capital, C/C+V, as V = 0. Our arbitrary choice of a fixed price ensures that price in pounds soon deviates from value in hours. Initially one hour is simply worth one unit of money, one pound, price in pounds simply equals value in hours. Once price in pounds deviates from value in hours one hour is no longer worth one pound. We need to calculate how the value of a hour of labour has changed. Freeman (1998) explains how we must calculate the Monetary Expression of Labour Time (MELT). MELT is defined as the ratio between the *intrinsic* hours value of commodities and their *Extrinsic* measure in money. It is the purchasing power of money in terms of abstract labour time. Freeman (1998) page 13,

> The MELT is the ratio, at the end of each period, of the price of the stock of capital to the value of the stock of capital. Since in this illustration all capital is consumed in each period, this is the ratio £M$^{/}$ to C$^{/}$; if fixed capital is involved it is the ratio

between the money price and labour-value of this same capital. Note as a consequence, Marx's first equality is necessarily true.

Marx's first equality concerns the preservation of value, total social wealth in terms of labour value (hours) can not change unless use-value is destroyed or created. It is this fundamental law which ensures that value can only be transferred in circulation and not created or lost in circulation. Production and consumption (reproduction) alter social wealth, circulation merely circulates it.

Setting price constant ensures the money profit rate is equal to the output, use-value, profit rate. Freeman (1998) explains how simultaneous theories, such as neo-classical theories, rely on this result in order for money to be identified purely as a veil. Freeman's system by contrast only produces such a result by assuming a 'special-case' price sequence. Any variation in price invalidates the result. Table 2 represents the same system as Table 1 but with variable prices. Note how we must carefully apply the appropriate prices to inputs and outputs. *v* is calculated by C'(h)/C'(O), and MELT is simply given by M'/C'(h). Freeman's approach attributes positive gains (or losses) resulting from in-period price or productivity changes to labour. £S is simply the residual between total output revenue and total input cost. Outside simultaneous equilibrium, where price or productivity may be variable, the different forms of profit rate may also be variable, between periods and each other.

Table 2. Variable Price.

Period	*v* end	P	Melt end	C £	h	O	S £	h	O	M' £	C' h	O	Money profit rate	Hours profit rate	Output profit rate	C/C+L in hours
0	5.00	5								50	50	10				
1	5.00	10	2.00	50	50	10	20	10	2	120	60	12	1.20	0.20	0.20	0.83
2	4.67	20	4.29	120	60	12	180	10	3	300	70	15	1.50	0.17	0.25	0.86
3	4.00	40	10.00	300	70	15	500	10	5	800	80	20	1.67	0.14	0.33	0.88
4	3.21	80	24.89	800	80	20	1440	10	8	2240	90	28	1.80	0.13	0.40	0.89

Changing the numeraire dramatically changes the money profit rate. Price changes are crucial, as Freeman points out just as monetary circuit theory suggests they should be. Freeman concludes that there are as many possible profit rates as price regimes.[1] Given the money profit rate is so variable, and thus likely to deviate from any 'real' measure of profit (most notably in speculative booms) we need to identify a concept of value to bring us to that 'real' underlying profit rate. Freeman (1998) explains how such a concept can only sensibly be labour time, the hours measure of value.

Building Wages Into The Simple System.

Although Freeman (1998) is very clear on the supremacy of the TSS system and the hours measure of value, price determination is not directly addressed, while wage determination is simply assumed away. The essential feature of capitalism Freeman (1998) wishes to draw our attention to is the inevitability of a falling rate of profit in value terms if capitalist accumulate (nett invest) in value terms. Growth, or more precisely accumulation, reduces

[1]Critics of Marx, by concentrating on the use-value, output, profit rate, and presenting it through simultaneous equilibrium as the only possible profit rate, have simply missed Marx's point (or deliberately distorted it in-order to dismiss it).

the real underlying rate of profit in the economy until it is so low that a crisis can not be avoided. Distribution, the relation of V to L (labour's share of new value), is purely considered as a possible temporary countervailing tendency to the overriding underlying trend. As V can only drop so far it can not disrupt the 'natural' cycle of capitalism in the end.

Freeman (1999), following Trotsky (1923), identifies two lengths of cycle. A normal short cycle of 7-10 years duration and a long cycle of 20 to 30 years duration. Accumulation over the long cycle leads to a falling rate of profit over short cycles. Crisis follows causing, over short cycles, a slowdown in the rate of growth. Once in endogenously created crisis an exogenous solution, rearrangement of capitalism is required in-order to shift to another long high growth cycle. The crucial difference between this concept of the long cycle and Kontradieff's concept of the long cycle is that the cycle is exogenously determined by social and political factors, economic development is not simply led by technological development.

Let us leave aside the question of the long cycle for the moment and consider the short cycle. To Trotsky, see Freeman (1999) page 1.

> 'The periodity of short cycles is conditioned by the internal dynamic of capitalist forces, which manifests itself whenever and wherever there is a market.'

Is this internal dynamic the falling rate of profit or not? Freeman (1999) fails to explore this point further. I would like to consider how questions of distribution may affect/condition the behaviour of the short cycle (and consequently may even influence the long cycle).

To proceed we need to build in the potential for distributional struggle into Freeman's TSS system. We need to make V (variable capital) >0. Most simply we could assume a fixed total supply of labour power, L = V+S, and follow the logic of Freemans (1998) footnote 10 ('a fixed proportion of the input is used to feed the workers; the results are numerically the same'). Firms would not be able to advance all of M' for inputs of dead labour/constant capital C for the next period. Some of M' (C') must be given to labour as variable capital V.

Let us apply this approach to Freeman's system by reducing C by 10 hours and by making V+S=20, with S=10 (100% rate of exploitation). To allow easy comparison with Freeman's simple system let us retain Freeman's arbitrary choice of output for each period. Table 3 shows us how our new system matches Freeman's simple system. Note I have added a 5th period with final output of 40. Wages in terms of both money and output (use-value) rise with productivity.

Table 3. Constant V and S (in hours).

	v	P	Melt	C			V		
Period	end	end	end	£	h	O	£	h	O
0	5.00	5.00	1.00						
1	5.00	5.00	1.00	40.00	40.00	8.00	10.00	10.00	2.00
	4.67	5.00	1.07	50.00	50.00	10.00	10.00	10.00	2.00
3	4.00	5.00	1.25	64.29	60.00	12.86	10.71	10.00	2.14
4	3.21	5.00	1.56	87.50	70.00	17.50	12.50	10.00	2.50
5	2.50	5.00	2.00	124.44	80.00	24.89	15.56	10.00	3.11
							Money	Hours	Output

	S			M'	C'		profit	profit	profit
Period	£	h	O	£	h	O	rate	rate	rate
0				50.00	50.00	10.00			
1	10.00	10.00	2.00	60.00	60.00	12.00	0.20	0.20	0.20
2	15.00	10.00	3.00	75.00	70.00	15.00	0.25	0.17	0.25
3	25.00	10.00	5.00	100.00	80.00	20.00	0.33	0.14	0.33
4	40.00	10.00	8.00	140.00	90.00	28.00	0.40	0.13	0.40
5	60.00	10.00	12.00	200.00	100.00	40.00	0.43	0.11	0.43

If wages were fixed in output, say at two units, and assuming a constant price level were thus fixed in money, the result would be different. In period 3 a wage of 2 units of output, £10, would represent 9.33 hours. As V hours falls to 9.33 S hours must rise to 10.67. At the same time, assuming maximum extended reproduction, the fall in V by 0.67 hours would allow C hours input to rise by 0.67 hours. If we kept period 3 output at 20 it would now represent 80.67 hours of value. We would have more total hours embodied in period 3 output than in Table 3, for no more total output! The logic of value theory is not breaking down, we input the same total hours in C+V in period 3 but as more surplus hours are applied the hours value of total output grows. It is only our arbitrary choice of output which keeps output constant. In reality application of more C, in both exchange and use-value terms, to the same labour power, V+S, would most probably increase output. Once we include wages Freeman's system seems to be more than just trivially effected, it appears to be technically under-identified.

To proceed we must define the technical conditions of production. To focus on the short cycle and questions of distribution let us leave behind the issue of a rising organic composition of capital, with its inevitable decline in the value profit rate, by simply assuming a fixed organic composition of capital (ratio C to V+S in hours). Let us assume that labour supply is perfectly flexible at any given wage rate. Our scenario is now more akin to the circumstances surrounding the short cycle. Say we assume that technical conditions are such that,

(1) $C = 2(V+S)$ in hours

$$O_t = \min(1.5C_t / v_t , 3(V_t+S_t)/v_t)$$

If S_t fell short by one hour, as two hours of C_t would be idle, output would drop by three hours in total. This raises the question of whether excess C_t could be kept in stock. As maximum reproduction is assumed firms would not have the resources to adjust C up if V+S exceeded expectation. There is the question of whether we should work in hours or objects for the C part of the C to V+S relation. What if we assumed flexibility in the C to V+S relation and workers simply worked more intensely for the same hours? We have no reason to adjust actual physical hours, *v* would simply fall. We would only adjust actual hours if we used a standard 'intensity' hour for the hours unit.

If, for convenience, we assume such production problems away we should recognise the limitations they practically apply to our results (assuming we can not realistically incorporate them back into our model at a later date). To rule out possible complexities for now we need to assume that the rate of exploitation is predictable and that all output is sold (no stocks). The rate of exploitation, e, is the proportion of S hours in V+S hours. With e predictable firms are able to always achieve an ideal C to V+S balance. Questions of technical change can be ruled out by assuming a constant *v*. If we wished to introduce technical change 'gently' we could assume that changes in productivity do not change the ideal C to V+S balance, but simply effect the overall value of v at the end of the period.

We must define a clear sequence of events. Firms have at the end of each period total budget M' which they entirely invest (maximum extended reproduction) in inputs for the next period. They buy constant capital for the next period at the price prevailing at the end of the last period. They also buy living labour for the next period at a wage determined at the end of the last period, w_t is set in period t-1.

(2) $M_t = M'_{t-1} = P_{t-1}C_t$ (output) + $w_t V_t$ (hours)

We can define the hourly wage as (1-e)MELT, where e is the rate of exploitation, so (1-e) is the proportion of the value of a hours work which is actually paid to labour. MELT simply converts hours to money. Sequentially, as labour for this period consumes last periods output at last period's prices, the appropriate MELT to calculate this period's wages is last period's MELT. By contrast e is forward looking. I assume expectations are fulfilled $e_t = E_{t-1}e_t$, workers agree $(1-e_t)$ at the end of t-1 by negotiation, as its agreed its fulfilled. The intensity of work is also implicitly agreed, so much V+S combined with so much C will deliver the 'expected' level of output.

(3) $w_t V_t = (1-e_t)MELT_{t-1}(V_t+S_t)$

(4) $P_{t-1}C_t$ (output) = $MELT_{t-1}C_t$(hours)

Substitute (1), (3) and (4) in (2) and rearrange to produce,

(5) $(V_t+S_t) = M_t / MELT_{t-1}(2+e_t)$

(5) determines this periods labour requirement, allowing for its cost, such as to leave a sufficient proportion of M_t to purchase enough C_t to ideally match V_t+S_t. To construct a sequential system we must firstly set our initial conditions, ie exogenously pick period 0 v, P and C'. We must then establish what (1-e) is agreed for period 1. We now have sufficient information to calculate inputs for period 1. Period 1 output, and physical surplus, is revealed once we know v_1. As we assume no technical change v stays constant throughout our example. The money value of period 1's output and surplus is revealed once we know P_1, which we exogenously pick. Period 1 profit rates can now be calculated. We now have all the necessary information to establish period 2 inputs, except $(1-e_t)$, which we must now exogenously pick. For further periods we must simply repeat the process over and over again. Table 4 provides an example of this process.

Table 4. Constant *v*, P and (1-e).

	v	P	Melt	C			V			(1-e)
Period	end	end	end	£	h	O	£	h	O	start
0	5.00	5.00	1.00							
1	5.00	5.00	1.00	40.00	40.00	8.00	10.00	10.00	2.00	0.50
2	5.00	5.00	1.00	48.00	48.00	9.60	12.00	12.00	2.40	0.50
3	5.00	5.00	1.00	57.60	57.60	11.52	14.40	14.40	2.88	0.50
4	5.00	5.00	1.00	69.12	69.12	13.82	17.28	17.28	3.46	0.50
5	5.00	5.00	1.00	82.94	82.94	16.59	20.74	20.74	4.15	0.50

	S			M'	C'		Money profit rate	Hours profit rate	Output profit rate
Period	£	h	O	£	h	O			

0				50.00	50.00	10.00			
1	10.00	10.00	2.00	60.00	60.00	12.00	0.20	0.20	0.20
2	12.00	12.00	2.40	72.00	72.00	14.40	0.20	0.20	0.20
3	14.40	14.40	2.88	86.40	86.40	17.28	0.20	0.20	0.20
4	17.28	17.28	3.46	103.68	103.68	20.74	0.20	0.20	0.20
5	20.74	20.74	4.15	124.42	124.42	24.88	0.20	0.20	0.20

Our initial conditions are P_0 = 5, C'_0 = 50, v_0 = 5, and $(1-e_t)$ =0.5. P, *v* and (1-e) are kept constant to produce an unchanging system. Production growth comes from investment of more dead labour, combined with the appropriate quantity of living labour, each period. The living labour requirement grows. What of distribution? Each period's value added is distributed equally between labour (actually to those who will work in the next period!) and capitalists (who simply invest it next period). Distribution and profit rate (all three rates) stay constant.

Let us now simply increase price in period 3 to 6, see Table 5. The money profit rate for period 3 rises. Let price remain at 6 in period 4 and 5. The money profit rate now drops down again to equality with the other two profit rates. Has the price change effected output? Comparing Table 5 with Table 4 shows that output is unchanged (as is the organic composition of capital). Is distribution effected? Surprisingly it is unchanged. Labour still receives the same proportion of value added in each period. Prices rise at the end of period 3 (which is the relevant price for the distribution of period 3 output) but period 4 wages (which consume labour's share of period 3's output) rise to compensate. So who has lost or gained anything as the result of the price change? The value of money declines, causing anyone abstractly holding money outside the system (not investing it in inputs for production or using it to consume goods) to clearly loose out. Capitalists gain in the sense that their capital grows faster in money terms. If they gave up production at the end of period 3 the price change would ensure they would exit with more money (assuming they can actually sell the output, which, within the confines of this model, they clearly could not, thus leaving them with the same physical output despite the price change).

Table 5. Constant *v* and (1-e) with variable P

	v	P	Melt	C			V			(1-e)
Period	end	end	end	£	h	O	£	h	O	start
0	5.00	5.00	1.00							
1	5.00	5.00	1.00	40.00	40.00	8.00	10.00	10.00	2.00	0.50
2	5.00	5.00	1.00	48.00	48.00	9.60	12.00	12.00	2.40	0.50
3	5.00	6.00	1.20	57.60	57.60	11.52	14.40	14.40	2.88	0.50
4	5.00	6.00	1.20	82.94	69.12	13.82	20.74	17.28	3.46	0.50
5	5.00	6.00	1.20	99.53	82.94	16.59	24.88	20.74	4.15	0.50

	S			M'	C'		Money profit rate	Hours profit rate	Output profit rate
Period	£	h	O	£	h	O			
0				50.00	50.00	10.00			
1	10.00	10.00	2.00	60.00	60.00	12.00	0.20	0.20	0.20
2	12.00	12.00	2.40	72.00	72.00	14.40	0.20	0.20	0.20

3	31.68	14.40	2.88	103.68	86.40	17.28	0.44	0.20	0.20
4	20.74	17.28	3.46	124.42	103.68	20.74	0.20	0.20	0.20
5	24.88	20.74	4.15	149.30	124.42	24.88	0.20	0.20	0.20

Let us now simulate the scenario of a falling rate of exploitation, hidden in money terms by a rising price level, see table 6.

Table 6. Constant *v*, variable P to preserve Money Profitability in the face of rising (1-e).

	v	P	Melt	C			V			(1-e)
Period	end	end	end	£	h	O	£	h	O	start
0	5.00	5.00	1.00							
1	5.00	5.00	1.00	40.00	40.00	8.00	10.00	10.00	2.00	0.50
2	5.00	5.10	1.02	47.06	47.06	9.41	12.94	12.94	2.59	0.55
3	5.00	5.30	1.06	55.38	54.30	10.86	16.62	16.29	3.26	0.60
4	5.00	5.62	1.12	65.21	61.47	12.29	21.19	19.98	4.00	0.65
	5.00	6.07	1.21	76.80	68.30	13.66	26.88	23.91	4.78	0.70

	S			M'	C'		Money profit rate	Hours profit rate	Output profit rate
Period	£	h	O	£	h	O			
0				50.00	50.00	10.00			
1	10.00	10.00	2.00	60.00	60.00	12.00	0.20	0.20	0.20
2	12.00	10.59	2.12	72.00	70.59	14.12	0.20	0.18	0.18
3	14.40	10.86	2.17	86.40	81.45	16.29	0.20	0.15	0.15
4	17.28	10.76	2.15	103.68	92.21	18.44	0.20	0.13	0.13
5	20.74	10.25	2.05	124.42	102.45	20.49	0.20	0.11	0.11

The fall in the rate of exploitation at the start of period 2 ensures more of period 1's output, in both use-value and hours terms, must be advanced in variable capital as compared to table 5 where exploitation is constant. Consequently less constant capital can be applied as compared to table 5, although total C plus V input is constant (by our assumption of maximum extended reproduction). The fall in the rate of exploitation ensures less surplus labour is applied in period 2 as compared to table 5, period 2 output is consequently lower, in both use-value and hours terms, than that achieved in table 5 with constant exploitation. As exploitation falls in each subsequent period, growth in both use-value and hours terms slows. The money profit rate is maintained at 20% throughout by appropriately setting price to deliver such a constant money profit rate.

We should note how each period’s three profit rates are independent of the actual distribution of that period’s output! If capitalists stopped producing at the end of period 1 (making (1-e) for period 2 irrelevant) they would make a 20% profit rate (all three rates). Of course this is unrealistic, as who would buy the output? Leaving this aside, it is the desire to produce in period 2, in the face of a higher (1-e), which actually allows the distribution of period 1 output to move in the workers favour. Consequently we may say that period 1 profit rates are not effected by the actual distribution of period 1 output!

Let us consider how effectively the maintenance of money profitability hides the underlying decline in hours profitability. Over the entire period we have 21.44% inflation, while MELT rises also by 21.44%. Hours profitability in period 5 is 44.4% lower than hours profitability in period 1. If we were to adjust M’ for inflation each period, before calculating money profitability, then ‘real’ money profitability would equal hours profitability. Little illusion is apparent.

Table 7. Falling *v*, variable P to preserve Money Profitability in the face of rising (1-e).

	v	P	Melt	C			V			(1-e)
Period	end	end	end	£	h	O	£	h	O	start
0	5.00	5.00	1.00							
1	5.00	5.00	1.00	40.00	40.00	8.00	10.00	10.00	2.00	0.50
2	4.90	5.00	1.02	47.06	47.06	9.41	12.94	12.94	2.59	0.55
3	4.80	5.09	1.06	55.38	54.30	11.08	16.62	16.29	3.32	0.60
4	4.71	5.29	1.12	65.21	61.47	12.80	21.19	19.98	4.16	0.65
5	4.61	5.60	1.21	76.80	68.30	14.51	26.88	23.91	5.08	0.70

	S			M'	C'		Money profit rate	Hours profit rate	Output profit rate
Period	£	h	O	£	h	O			
0				50.00	50.00	10.00			
1	10.00	10.00	2.00	60.00	60.00	12.00	0.20	0.20	0.20
2	12.00	10.59	2.41	72.00	70.59	14.41	0.20	0.18	0.20
3	14.40	10.86	2.56	86.40	81.45	16.96	0.20	0.15	0.18
4	17.28	10.76	2.63	103.68	92.21	19.59	0.20	0.13	0.16
5	20.74	10.25	2.62	124.42	102.45	22.21	0.20	0.11	0.13

If we were to allow for a process of technological change, say by reducing *v* by 2% each period, it becomes harder to identify the underlying reduction in hours profitability. As *v* falls output in use-value terms grows faster, while output in hours grows as before with constant *v*, see table 7. From period 1 to period 5 the hours profit rate still drops by 44.44% but commutative inflation is only 12%, while MELT still falls by 21.44%. If we were to adjust M' for inflation each period by using P_0 throughout, each period's 'real' money profitability would still exceed actual underlying hours profitability (as price does not actually change in period 2 we would completely miss period 2's decline in hours profitability). Period 5 M' adjusted to P_0 would equal £111.07, producing a 13% 'real' money profit rate (with M' for period 4 at P_0 equalling £97.97). Adjustment for inflation simply ensures that each period's 'real' money profitability equals that period's output/use-value rate of profitability.

The inflation rate now underestimates the decline in the hours value of a unit of money, 1/MELT. Technical progress is eroding the value of money as surely as price increases erode the value of money. To be precise setting price above value erodes the value of money. If price fell to match *v* in each period MELT would stay constant at 1, while money profitability would equal hours profitability. It would seem that for an economy to maintain the value of money in the face of technological progress, prices must fall in line with productivity improvements. Deflation rather than inflation would be the norm. Interestingly Hayek, see Desai (1995) recommends monetary authorities should aim for a normal state of deflation, while of course prices did on average fall over the 19th century, see Hobsbawm (1987).

Wether or not capitalists successfully hide the underlying decline in the rate of exploitation by setting price above value, setting price above value clearly causes anyone abstractly holding money outside the system to clearly lose out, as the hours value of money declines. Significantly once we allow for technological progress the decline in the hours value of money exceeds the observed rate of inflation. If money holders received interest, and interest rates rise merely to reflect inflation, they would not be fully compensated for the decline in the hours value of their money. To proceed we must integrate money and money holders into our system.

Money, Circulation and Rentiers.

I follow a TSS approach to money and circulation, as explained in Freeman (1996). The key to understanding circulation lies in understanding Marx's first equality. Value can only be transferred in circulation, not created or lost. Production and consumption (reproduction) alter social wealth, circulation merely circulates it. Total social wealth (TSW) in hours is determined at the end of the production period, circulation can not alter this total, but price changes in circulation can transfer the ownership of TSW. Freeman (1996) explains how trade transfers use-values, while price changes transfer exchange-values/hours between commodity holders, within the overall constraint that TSW in hours remains unaltered. Goods do not need to trade, just change price, for value to be transferred. If a barrel of oil increases in price, relative in aggregate to all other commodities, it represents more hours value. If we sell the oil we realise this new higher hours value in money, if we keep the oil we simply own the new higher hours value as determined by the price rise.

In the simple system we assumed maximum extended reproduction, all output is traded we have no untraded stocks. At first sight it would appear that all commodities trade, making the above analysis irrelevant, but we are forgetting the 'special' commodity, money. Why is money a 'special' commodity? Money uniquely among commodities acts as the standard of price for all commodities and thus as the medium of exchange for all transactions. The value of money is defined by the price of all other commodities. If all prices rise the value of money, the quantity of abstract social labour (hours) it represents, falls. The hours value of a unit of money is the reciprocal of the monetary expression of labour time, 1/MELT. As MELT equals TSW in money divided by TSW in hours, the hours value of a unit of money is simply given by TSW in hours divided by TSW in money. So if all prices were to double would the value of money halve as mainstream economic thought would suggest? It would not if, following Freeman (1996), we properly included money as a stock of value.

Money represents past accumulated value, say we had £200, which through MELT=1 represented 200 hours. Additionally let there be 10 commodities, in total containing 100 hours of value. If the commodities in total were priced at £100 we would have £300 of TSW in money and 300 hours of TSW in value. Now let prices double, our 10 commodities are now priced at £200 in total. We still have 300 hours of TSW in value but £400 of TSW in money. One unit of money must now represent 0.75 units of value (hours). The doubling of prices has reduced the value of money, but it has not halved it, because we have recognised the existence of money as a stock of past accumulated value. The price change transfers value from money into the commodities. The value of commodities in total is now equal to £200/$1^1/_3$(MELT) = 150 hours. The value of the stock of money now also equals £200/$1^1/_3$ = 150 hours. We can clearly see how price changes transfer the ownership of TSW without changing TSW. Note we did not need to change the quantity of money for it to change value. Table 8 introduces circulation and money as a stock into our simple system, as previously represented by table 4. Inputs still follow the input constraint, equation (5), we still assume maximum extended reproduction. Note SP stands for start production, EP stands for end production, PC stands for post-circulation and MS stands for money stock.

Table 8 - Base Case With Money And Circulation.

	Money SP			C			V			S		
Period	£	h	(1-e)	£	h	O	£	h	O	£ (PC)	h	O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.50	48.00	48.00	9.60	12.00	12.00	2.40	12.00	12.00	2.40
3	200.00	200.00	0.50	57.60	57.60	11.52	14.40	14.40	2.88	14.40	14.40	2.88
4	200.00	200.00	0.50	69.12	69.12	13.82	17.28	17.28	3.46	17.28	17.28	3.46
5	200.00	200.00	0.50	82.94	82.94	16.59	20.74	20.74	4.15	20.74	20.74	4.15

	C'		*v*	C/C+L hours	Hours profit %	Output profit %	Price	M'	Money profit %	*v*	MELT	Hours in 1£
Period	h	O	EP	EP+MS	EP+MS	EP	PC	PC	PC+MS	PC	PC	PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	
1	60.00	12.00	5.00	0.92	0.04	0.20	5.00	60.00	0.04	5.00	1.00	1.00
2	72.00	14.40	5.00	0.91	0.05	0.20	5.00	72.00	0.05	5.00	1.00	1.00
3	86.40	17.28	5.00	0.90	0.05	0.20	5.00	86.40	0.05	5.00	1.00	1.00
4	103.68	20.74	5.00	0.89	0.06	0.20	5.00	103.68	0.06	5.00	1.00	1.00
5	124.42	24.88	5.00	0.87	0.07	0.20	5.00	124.42	0.07	5.00	1.00	1.00

	Money PC		TSW PC		TSW PC		MS not in Capital C/C+L hours	Hours profit	Money profit	C' Hours	Hours profit
Period	£	h	£	h	in O	in M	EP	rate EP	rate PC	PC	rate PC
0	200.00	200.00			50.00	200.00					
1	200.00	200.00	260.00	260.00	60.00	200.00	0.67	0.20	0.20	60.00	0.20
2	200.00	200.00	272.00	272.00	72.00	200.00	0.67	0.20	0.20	72.00	0.20
3	200.00	200.00	286.40	286.40	86.40	200.00	0.67	0.20	0.20	86.40	0.20
4	200.00	200.00	303.68	303.68	103.68	200.00	0.67	0.20	0.20	103.68	0.20
5	200.00	200.00	324.42	324.42	124.42	200.00	0.67	0.20	0.20	124.42	0.20

	r (Real	Loan lent	Loan due	M' - L+r	M' - r	Money profit %	Rentier wealth PC In money stock		Cumulative r		Total Rentier wealth PC	
Period	r=2%)	SP	PC	PC	PC	PC - r	£	h	£	h	£	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	19.98	70.98	0.18	200.00	200.00	2.02	2.02	202.02	202.02
3	0.02	52.02	53.06	33.34	85.36	0.19	200.00	200.00	3.06	3.06	203.06	203.06
4	0.02	53.06	54.12	49.56	102.62	0.19	200.00	200.00	4.12	4.12	204.12	204.12
5	0.02	54.12	55.20	69.21	123.33	0.19	200.00	200.00	5.20	5.20	205.20	205.20

Inputs and outputs, in money, hours and output (use-value) terms, are unchanged from table 4. As price equals value in hours throughout MELT is constant at unity, the value of the stock of money is preserved. TSW is simply £200 and 200 hours higher now we include the stock of money. Firstly let us assume that the stock of money is held by productive capitalists as part of their capital stock. Consequently the hours organic composition of capital is initially higher than it was in table 4 (where it was $^2/_3$ throughout). The hours organic composition of capital subsequently falls as V+S in hours, although fixed in proportion to C hours by the input constraint, rises in proportion to C hours plus the constant hours value of money. Both hours and money profitability are reduced by including money in the capital stock. Again as S hours and S money rise with C+V, the constant stock of money in hours and units of money ensures that both hours and money profitability on total capital including money rises. If we remove the money stock from productive capitalists' capital stock the hours organic composition of capital and the hours and the money profit rates are all restored to their values in table 4. So if productive capitalists do not hold money who would hold money and make it available for transactions and to be applied as capital?

Let us assume that rentiers hold the money stock. Initially assume productive capitalists hold no money at the end of period 0, they must borrow £50 to purchase period 0 output for input in period 1.[2] Assume rentiers charge a constant 'real' interest rate of 2%, ie the

[2]This assumption is made for convenience and may seem unrealistic. To add realism we could simply assume that period 0 was a recessionary period which bankrupted all productive capitalists. New productive capitalists start from scratch in period 1, entirely borrowing in

previous period's inflation rate plus 2%. As price stays constant in table 8 the interest rate stays constant at 2%. At the end of period 1, in circulation, productive capitalists must pay back to rentiers their loan plus interest, this leaves productive capitalists with £9 of M_1'. We can now calculate productive capitalists' post-interest M_1' and money profit rate. We do not subtract productive capitalists borrowing from M_1'- r to calculate post-interest money profitability as borrowed money still counts as capital to earn profit from. Let us assume that rentiers consume no output, leaving all of C_0' available for input in period 1. Such an assumption maintains maximum extended reproduction and facilitates a more direct comparison to the simple system, while preserving the notion that rentiers main preoccupation is growing their stock of money (just as we assume productive capitalists consume nothing to maximise the growth of their capital stock). To purchase C_0' at P_0, and thus maintain maximum extended reproduction, productive capitalists require £60, they have £9 already so need to borrow £51.

Total rentier wealth equals the monetary and hours value of the stock of money plus their interest rate claim on productive capitalists. Rentiers never fail to roll over productive capitalists loans, adding each period's interest payment to the total value of the loan. Over time rentier loans decline as a proportion of total M input and M' output for each period, explaining why post-interest money profitability gradually rises.

If v^{EP} fell by 2% a period from period 2 and price fell to maintain price equal to value, MELT=1, such technological progress would little change table 8. All money and hours values, plus rentier loans and returns, would remain unchanged. Only actual output, use-value, would grow, increasing the output profit rate to 22% from period 2. If price remained at 5 while v^{EP} fell the situation would be very different, because price would deviate from hours value.

To explore the implication of price deviating from value let us fix v^{EP} again and increase price to 6 from period 3, see table 9 on page 15. Before we can properly interpret/construct table 9 we must first consider how both the input constraint and production assumptions are affected by the possibility of price deviating from hours value. If price deviates from hours value the post circulation value of a unit of output, v_t^{PC}, will deviate from the pre-circulation/end production value of a unit of output, v_t^{EP}. v_t^{EP} is determined by C_t' hours (denote as $C_t'^h$) pre-circulation divided by the total number of units of output C_t'(denote as $C_t'^O$) $C_t'^h$ represents. The post-circulation value of a unit of $C_t'^O$ is determined differently, by its price divided by the post circulation value of $MELT_t$. MELT defines the hours content of a unit of money so the post-circulation value of a unit output must equal its price, P_t, divided by $MELT_t$. Inputs must carry/transform their post-circulation value in the previous period into the new period's output. So if $v_{t-1}^{PC} > v_{t-1}^{EP}$ C_t^h will rise in hours terms, but how will this effect output? Logically we could not expect the same physical quantity of C_t^O input to magically produce more physical output purely due to a price change changing its value in the previous period. To find output in the simple system we simply divided $C_t'^h$ ($C_t^h + V_t^h + S_t^h$) by v_t (implicitly v_t^{EP}). If we still calculated $C_t'^O$ in the same way, dividing by a value of v_t^{EP} unchanged from the previous period, physical output would rise purely because C_t^h input is inflated by the last period of circulation. This is unrealistic, production must actually depend on the physical quantity of C_t^O and the number of hours of living labour applied. To remove this distortion we need to adjust C_t^h contribution to this periods output by dividing

order to apply total period 0 output as period 1 input.

C_t^h by its post-circulation value at the end of the last period (by v_{t-1}^{PC}). Living labour, $V_t^h + S_t^h$, can be assumed to produce output according to this period's assumed value of v_t^{EP}. Output is now given by,

$$(6) \qquad C_t'^O = (C_t^h/v_{t-1}^{PC}) + (V_t^h + S_t^h)/v_t^{EP}$$

Consequently, once price has deviated from value, v_t^{EP} no longer represents the average value of a unit of output, it purely represents the rate living labour transforms into physical output in that period. Let us turn to the input constraint. We have assumed that,

$$(1) \qquad C_t^h = 2(V_t^h + S_t^h)$$

ideally balances inputs in their most productive combination. We derived equation (5) to calculate, for given M_t and $MELT_{t-1}$, the ideal quantity of $(V_t^h + S_t^h)$ to match C_t^h, so V_t^h+$C_t^h = C_{t-1}'^h$, thus preserving maximum extended reproduction.

$$(5) \qquad (V_t^h + S_t^h) = M_t/MELT_{t-1}(2 + e_t)$$

In deriving equation (5) on page 6 we used equation (4), $P_{t-1}C_t^O = MELT_{t-1}C_t^h$, where $C_t^h = C_t^O v_{t-1}$. Now with circulation potentially causing $v_{t-1}^{PC} > v_{t-1}^{EP}$ do (4) and (5) still hold? Or put it another way, does $MELT_{t-1}$ capture $v_{t-1}^{PC} > v_{t-1}^{EP}$. To answer this question let us derive (5) by a different method using v_{t-1}^{PC} but not using $MELT_{t-1}$. Equations (1) and (2) are unchanged, (3) and (4) become,

$$(3') \qquad w_t V_t^h = P_{t-1}((1 - e_t)(V_t^h + S_t^h))/v_{t-1}^{PC}$$

$$(4') \qquad P_{t-1}C_t^O = P_{t-1}C_t^h/v_{t-1}^{PC}$$

Substitute (1), (3') and (4') in (2) and rearrange to produce,

$$(5') \qquad (V_t^h + S_t^h) = v_{t-1}^{PC}M_t/P_{t-1}(2 + e_t) \qquad \text{as } v_{t-1}^{PC} = P_{t-1}/MELT_{t-1}$$

$$(V_t^h + S_t^h) = M_t/MELT_{t-1}(2 + e_t)$$

We have the same result (5) still holds, $MELT_{t-1}$ captures any change in v_{t-1}^{PC} from v_{t-1}^{EP}. To interpret (5') let us recognise that $M_t/P_{t-1} = C_{t-1}'^O$, (5') becomes,

$$(5'') \qquad (V_t^h + S_t^h) = v_{t-1}^{PC}C_{t-1}'^O/(2 + e_t)$$

(5'') has no direct money terms, it only has an indirect link to money through v_{t-1}^{PC}. If $P_{t-1} > v_{t-1}^{EP}$ v_{t-1}^{PC} will rise as value transfers from money to commodities. All other variables in (5'') are assumed to be invariant to price changes in the previous period. So how/why does a rise in v_{t-1}^{PC} increase the living labour requirement? The change follows from our definition of the wage as a proportion of total labour hours, $(1-e_t)(V_t^h + S_t^h)$. When v_{t-1}^{PC} rises we can pay the same labour, $(V_t^h + S_t^h)$, less output because each unit of output represents more hours. If we compare period 4 input in table 8 to period 4 input in table 9, C_t^O is the same while C_t^h is higher in table 9 due to the price increase above v_{t-1}^{EP} at the end of period 3. Equation (6) ensures C_t^O contributes to physical output equally in both tables. The difference between the tables, which ensures both $C_t'^O$ and $C_t'^h$ are higher in table 9 period 4, increasing TSW, is that for the same physical output period 4 ($V_t^h + S_t^h$) is higher in table 9 than in table 8. Higher period 4 output, in use-value and hours terms, ensures a higher level of inputs for period 5, causing period 5 output, in use-value and hours terms (and TSW in hours terms), to exceed that achieved with price equal to value in table 8.[3]

Let us also explain at this point the process by which post-circulation TSW in hours is calculated. I use the logic of Marx's first equality (value remains constant, in aggregate, in circulation) and simply add the pre-circulation hours value of money and commodities together to represent the post-circulation value of TSW in hours. Marx's first equality must ensure that pre-circulation hours TSW equals post-circulation hours TSW. Finally we must also recognise that if $P_t > v_t^{EP}$, so $v_t^{PC} > v_t^{EP}$, post-circulation $C_t'^h$ will exceed pre-circulation $C_t'^h$, as value transfers from money to commodities. We can now identify an end production/pre-circulation value of $C_t'^h$, with accompanying end production hours profit rate (as previously calculated in the simple system), and a new post-circulation value of $C_t'^h$ which produces a new post-circulation hours profit rate. We can define the two profit rates as,

Hours Profit Rate End Production = $(C_t'^{hEP} - (C_t^h + V_t^h))/(V_t^h + S_t^h)$

Hours Profit Rate Post-Circulation = $(C_t'^{hPC} - (C_t^h + V_t^h))/(C_t^h + V_t^h)$

Table 9 - Price Rise.

Period	Money SP £	Money SP h	(1-e)	C £	C h	C O	V £	V h	V O	S £ (PC)	S h	S O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.50	48.00	48.00	9.60	12.00	12.00	2.40	12.00	12.00	2.40
3	200.00	200.00	0.50	57.60	57.60	11.52	14.40	14.40	2.88	17.28	14.40	2.88
4	200.00	188.62	0.50	82.94	78.22	13.82	20.74	19.56	3.46	26.20	19.56	4.37
5	200.00	185.50	0.50	103.90	96.37	17.32	25.98	24.09	4.33	31.85	24.09	5.31

Period	C' h	C' O	v EP	C/C+L hours EP	Hours profit rate EP	Output profit rate EP	Price PC	M' PC	Money profit rate PC	v PC	MELT PC	Hours in 1£ PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	
1	60.00	12.00	5.00	0.67	0.20	0.20	5.00	60.00	0.20	5.00	1.00	1.00
2	72.00	14.40	5.00	0.67	0.20	0.20	5.00	72.00	0.20	5.00	1.00	1.00
3	86.40	17.28	5.00	0.67	0.20	0.20	6.00	103.68	0.44	5.66	1.06	0.94
4	117.34	21.65	5.00	0.67	0.20	0.25	6.00	129.88	0.25	5.56	1.08	0.93
5	144.55	26.95	5.00	0.67	0.20	0.25	6.00	161.72	0.25	5.47	1.10	0.91

Period	Money PC £	Money PC h	TSW PC £	TSW PC h	TSW PC in O	TSW PC in M	C' Hours PC	Hours profit rate PC
0	200.00	200.00			50.00	200.00		
1	200.00	200.00	260.00	260.00	60.00	200.00	60.00	0.20
2	200.00	200.00	272.00	272.00	72.00	200.00	72.00	0.20
3	200.00	188.62	303.68	286.40	97.78	188.62	97.78	0.36
4	200.00	185.50	329.88	305.96	120.46	185.50	120.46	0.23
5	200.00	182.49	361.72	330.05	147.56	182.49	147.56	0.22

[3] I am still concerned about how, as seen in table 9 period 3, the same physical quantity of C is applied to more units of labour as compared to table 8. This seems to contradict the spirit of my hours input constraint, implying some 'flexibility' in production, ie a price change can alter the ideal productive relationship between C_t^O and ($V_t^h + S_t^h$). The problem purely results from my decision to define the ideal productive relationship between C and V+S in hours terms. At present I see no alternative to this approach, modelling requires structure, while alternatively using an output or a money based input constraint would create even more complexities and anomalies.

Period	r (Real r=2%)	Loan lent SP	Loan due PC	M'-L-r PC	M'-r PC	Money profit % PC - r	Rentier wealth PC In money stock £	h	Cumulative r £	h	Total Rentier wealth PC £	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	19.98	70.98	0.18	200.00	200.00	2.02	2.02	202.02	202.02
3	0.02	52.02	53.06	50.62	102.64	0.43	200.00	188.62	3.06	2.89	203.06	191.51
4	0.22	53.06	64.73	65.14	118.21	0.14	200.00	185.50	14.73	13.67	214.73	199.16
5	0.02	64.73	66.03	95.70	160.43	0.24	200.00	182.49	16.03	14.62	216.03	197.11

We are now ready to consider table 9 in depth. From period 3 the post-circulation hours value of C' significantly rises as the price increase transfers value from money to C', v^{PC} rises above v^{EP}. Consequently period 3's 20% price rise causes period 3 post-circulation hours profitability to shoot up. Despite return to price stability in period 4 and 5, as price still exceeds value, value still transfers from money to C', boosting post-circulation hours profitability. Productive capitalists clearly benefit from the price increase. Workers are equally exploited in hours terms, as compared to table 8, but their wage falls in output terms to reflect the increased hours value of commodities. Rentiers are very much worse off. Period 4's rise in interest rate, in response to period 3's 20% inflation, ensures, in money terms, that rentier total wealth rises to £216.03 by the end of period 5. This surface victory hides the real underlying situation, the decline in the value of money causes rentier total wealth to fall to 197.11 hours at the end of period 5. If we were to allow for technological progress, v^{EP} falling by 2% a period from period 2, the result would be even worse for rentiers, assuming prices were unchanged from their levels in table 9.[4] Price would simply deviate further from value as v^{EP} falls, accelerating the transfer of value from money into C' (increased variation of price from value would leave final TSW in hours slightly higher at 332.04 as the output wage for given hours exploitation slightly falls allowing more living labour to be applied). Post-circulation hours profitability would rise to 22% in period 2 (now the first period of $P>v^{EP}$ as v^{EP} falls by 2% to 4.9), 38% in period 3 and 25% in period 4 and 5. As the fall in v^{EP} increases physical output, keeping price at 5 in period 1 and 2 and at 6 from period 3 will boost money profitability, which rises to 22% in period 2, 48% in period 3 and 29% in both period 4 and 5. As inflation and interest rates are unaffected by the falling v^{EP} rentiers would have the same money total wealth, £216.03, but as the value of money would fall even further their total wealth in hours would fall further to 188.77 hours.

Whether v^{EP} falls or not we can clearly see how anyone holding money, now within the system, clearly loses out if prices rise. It is also evident that rentier and productive capitalist interests do not coincide. We have a tension between production, which grows faster in table 9 when price rises than in table 8 when price is constant, and the preservation of the value of past accumulated wealth.

Table 10 - Price Rise Then Price Fall.

Period	Money SP £	h	(1-e)	C £	h	O	V £	h	O	S £ (PC)	h	O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.50	48.00	48.00	9.60	12.00	12.00	2.40	12.00	12.00	2.40
3	200.00	200.00	0.50	57.60	57.60	11.52	14.40	14.40	2.88	17.28	14.40	2.88

[4] To follow the spirit of technological change that we introduced for our simple system, as represented in table 7, where both C and V+S magically increased productivity by the fall in *v*, I adjust equation (6) to allow both C and V+S to increase productivity by the change in v^{EP}. Equation (6) now becomes, $C_t'^{O} = (C_t^h/v_{t-1}^{PC})(v_{t-1}^{EP}/v_t^{EP}) + (V_t^h + S_t^h)/v_t^{EP}$.

4	200.00	188.62	0.50	82.94	78.22	13.82	20.74	19.56	3.46	21.83	19.56	4.37
5	200.00	198.52	0.50	86.59	85.95	17.32	21.65	21.49	4.33	21.33	21.49	4.27

	C'		*v*	C/C+L hours	Hours profit	Output profit	Price	M'	Money profit	*v*	MELT	Hours in 1£
Period	h	O	EP	EP	rate EP	rate EP	PC	PC	rate PC	PC	PC	PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	
1	60.00	12.00	5.00	0.67	0.20	0.20	5.00	60.00	0.20	5.00	1.00	1.00
2	72.00	14.40	5.00	0.67	0.20	0.20	5.00	72.00	0.20	5.00	1.00	1.00
3	86.40	17.28	5.00	0.67	0.20	0.20	6.00	103.68	0.44	5.66	1.06	0.94
4	117.34	21.65	5.00	0.67	0.20	0.25	5.00	108.23	0.04	4.96	1.01	0.99
5	128.92	25.91	5.00	0.67	0.20	0.20	5.00	129.56	0.20	4.97	1.01	0.99

	Money PC		TSW PC		TSW PC		C' Hours	Hours profit
Period	£	h	£	h	in O	in M	PC	rate PC
0	200.00	200.00			50.00	200.00		
1	200.00	200.00	260.00	260.00	60.00	200.00	60.00	0.20
2	200.00	200.00	272.00	272.00	72.00	200.00	72.00	0.20
3	200.00	188.62	303.68	286.40	97.78	188.62	97.78	0.36
4	200.00	198.52	308.23	305.96	107.43	198.52	107.43	0.10
5	200.00	198.72	329.56	327.44	128.73	198.72	128.73	0.20

	r	Loan	Loan			Money	Rentier wealth PC				Total Rentier	
	(Real	lent	due	M'-L-r	M'-r	profit %	In money stock		Cumulative r		wealth PC	
Period	r=2%)	SP	PC	PC	PC	PC - r	£	h	£	h	£	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	19.98	70.98	0.18	200.00	200.00	2.02	2.02	202.02	202.02
3	0.02	52.02	53.06	50.62	102.64	0.43	200.00	188.62	3.06	2.89	203.06	191.51
4	0.22	53.06	64.73	43.50	96.56	-0.07	200.00	198.52	14.73	14.62	214.73	213.15
5	0.02	64.73	66.03	63.53	128.26	0.19	200.00	198.72	16.03	15.93	216.03	214.64

What if price were to fall back after rising? Table 10 illustrates such a scenario. Price rises as before in period 3 but falls back to 5 for period 4 and 5. Up to the end of period 3 table 10 is identical to table 9. Rentiers take the same blow to their hours total wealth at the end of period 3, but by the end of period 5 they are far better off in hours terms as compared to table 9, in fact they are even better off in hours terms than when price did not rise at all in table 8! Why are rentiers now so well off? The price fall in period 4 largely restores the value of money, while the interest rate for period 5 does not become negative to reflect 20% deflation in period 4 (I assume that the interest rate falls no lower than 2% in period 5, the normal 'real' interest rate). The price fall in period 4 thus crucially escalates the 'real' interest rate to 22% in period 5. Productive capitalists gain in period 3 only to dramatically lose out in period 4, when they even make a post-interest money loss. Money and hours profitability recover in period 5 to rates achieved in period 5 in table 8 with constant price (clearly profitability is still lower than in table 9 period 5 where price still exceeds value). Output and employment rise more slowly in period 4 and 5 as compared to table 9, the fortunes of rentiers are thus enhanced at the cost of slower growth.

Table 11 - Price Rise Then Price Fall, Falling v^{EP}.

	Money SP			C			V			S		
Period	£	h	(1-e)	£	h	O	£	h	O	£ (PC)	h	O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.50	48.00	48.00	9.60	12.00	12.00	2.40	13.47	12.00	2.69
3	200.00	198.93	0.50	58.78	58.46	11.76	14.69	14.61	2.94	20.33	14.61	3.39
4	200.00	185.82	0.50	86.79	80.64	14.47	21.70	20.16	3.62	26.23	20.16	5.25
5	200.00	193.77	0.50	93.31	90.41	18.66	23.33	22.60	4.67	27.58	22.60	5.52

	C'		*v*	C/C+L hours	Hours profit	Output profit	Price	M'	Money profit	*v*	MELT	Hours in 1£
Period	h	O	EP	EP	rate EP	rate EP	PC	PC	rate PC	PC	PC	PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	
1	60.00	12.00	5.00	0.67	0.20	0.20	5.00	60.00	0.20	5.00	1.00	1.00
2	72.00	14.69	4.90	0.67	0.20	0.22	5.00	73.47	0.22	4.97	1.01	0.99

3	87.69	18.08	4.80	0.67	0.20	0.23	6.00	108.49	0.48	5.57	1.08	0.93
4	120.96	23.33	4.71	0.67	0.20	0.29	5.00	116.64	0.08	4.84	1.03	0.97
5	135.61	28.85	4.61	0.67	0.20	0.24	5.00	144.23	0.24	4.78	1.05	0.96
	Money PC		TSW PC		TSW PC		C' Hours	Hours profit				
Period	£	h	£	h	in O	in M	PC	rate PC				
0	200.00	200.00			50.00	200.00						
1	200.00	200.00	260.00	260.00	60.00	200.00	60.00	0.20				
2	200.00	198.93	273.47	272.00	73.07	198.93	73.07	0.22				
3	200.00	185.82	308.49	286.61	100.80	185.82	100.80	0.38				
4	200.00	193.77	316.64	306.77	113.01	193.77	113.01	0.12				
5	200.00	191.37	344.23	329.38	138.00	191.37	138.00	0.22				
	r	Loan	Loan			Money	Rentier wealth PC				Total Rentier	
	(Real	lent	due	M'-L-r	M'-r	profit %	In money stock		Cumulative r		wealth PC	
Period	r=2%)	SP	PC	PC	PC	PC - r	£	h	£	h	£	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	21.45	72.45	0.21	200.00	198.93	2.02	2.01	202.02	200.93
3	0.02	52.02	53.06	55.43	107.45	0.46	200.00	185.82	3.06	2.84	203.06	188.66
4	0.22	53.06	64.73	51.91	104.97	-0.03	200.00	193.77	14.73	14.27	214.73	208.04
5	0.02	64.73	66.03	78.20	142.93	0.23	200.00	191.37	16.03	15.34	216.03	206.71

Rentiers do not do as well if we introduce technological change. Let v^{EP} fall by 2% a period from period 2, see table 11. Price exceeds v^{EP} in period 2 and 3, to the detriment of rentiers and advantage of productive capitalists. The price fall in period 4 only partially restores the value of money as price falls below period 3 v^{PC}, but still exceeds period 4 v^{EP}. Price exceeds v^{EP} by a larger margin in period 5, benefiting productive capitalists at rentiers' expense. At the end of period 5 rentiers are still better off in hours terms than at the end of period 5 in table 9 or 8, but their gain is being eroded fast, they are actually worse off in hours terms at the end of period 5 than at the end of period 4.

What can we conclude from table 10 and 11? Rentiers benefit from price instability, as long as price rises alternate with price falls. If prices just rise rentiers lose out. We must also conclude that technological progress, unmatched by price reductions to preserve the value of money (P= v^{EP}), also threatens rentier interests. If rentiers are to preserve the value of their money in the face of technological progress there must be a permanent average state of deflation rather than just low average inflation or average price stability. We should not underestimate just how biased to deflation rentier interests really are.[5]

Table 12 - Falling Exploitation, Constant Money Profitability.

	Money SP			C			V			S		
Period	£	h	(1-e)	£	h	O	£	h	O	£ (PC)	h	O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.55	47.06	47.06	9.41	12.94	12.94	2.59	10.80	10.59	2.12
3	200.00	198.96	0.60	55.38	55.10	10.86	16.62	16.53	3.26	11.89	11.02	2.25
4	200.00	196.63	0.65	65.23	64.13	12.35	21.20	20.84	4.02	13.25	11.22	2.40
5	200.00	192.85	0.70	76.81	74.06	13.90	26.88	25.92	4.87	14.84	11.11	2.54
	C'		v	C/C+L hours	Hours profit	Output profit	Price	M'	Money profit	v	MELT	Hours in 1£
Period	h	O	EP	EP	rate EP	rate EP	PC	PC	rate PC	PC	PC	PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	

[5]We can now appreciate how the average inflationary twentieth century must have been a great disappointment to rentier interests as compared to the average deflationary ninetieth century. The question facing us today, given increased rentier/Central Banker control of advanced capitalist countries' monetary policy, is whether rentiers will enjoy an average deflationary twenty first century?

1	60.00	12.00	5.00	0.67	0.20	0.20	5.00	60.00	0.20	5.00	1.00	1.00
2	70.59	14.12	5.00	0.67	0.18	0.18	5.10	72.00	0.20	5.07	1.01	0.99
3	82.65	16.37	5.00	0.67	0.15	0.16	5.28	86.43	0.20	5.19	1.02	0.98
4	96.20	18.77	5.00	0.67	0.13	0.15	5.53	103.69	0.20	5.33	1.04	0.96
5	111.09	21.31	5.00	0.67	0.11	0.14	5.84	124.44	0.20	5.47	1.07	0.94
	Money PC		TSW PC		TSW PC		C' Hours	Hours profit				
Period	£	h	£	h	in O	in M	PC	rate PC				
0	200.00	200.00			50.00	200.00						
1	200.00	200.00	260.00	260.00	60.00	200.00	60.00	0.20				
2	200.00	198.96	272.00	270.59	71.63	198.96	71.63	0.19				
3	200.00	196.63	286.43	281.61	84.98	196.63	84.98	0.19				
4	200.00	192.85	303.69	292.83	99.98	192.85	99.98	0.18				
5	200.00	187.36	324.44	303.94	116.58	187.36	116.58	0.17				
	r	Loan	Loan			Money	Rentier wealth PC				Total Rentier wealth PC	
	(Real	lent	due	M'-L-r	M'-r	profit %	In money stock		Cumulative r			
Period	r=2%)	SP	PC	PC	PC	PC - r	£	h	£	h	£	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	19.98	70.98	0.18	200.00	198.96	2.02	2.01	202.02	200.97
3	0.04	52.02	54.10	32.33	84.35	0.17	200.00	196.63	4.10	4.03	204.10	200.66
4	0.06	54.10	57.09	46.60	100.70	0.17	200.00	192.85	7.09	6.84	207.09	199.69
5	0.07	57.09	60.88	63.56	120.65	0.16	200.00	187.36	10.88	10.20	210.88	197.56

Let us turn our attention to the effect of a falling rate of exploitation in hours terms. We found for our simple system that productive capitalists could price to preserve money profitability and thus partially hide, particularly if *v* fell, the erosion of their real power vis a v labour. We can now explore how this scenario is altered by the inclusion of rentiers and accumulated wealth/money into our system. Table 12 reproduces the scenario represented in table 6. Table 6, with fixed *v*, seemed a disappointing result, the 'real' situation can be easily identified by appropriately adjusting M' for inflation. Now in table 12 it is the 'real' situation which has dramatically changed! Pricing to restore money profitability (now pre-interest money profitability) actually largely restores hours profitability directly at the expense of rentiers.[6] The crucial difference is that when we include money as a stock of value, deviations of price from value transfers value between money and commodities. Although rentier interest earnings rise with inflation, increasing their total wealth in money terms, the decline in the value of money leaves rentiers increasingly worse off in hours terms. The situation is thus disastrous to rentiers. Note as value transfers into commodities, increasing v^{PC}, the output wage in table 12 from period 3 is lower than in table 6, despite identical rates of hours exploitation. Consequently slightly more living labour is applied from period 3 as compared to table 6, producing a slightly higher level of output from period 3. Higher output allows money profitability to be preserved with lower prices than in table 6 from period 3.

If we allowed technological progress to reduce v^{EP} by 2% a period from period 2 the result would be even worse for rentiers. We merely need price to exceed value for value to transfer from money into commodities. Given falling v^{EP} productive capitalists could maintain money profitability at 20% in period 2 without even having to raise price above 5. For the rest of the periods, to preserve money profitability at 20%, price would need to rise slower than in table 12. The value of money would decline as before in table12, but as inflation would be lower rentier interest earnings would fall, leaving rentiers worse off in both money, £207.37, and hours, 194.29, terms as compared to table 12.

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[6]We could just as easily imagine pricing to preserve post-interest money profitability, prices would need to rise slightly more leaving rentier hours total wealth at 195.75 hours at the end of period 5.

Whether we allow for technological progress or not it is clearly rentiers who are largely bearing the cost of labour's advance. If we were to allow productive capitalists to actually price to preserve post-circulation hours profitability at 20%, see table 13, we find that productive capitalists can maintain their 'real' power by passing the entire effect of labour's increase in power directly onto rentiers. Rentiers are even worse off at the end of period 5 in table 13 than at the end of period 5 in table 12, as price, in aggregate, has deviated even more from value in order to maintain hours profitability. Not surprisingly if we were to allow technological progress, v^{EP} falling by 2% a period from period 2, rentiers would be even worse off. With v^{EP} falling the necessary deviation of price from value, to preserve hours profitability, would require a lower rate of price increase. Just as when v^{EP} and money profitability was preserved, money would lose the same value (as in table 13), but rentiers would receive less interest as inflation would be lower in each period. Rentier total wealth would fall to £210.13 and 189.31 hours by the end of period 5.

Table 13 - Falling Exploitation, Constant Hours Profitability.

	Money SP			C			V			S		
Period	£	h	(1-e)	£	h	O	£	h	O	£ (PC)	h	O
0												
1	200.00	200.00	0.50	40.00	40.00	8.00	10.00	10.00	2.00	10.00	10.00	2.00
2	200.00	200.00	0.55	47.06	47.06	9.41	12.94	12.94	2.59	10.87	10.59	2.12
3	200.00	198.60	0.60	55.76	55.37	10.86	16.73	16.61	3.26	12.30	11.07	2.28
4	200.00	195.29	0.65	66.76	65.19	12.38	21.70	21.19	4.02	14.47	11.41	2.50
5	200.00	189.39	0.70	81.11	76.80	14.00	28.39	26.88	4.90	17.72	11.52	2.78

Period	C' h	C' O	v EP	C/C+L hours EP	Hours profit rate EP	Output profit rate EP	Price PC	M' PC	Money profit rate PC	v PC	MELT PC	Hours in 1£ PC
0	50.00	10.00	5.00				5.00	50.00		5.00	1.00	
1	60.00	12.00	5.00	0.67	0.20	0.20	5.00	60.00	0.20	5.00	1.00	1.00
2	70.59	14.12	5.00	0.67	0.18	0.18	5.14	72.49	0.21	5.10	1.01	0.99
3	83.06	16.40	5.00	0.67	0.15	0.16	5.40	88.46	0.22	5.27	1.02	0.98
4	97.79	18.89	5.00	0.67	0.13	0.15	5.80	109.49	0.24	5.49	1.06	0.95
5	115.20	21.68	5.00	0.67	0.11	0.15	6.37	138.05	0.26	5.74	1.11	0.90

	Money PC		TSW PC		TSW PC		C' Hours	Hours profit
Period	£	h	£	h	in O	in M	PC	rate PC
0	200.00	200.00			50.00	200.00		
1	200.00	200.00	260.00	260.00	60.00	200.00	60.00	0.20
2	200.00	198.60	272.49	270.59	71.99	198.60	71.99	0.20
3	200.00	195.29	288.46	281.66	86.38	195.29	86.38	0.20
4	200.00	189.39	309.49	293.07	103.68	189.39	103.68	0.20
5	200.00	180.20	338.05	304.59	124.39	180.20	124.39	0.20

	r	Loan	Loan			Money	Rentier wealth PC				Total Rentier	
	(Real	lent	due	M'-L-r	M'-r	profit %	In money stock		Cumulative r		wealth PC	
Period	r=2%)	SP	PC	PC	PC	PC - r	£	h	£	h	£	h
0							200.00	200.00				
1	0.02	50.00	51.00	9.00	59.00	0.18	200.00	200.00	1.00	1.00	201.00	201.00
2	0.02	51.00	52.02	20.47	71.47	0.19	200.00	198.60	2.02	2.01	202.02	200.61
3	0.05	52.02	54.46	34.00	86.02	0.19	200.00	195.29	4.46	4.36	204.46	199.65
4	0.07	54.46	58.31	51.18	105.65	0.19	200.00	189.39	8.31	7.87	208.31	197.26
5	0.09	58.31	63.80	74.25	132.56	0.21	200.00	180.20	13.80	12.44	213.80	192.64

Table 13 clearly shows how a fall in labour exploitation can be hidden, indeed completely countered, by appropriate price increases, directly at the expense of rentier interests. Let us now explore the possible implications of our results.

Conclusion, Inflation 'Public' Enemy Number One.

As I explain on page 6 I build wages into Alan Freeman's system in order to concentrate on the dynamics of the short cycle. To be precise I have concentrated my analysis on just one phase of the short cycle, the expansion phase. Output and employment rise, as price rises to counter the falling rate of hours exploitation. We need only add a comparatively fixed total supply of labour for this scenario to be associated with a falling rate of unemployment, thus explaining why exploitation should fall as labour gains confidence in an improving labour market.[7] Conventional analysis would suggest that such an expansionary phase, associated with rising prices, is unsustainable rather than immediately harmful to business and rentier interests. Business can price to maintain money profitability in the face of wage increases, while the 'real' interest rate can be increased to reflect inflation, the only difference is a rising rate of inflation. The situation is not immediately threatening but, to prevent eventual hyper-inflation, rampant unemployment and complete collapse, action against inflation must be taken at some point before the expansion goes too far. So why are Central Bankers and International Financial Institutions so set against 'comparatively harmless' inflationary expansionary periods?

The TSS approach immediately explains the situation. Rentier interests are not just concerned with stopping a disaster before it happens, in reality they are confronted with a situation which is already a disaster to their interests. Table 12 clearly shows a situation of apparent surface stability, but such stability is only surface deep. As exploitation in hours terms falls pricing to preserve money profitability transfers value from money into commodities, causing rentiers to already suffer in hours terms. It is not surprising that Kalecki's rentiers should be boom tired, see Kalecki (1943), to be more accurate they are already boom battered. Here is the real disaster that even mild inflationary expansion creates, it is a disaster to accumulated wealth ie to rentier interests. Productive capitalists can maintain money or even hours profitability despite falling exploitation, leaving the rentiers to suffer.

Employing a TSS approach allows us to understand economic phenomena in greater depth, revealing how logical certain 'irrationally' held prejudices really are! Central Bankers

[7]See Potts (1998) for a non-TSS based discussion on how exploitation may vary with the level of unemployment, while inflation adjusts to indicate the real underlying situation in the labour market.

clearly despise inflation more passionately than many mainstream economists, particularly Post-Keynesian economists, can understand within the restrictions of their equilibrium approaches. In the name of stability many mainstream economists have advocated Central Bank independence. As part of the post 1979 international ideological switch to the right rentier representatives have increasingly been granted guardianship of apparently democratic countries macroeconomic policy. The new independent European Central Bank now eagerly worries about inflation and labour market inflexibility, see Potts (2001). We should not be surprised if rentier representatives guard rentier interests ie the value of past accumulated wealth. Truly this must be the real meaning of the ideology of price stability.

Recently a friend tried to convince me that Bill Gates was the most powerful man in the world, I retorted that his power is as nothing to the power of past accumulated wealth. If inflation were to threaten the value of past accumulated wealth, its guardians, the independent Central Bankers, would fight to restore/enhance its value by increasing interest rates, plunging living labour and productive capitalists into crisis. The living are dominated by the dead, who despite not voting are represented by those who now hold the real economic power, the independent Central Bankers (who really are the most powerful men in the world).

My model fails to reflect all the features of a real economy. Fixed capital, stocks, foreign trade, international capital movements and exchange rates are all ignored, as is government. Prices, value (v^{EP}) and exploitation are arbitrarily exogenously chosen, while production and input requirements are also defined in an arbitrary fashion. I hope to address many of these factors through further research, but ultimately economics is an imperfect science. It is my hope that my model, imperfectly assumed as it is, captures more of reality than any countless number of equally contrived equilibrium models which ignore money as a stock of real value.

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