A long-range Financialisation Mechanism

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Abstract

One prominent characteristic of the decades-long run-up to today's global financial crisis, is the increasing relative size of debt and the financial sector in countries' economies. A mechanism explaining one aspect of this, due to financial accumulation through non-financial capitalists' lending, is explored. The exercise also leads to the conclusion that in the aggregate, financial accumulation by capitalists through the alternative option of real-economic investment, is not feasible.

1 Introduction

We wish to examine an aspect of debt growth dynamics of a macroeconomy, on a decades-long time scale. In this scenario, non-financial firm (often abbreviated "NFF" from now on) owners/capitalists have a choice between using the non-consumed part of their profits to extend loans, or for investment. The conjecture is that in the very long run, lending will be more profitable than investing for NFF capitalists, and therefore preferred. For simplicity, we assume that they lend in the form of buying bonds from (other) non-financial firms. Thus, in the aggregate the NFF "capitalist" lends to "himself" (we use the male sex for this creature). When bonds are paid back, the principal is re-lent after a short time lag. Capitalists consume some of their profits, workers spend all their wages.

Another part of financial activity, lending from licensed banks, which have the privilege of increasing credit money as part of their lending, is assumed to have occured to a certain level, and then frozen. Thus the stock of circulating bank-created money is assumed constant, and by implication also debt to licensed banks. But the related interest burden on NFF's is ignored here. The presence of non-bank financial institutions is also abstracted from, except that they and licensed banks manage the lending flows from NFF capitalists (owners). The fees to banks for this are are assumed only to be used for banks' expenses and wages, and not for bank lending. To sum up these assumptions, the only financial accumulation allowed in the system, is through NFF capitalist activity. This is obviously an unrealistic scenario in the sense that the main factors for a long-term financial crisis are ignored. But the point of the exercise is to check whether there is also an incentive for NFF capitalists to gradually behave more like lenders than investors in the long run. We will return briefly to the the role of banks in the conclusion.

Further assumptions are that we do not account for losses on capitalists' bonds and on their investment. And there are no stock market or housing bubbles in this model, only the long-term financial accumulation process (such bubbles have faster dynamics and are seen as excursions on top of the long-term debt-growth path.The term "bubbles" should not be used for the dynamics to be examined here).

We wish to answer two main questions:

Is it, as time goes, more attractive to recycle profits to owners of non-financial firms as loans instead of investing them – and how may this unfold, also when part of these profits stem from NFF activity?

– If the answer is yes to the first question, we have a possible explanation for one of the mechanisms behind the financialisation process.

2 The model

Readers are recommended to check out the block diagram in figure 1 in the appendix. This type of model representation is much used in the control systems community, but may be easily understood also by academics with other backgrounds. It is quite useful when one has become somewhat familiar with it.

This paper however, is written mainly for an economist audience[1], and therefore the model will be developed based on equations only. We will see that it boils down to a simple four-state linear dynamical system, where it furthermore turns out that three states may be ignored at the time scale (decades) that we are considering, resulting in a first order system.

The model is defined in continuous time. "$"is used as a symbol for the monetary unit. Brackets are used to signify denomination. Denomination for money flows is then [$/y] (where "$y$" means "year"), and for stocks it is [$]. Empty brackets [ ] signify a dimensionless entity. All monetary entities are in nominal terms. We define the following variables and parameters:

T_F = First order time lag for the aggregate of non-financial firms [y].

T_K = First order time lag for the aggregate of capitalists, who own the NFFs [y].

T_W = First order time lag for the aggregate of (non-saving) workers/households [y].

M = total money stock in circulation, here assumed constant [$].

$Y_d(t)$ = aggregate demand for NFF products and services [$/y].

$Y_{dn}(t)$ = aggregate demand remaining after NFFs' debt service [$/y].

$Y_o(t)$ = aggregate NFF output [$/y].

$M_F(t), M_K(t), M_W(t)$ = money stock in circulation [$]: held by firms, capitalists and workers, respectively. We have $M = M_F + M_K + M_W$.

$D(t)$ = NFF capitalists' financial assets = bonds [$].

i = interest rate on bonds [$1/y$].

r = loan (bond) repayment rate [$1/y$]. r is defined such that the loan repayment flow is proportional to the aggregate loan, we have $rD(t)$. This is unconventional, since bond repayment schemes are usually that the entire principal is paid at maturity. But in the aggregate, this is acceptable.

σ = share of interest income that is left for capitalists after fees for managing lending and payment flows [ ]; $0 << \sigma < 1$.

$F(t)$ = flow of fees for managing the lending flows [$/y].

π = share of NFF output that capitalists receive [ ]; $0 < \pi < 1$. The workers' share is then $1 - \pi$.

s_K = share of capitalists' profit flow that is not used for consumption [ ]; $0 < s_K < 1$.

s_{KL} = share of capitalists' non-consumption flow that is used for buying bonds [ ]; $0 < s_{KL} < 1$. The share $1 - s_{KL}$ is then used for investment.

$L(t)$ = flow of new loans [$/y], includes re-lending of re-paid bonds.

$I(t)$ = flow of new investment [$/y]

$W(t)$ = workers' wages flow [$/y]; workers are assumed to use their entire wages for consumption $= C_W(t)$, after a lag T_W.

$C(t)$ = aggregate consumption flow [$/y].

$C_K(t)$ = capitalists' aggregate consumption flow [$/y], we have $C = C_W + C_K$.

$\Pi_R(t)$ = profit flow from NFF activity to capitalists (= NFF owners) [$/y].

$\Pi_L(t)$ = profit flow from interest paid to NFF owners on their bonds [$/y].

[1] Thanks to Carl Chiarella for advice on making this paper (hopefully) more readable to economists.

$\Pi(t) = \Pi_R(t) + \Pi_L(t) =$ aggregate profit flow [$/y$].

$\Pi_o(t) =$ lagged profit flow emerging from aggregate of capitalists, used for sconsumption or saved [$/y$].

We start the presentation with the input/output dynamics of three defined aggregates: non-financial firms, capitalists (who own these firms), and workers. These dynamics may be explained via the firm aggregate which has time lag T_F – properties for capitalist and worker aggregates are similar, except for time lags being T_K and T_W. We assume that all lags are of the first-order type, corresponding to a differential equation (using the aggregate of firms)[2]:

$$T_F \dot{Y}_o = -Y_o + Y_{dn} \tag{1}$$

The money held at any time[3] by the aggregate of firms, must satisfy

$$\dot{M}_F = -Y_o + Y_{dn} \ , \tag{2}$$

so that

$$Y_o = \frac{M_F}{T_F} \ (= M_F v_F) \tag{3}$$

where v_F is firm money velocity [$1/y$] (but we will not use v_F in the following). With such input-output dynamics, a stepwise change in the input flow gives an output response that adjusts asymptotically to the input in the form of a stable exponential with a lag T_F. This type of subsystem (= aggregate) is of order 1. As mentioned above, the capitalist and worker subsystems have the same properties. Equations for the capitalist aggregate are:

$$T_K \dot{\Pi}_o = -\Pi_o + \Pi \tag{4}$$

with

$$\Pi_o = \frac{M_K}{T_K}, \tag{5}$$

and for workers:

$$T_W \dot{C}_W = -C_W + W \tag{6}$$

with

$$C_W = \frac{M_W}{T_W} \tag{7}$$

In addition to these three differential equations, we have one for debt growth:

$$\dot{D} = s_K s_{KL} \Pi_o \tag{8}$$

The total system is therefore of order 4. The lags T_F, T_K, T_W will be of the magnitude weeks or at most months. On the decades-long time scale we are considering for the financial accumulation process, we may therefore ignore the effect of T_F, T_K, T_W for growth dynamics. Then

the outputs for the three aggregates may be considered equal to their inputs. (9)

We will exploit this further below. But first we need to complete the system by listing the remaining (non-differential-) equations.

The profit flowing to capitalists is:

$$\Pi = \Pi_L + \Pi_R = \sigma i D + \pi Y_o \tag{10}$$

For wages to workers we have their share of output:

$$W = (1 - \pi) Y_o \tag{11}$$

[2] We use dot notation for time derivatives. And a variable's dependency on time t is here and in the following mostly implied and not indicated.

[3] Obviously circulating money stock must reside somewhere at any time. And for money velocity not to be infinite, money has to stay with an aggregate for a finite time. This is accounted for by the time lag in the first order differential equation representation.

For demand to firms after firms' servicing debt we have:

$$Y_{dn} = Y_d - (i + r)D \tag{12}$$

And demand before debt service is

$$Y_d = C + I + L + F \tag{13}$$

where

$$C = C_K + C_W = (1 - s_K)\Pi_o + C_W, \tag{14}$$

and

$$I = s_K(1 - s_{KL})\Pi_o, \tag{15}$$

and

$$L = rD + \dot{D}, \tag{16}$$

and

$$F = (1 - \sigma)iD \tag{17}$$

This completes the set of equations describing the system.

We now wish to find the solution for the NFF profit flow $\Pi_R(t)$. The conjecture is that it will shrink. We have

$$M = M_F + M_K + M_W, \tag{18}$$

so that any increase in money stock held by one aggregate must mean a corresponding decrease in the sum for the two other aggregates. By the assumption (9) that flow in may be considered equal to the flow out, we have for the aggregate NFF capitalist that the flow in is also equal to money held divided by the time lag. Using this, (10) and (5), we get:

$$\Pi = \Pi_L + \Pi_R = \sigma iD + \pi Y = \Pi_o = \frac{M_K}{T_K}, \tag{19}$$

where we have now, in accordance with (9), introduced the term $Y = Y_o = Y_{dn}$.

For the worker/household sector (11) and (7) give

$$W = (1 - \pi)\, Y = C_W = \frac{M_W}{T_W} \tag{20}$$

Using (9), and (3), (19), (20) to substitute for M_F, M_K, M_W in (18) we get

$$M = T_F Y + T_K(\sigma iD + \pi Y) + T_W\, (1 - \pi)\, Y \tag{21}$$

We solve for Y:

$$Y = \frac{M - T_K \sigma iD}{T_F + \pi T_K + (1 - \pi)\, T_W} \tag{22}$$

Our total system's dynamics are, with the simplification (9) and similar for the aggregates of capitalists and workers, described by just one differential equation. From (8) and (19) we have:

$$\dot{D} = s_K s_{KL} \Pi_o = s_K s_{KL}(i\sigma D + \pi Y) \tag{23}$$

In (23), we substitute (22) for Y:

$$\dot{D} = s_K s_{KL}(i\sigma D + \pi \frac{M - T_K \sigma iD}{T_F + \pi T_K + (1 - \pi)\, T_W}) = a + bD, \tag{24}$$

where

$$b = s_K s_{KL} i\sigma(1 - \frac{\pi T_K}{T_F + \pi T_K + (1 - \pi)\, T_W}) = s_K s_{KL} i\sigma \frac{T_F + (1 - \pi)\, T_W}{T_F + \pi T_K + (1 - \pi)\, T_W} \tag{25}$$

and

$$a = s_K s_{KL} \frac{\pi M}{T_F + \pi T_K + (1 - \pi)\, T_W} \tag{26}$$

We note the interesting property that the growth rate b will be higher the faster money passes through the capitalist aggregate, i.e. when T_K is small.

If we assume an initial value $D(0) = 0$, the solution to (24) is

$$D(t) = \frac{a}{b}\left(\mathrm{e}^{bt} - 1\right) = \frac{\pi M}{i\sigma\left[T_F + (1-\pi)\,T_W\right]}\left(\mathrm{e}^{bt} - 1\right), \tag{27}$$

which is exponential growth (minus a constant).

All other flows in the system may now be deduced based on (27). Eq. (10) gives the financial profit flow Π_L to the aggregate NFF capitalist:

$$\Pi_L = \sigma i D \tag{28}$$

Since Π_L is proportional to D, it also grows exponentially.

Using (19), (22) and (27), we have

$$\Pi_R = \pi Y = \pi \frac{M - T_K \sigma i \frac{\pi M}{i\sigma[T_F + (1-\pi) T_W]}\left(\mathrm{e}^{bt} - 1\right)}{T_F + \pi T_K + (1-\pi)\,T_W} = \bar{a} - \bar{b}\left(\mathrm{e}^{bt} - 1\right), \tag{29}$$

where

$$\bar{b} = \frac{\pi M T_K}{\left[T_F + \pi T_K + (1-\pi)\,T_W\right]\left[T_F + (1-\pi)\,T_W\right]} \tag{30}$$

and

$$\bar{a} = \frac{\pi M}{T_F + \pi T_K + (1-\pi)\,T_W} \tag{31}$$

Thus, while Π_L grows exponentially, Π_R falls at a similar rate – an unstable negative exponential path. The same is the case with Y and W.[4]

3 Conclusion

We have shown that even a simple, best-case linear model without accumulation by banks and non-bank financial institutions (NBFIs), gives an unsustainable dynamic, at least in the very long run, and that profits from NFF capitalists' lending, Π_L, crowd out profits from investing, Π_R.

If we also allow the aggregate NFF capitalist to change the weighting of his two outgoing flows, based on observing a long-term trend of his financial profits crowding out his NFF profits, this corresponds to letting s_{KL} increase with

$$\frac{\Pi_L}{\Pi_R + \Pi_L}, \tag{32}$$

making the crowding-out mechanism stronger.

Additionally, in a more realistic setting, with banks and NBFIs also in the system – visibly accumulating through their own lending – one should expect the NFF capitalists to get an additional incentive to increase s_{KL}. Increasing s_{KL} – for whichever reason – will make the debt growth process steeper than exponential, and even less sustainable.

Another conclusion follows from the above exercise is if we set $s_{KL} = 0$, i.e NFF capitalists use all their saving for non-financial investment, and nothing to extend loans. Then there is no exponential debt growth. This means that the NFF capitalists *cannot accumulate financially in the aggregate.* Investment is a zero-sum game for them. This seems to be a fairly dramatic conclusion ....

[4] This does not happen in the real world, however. The reason for this is that bank lending, abstracted from in this paper, increases M, which is held constant here. So we have race between long-run exponential debt build-up, which is unsustainable, and exponential money growth on the same time scale, which, ignoring the question of inflation, ameliorates the situation. Bank money creation, however, is accompanied by bank loan exponential build-up, which adds to the debt burden discussed here.

Appendix: A block diagram representation

The model earlier described through a set of equations, is shown in figure 1 as a block diagram. It may seem complex at a first glance, but it gives a better overview of the interactions in the system than a set of equations only.

The rules for interpreting this diagram are as follows:

1. The variable exiting a rectangular block, as long as the block only contains a coefficient, is the product of the variable entering the block and the expression within the block. Thus we have $\Pi_L = \sigma(iD)$.
2. If the block contains a "time lag", this signifies a first-order linear dynamic, as explained earlier.
3. If it contains an integrator symbol, this means that the output is the integral of the input.
4. A small dot upon a line signifies a *branching point*. This means that a variable is used as an input to two other parts of the system. Example: we have Y_o being used both for profits and wages, $\Pi_R = \pi Y_o$ and $W = (1-\pi)Y_o$.
5. A small circle at an intersection of lines signifies a *summation point*: the variable associated with an arrow leaving a circle is the sum of variables associated with arrows entering the circle. Thus we have $\Pi = \Pi_R + \Pi_L$. An arrowhead with a minus sign associated with it, means that the corresponding variable is to be subtracted in the summation.

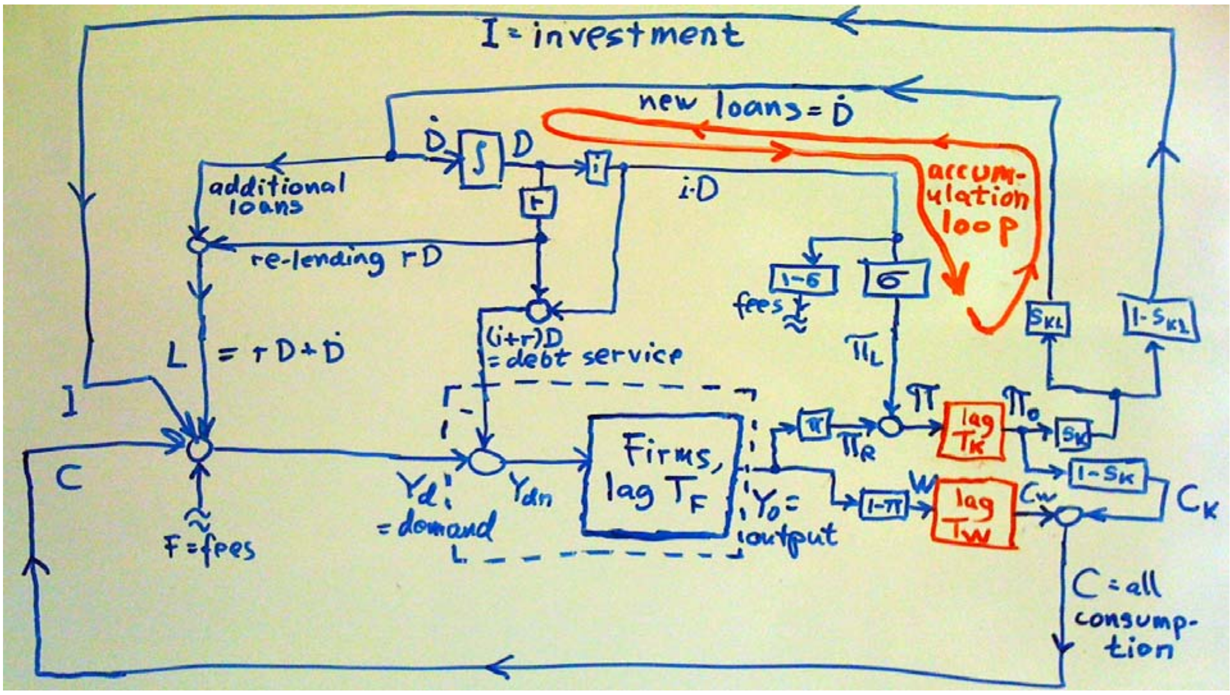

Figure 1: