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Financialized growth regime: lessons from Stock Flow Consistent models

Luis Reyes

PhD student CEPN, université Paris 13,
luisantonio.reyesortiz@univ-paris13.fr

Jacques Mazier

Emeritus Professor CEPN, université Paris 13, mazier@univ-paris13.fr

The financialized growth rate that settled in most developed economies in the nineties is characterized by the quest for higher shareholders' profitability, increased financial accumulation at the expense of productive accumulation and the use of leverage effects. Stock Flow Consistent models à la Godley and Lavoie are well suited to analyze this growth regime. We retain two types of closures for non financial companies, either an indebtedness norm or an own funds norm. The paper studies the dynamics of these two models with the aid of simulations and supply or demand shocks, or stemming from the financial sector. Their fitness to take into account financial cycles and over indebtedness typical of financialized growth may thus be analyzed. The model with the indebtedness norm generates short-term financial cycles which appear as the regulation mode of this growth regime with an asset price serving as an adjustment variable. The model with the own funds norm generates a financial bubble with growing indebtedness and no self-stabilizing mechanism.

Le régime de croissance financiarisée qui s'est installé dans la plupart des économies développées à partir des années 1990 se caractérise par la recherche d'une rentabilité élevée pour les actionnaires, une accumulation financière accrue au détriment de l'accumulation productive et le recours à l'effet levier. Les modèles Stock Flux Consistant (SFC) à la Godley et Lavoie sont bien adaptés pour rendre compte de ce régime de croissance. Deux types de fermeture de ces modèles sont distingués en retenant au niveau des entreprises non financières, soit une norme d'endettement, soit une norme de fonds propres. Le papier étudie la dynamique de ces deux types de modèles à l'aide de simulations et de chocs d'offre ou de demande ou au niveau de la sphère financière. Leur aptitude à rendre compte des cycles financiers et de surendettement caractéristiques de la croissance financiarisée peut ainsi être analysée. Le modèle avec norme d'endettement génère des cycles financiers de courte période qui apparaissent comme le mode de régulation de ce régime de croissance avec un prix des actions servant de variable d'ajustement. Le modèle avec norme de fonds propres engendre une bulle financière avec endettement croissant sans mécanisme de stabilisation propre.

In order to make the program work, it suffices to open the file using Eviews 7 or a more recent version. Once open, the program shows « dialog boxes » with default values (text or numbers). If the user wishes to change these values, she/he may easily do so (however, this does not guarantee the model will work).

Afin de pouvoir faire tourner le programme il suffit d'ouvrir le fichier en utilisant la version 7 (ou plus récente) d'EViews. Une fois ouvert, le programme sort de « boîtes de dialogue » avec des valeurs (texte ou chiffres) par défaut. Si l'utilisateur veut les changer il peut facilement le faire (cependant, ceci ne garantit pas que le modèle marchera).

Introduction

Since the 1980s liberal reforms (particularly in the financial and labor markets) have set up a financialized growth regime in most developed countries (Aglietta, 1998; Boyer, 2000). This financialized growth regime is characterized by the quest of a high return on own funds, large leverage effects and increasing financial accumulation, even at the expense of long term growth and an increasingly unequal distribution of income. These transformations have generated unprecedented macroeconomic instability and, in many cases, weak growth despite the restoration of profits to a high level. In the present paper we try to describe the mechanisms which produce the macroeconomic instability of these growth regimes. This instability seems to be caused by wealth and leverage effects. This is the main reason why we focus on the financing mode and the financial structure of non financial companies (NFCs henceforth).

Stock Flow Consistent (SFC, henceforth) models, as in Godley and Lavoie (2007), are well suited to represent a financialized growth regime because the wealth and leverage effects are integrated in coherent social accounting matrices where the price of equity, *i.e.* an index such as the CAC 40, may be (as is in the present model) endogenized. In order to characterize financialization, two alternative closures of the SFC model are considered with alternative ways in which NFCs finance investment: the first with an indebtedness norm, where equities appear as a residual; the second with an own-funds norm where, on the contrary, loans are determined as a residual. The results of simulations in these two configurations describe financial cycles due to leverage and revaluation effects, but with contrasted mechanisms. Our main objective is to compare the nature of these two regimes by carrying out demand or supply shocks as well as shocks on the financial side.

The paper is organized as follows. Section 1 describes the stylized facts for France from 1979 to 2011 (the longest available time span given official data at the time of writing). In section 2 we give account of the most relevant works on SFC models in our literature review, in order to present the model in detail in section 3. Lastly, we present the results of the model and some scenarios (or shocks, as these are known in the literature) in section 4.

1. Stylized Facts

Liberal reforms implemented in the decade of the eighties, which gained considerable strength during the nineties, have had major consequences in the way economies behave today, both at a national level and world-wide. National economies have suffered a drastic transformation in the capital structure of the non financial sector, largely increasing their dependence on financial instruments which, instead of boosting investment demand, have generated massive stagnation. Macroeconomic policy has played mostly in favor of capital owners' income at the expense of workers' well-being, leading to growing inequality, which has further contributed to the slowdown of economic activity via depressed purchasing power of workers.

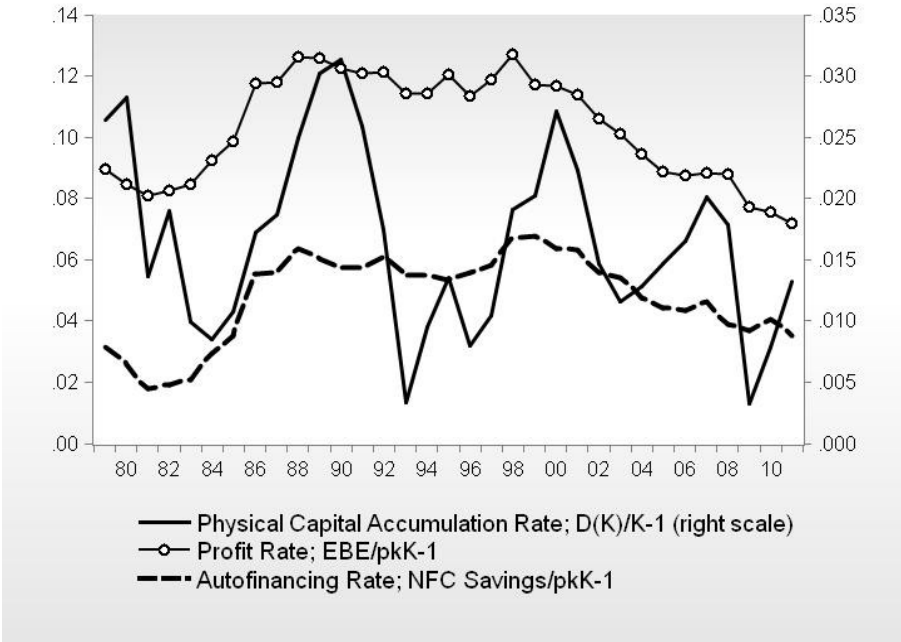
Indeed, globalization has played an increasingly important role in this process. In the remaining of this paper, however, we will focus on a single fictitious closed economy, leaving the aspects of an open economy for further research. We do this for two main reasons, the first one being theoretical, and the second technical. First, we want to focus on the way NFCs are financed, proposing a model which takes into account firms' major liabilities explicitly, with the price of equity determined within the model. Second, as a consequence of the first, we prefer to keep this model as simple as possible and focus on open economy issues in the future, once the closed economy model is set up.

Figures 1-4 are for France which is, in our view, a good example of a typical financialized economy. We do not claim, of course, that whatever has happened in this particular economy

has had the same timing or peculiarities elsewhere. We claim instead that the overall trend is about the same in other major advanced economies, such as the U.S. and the U.K., for instance.

Figure 1 shows the rate of capital accumulation of NFCs along with their aggregate profit rate¹, one of its main determinants following the Kaleckian tradition. The former is shown as (1) Gross Operating Surplus as a ratio of the previous period non financial assets (profit rate in the figure), and as (2) firms' savings divided by lagged non financial assets (self-financing rate) which, despite the obvious scale difference, have moved (unsurprisingly) in unison. The association between the rate of profit and the rate of capital accumulation seems clearly positive, although the rise of the former since the middle of the 1980s did not lead to a permanent recovery of the latter. This also coincides with the beginning of the global Neoliberal strategy. In 1993, capital accumulation grew at a rate of 0.34%, whereas profits remained relatively high (11.4%). By 2000 investment represented 2.8% of the previous year's capital stock, while profits represented 12.2% of it. From then on, and until 2011, the downward trend of both series became more evident. For, as a consequence of the financialized regime implemented along the two previous decades and a series of inadequate economic policies, physical capital accumulation and undistributed profits decreased significantly by 0.32 and 7.6%, respectively.

Figure 1



Source: INSEE, authors calculations.

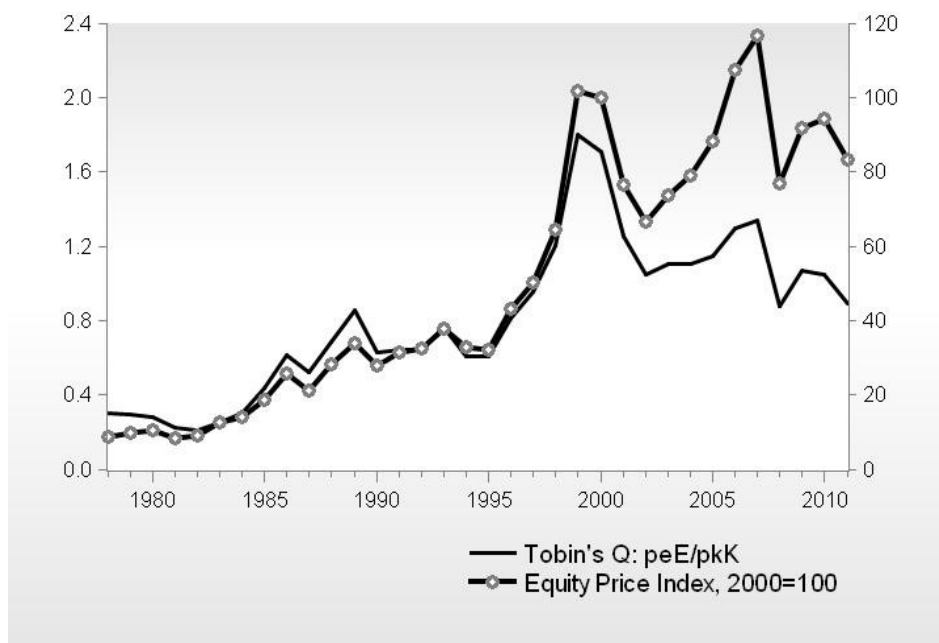
The rise in capitalists' share of income, in this context, had as a natural counterpart a fall in the share of wage earners. This in turn depressed demand massively, provoking and further enhancing the fall of the already weak capital accumulation rate. That is, the indiscriminate increase in capitalists' wealth at the expense of that of workers proved highly ineffective in boosting investment demand. Austerity measures, the road to –and the introduction of– the euro, as well as policies favoring stability over growth, *i.e.* the Stability and Growth Pact, also played an important role in this stagnation process.

Our main contention is that this shift in the distribution of income and the fall in the accumulation rate are closely linked to the way firms are financed, either by issuing more

¹ Note that the series in Figure 1 are presented corrected for changes in prices. That is, $\Delta K/K_{-1}$ (the accumulation rate), and UP/pkK_{-1} (the profit rate).

equities or by increasing their level of indebtedness². A closer look at the financial sector will reinforce our contention.

Figure 2



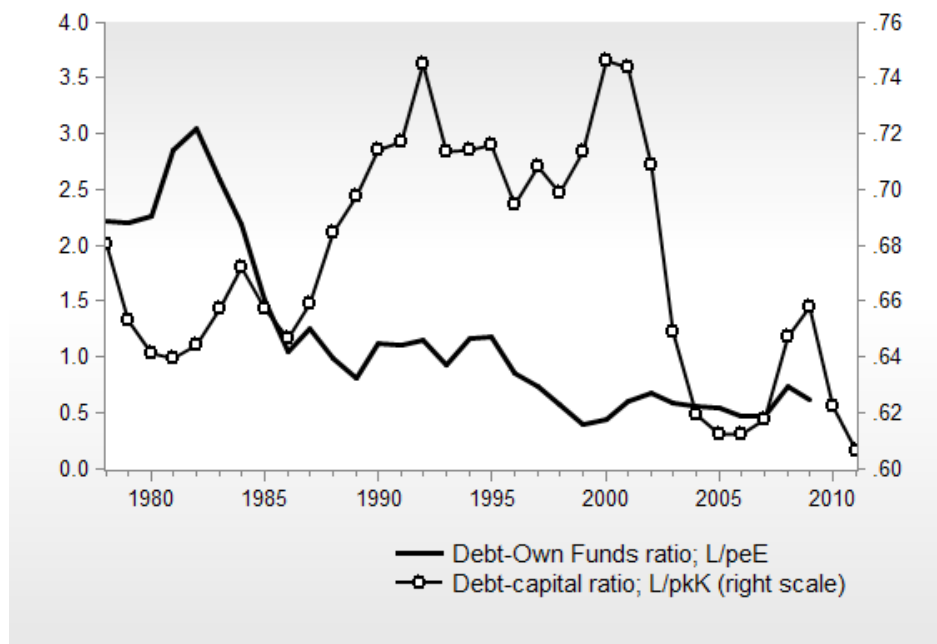
Source: INSEE and Banque de France, authors calculations

Figure 2 shows the evolution of the so-called Tobin's Q^3 and the index of the price of equities (base 2000). These two series move almost identically until 2000, and less equally afterwards though in the same sense. The drastic increase in the price of equities made the value of this financial instrument greatly surpass the value of the capital stock during the stock-market boom, until the bubble burst in 1999. The financial crashes of 1987 and 1990 are overly dwarfed by the gigantic magnitude of the dot-com boom and subsequent crash, though it must be mentioned that these were not minor. The price of equity fell to almost half its level from 1999 to 2002. A second wave of speculation led the market to value equities at a much higher level in 2007. The fall in the price of equity and of Tobin's Q from that year to the next was of about 34%. Before 2000 the price called the tune in the equities market, but the issuing of this financial instrument was by this year no longer affordable. Therefore, after that year the retrenchment in equity issuing accounts for the path difference between Q and the equity price index. Thus, the falling rate of capital accumulation and the growing supply of equities over physical capital have come about hand in hand. As a consequence, financial accumulation has gained larger and larger shares in firms' total accumulation, at the expense of physical capital. This fall in the price of equity has been accompanied by what Richard Koo calls a "Balance sheet recession" (see below).

Figure 3

² For a review of the consequences of the current recession under a theoretical-historical context dealing with the Modigliani-Miller (1958) capital-structure-irrelevance theorem see Pasinetti (2012).

³ The value of equities held, peE , divided by the value of non financial assets, p_kK .

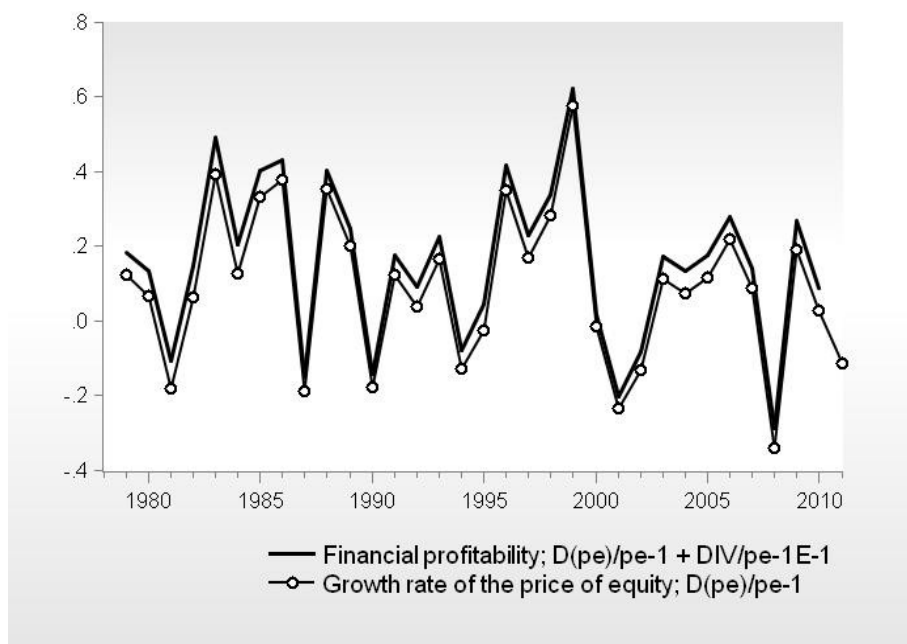


Source: INSEE and Banque de France, authors calculations

Indebtedness has played no secondary role in this financialization process. The timing of the evolution of the series presented in Figure 3 is closely linked to those of the series described above. Starting in 1986, debt as a ratio of non financial assets began a moderate upward path which lasted until 1992, passing from 0.65 to 0.75, remaining at 0.7 or higher until the arrival of the new millennium, when it began its downward path (from 0.74 in 2001 to 0.61 in 2004). This fall of the debt ratio may be explained as a consequence of the unwillingness of firms to borrow, irrespective of how low the interest rate may be. Koo (2009) explains that, following a bubble burst (*i.e.* 2000 in France) firms' balance sheets are most likely underwater. Firms may not want banks to know this (because their credit ratings are in jeopardy), and banks may even want to pay a blind eye to the issue (because otherwise they will be exposed as conceding nonperforming loans). This dangerous combination (falling equity prices–falling credit demand–low interest rates–falling profit rates) may generate a deflationary gap, thus a recession of the kind we are experiencing today.

Figure 3 also shows the ratio of the debt to the own funds which gives a different picture of firms' indebtedness. By 1982 external financing (debt) was three times as large as own funds, but the debt-own funds ratio subsequently fell and remained at around 1.2 or lower as a consequence of the stock-market boom. Once the bubble burst, the value of equities issued fell, thus showing a slight recovery of the debt-own funds ratio.

Figure 4



Source : INSEE and Banque de France, authors calculations

The evolution of equity issuing has been mainly guided by that of financial profitability throughout the period under study, leaving a negligible role for dividends (as a share of equities issued the previous period) as determinant of the financial rate of return (see equation 20 below). This is seen in Figure 4.

As we see from the figures above, the capital structure of firms has suffered significant changes, and along with these came changes in the evolution of demand and income shares to the detriment of wage-earners, even paradoxically yielding lower profit rates. We believe that focusing on the behavior and determinants of firms' liabilities is important in order to understand a financialized regime. We also believe it is important to include them explicitly in models pretending to study financialized regimes. The model we propose is a first attempt to do this.

2. Literature Review

To our knowledge, one of the first serious attempts to empirically deal with financial phenomena on a macroeconomic perspective, combining stocks and flows rather than dealing with one at the time, was that of Brainard and Tobin (1968), then extended by Tobin (1969) and others from the Yale school. This approach did not make its way to current mainstream economics because it lacked micro foundations which explained the mechanism by which agents allocated their financial resources. When asked about the abandonment of SFC models, Tobin's reply was "Well, people would rather do the other thing [computable, numerical or applied general equilibrium models] because it's easier" (Dimand, 2003, p. 19).

Some years later, a group of researchers from the Post Keynesian school took over SFC models and, thanks to the ease of access to large-scale reliable computational techniques rapidly evolving, gave them further solidity and more realism. Instead of a general equilibrium taste, these authors gave it a Keynesian/Minskyan flavor that aimed at explaining endogenously created disequilibrium without optimizing behavior from economic agents. Lavoie and Godley (2001) and Godley and Lavoie (2007) account for the most influential works on this type of analyses among Post-Keynesians⁴.

⁴ There are, however, a number of Stock-Flow models which do not "fit" into the Post-Keynesian approach and are, however, important references. See, for instance, Blinder and Solow (1973), Backus, Brainard, Smith and Tobin (1980) and Davis (1987).

SFC models consist of systems of simultaneous equations which combine stocks (of debt, capital or deposits) with flows (of production, income or liquid assets) using experimental data under a realistic accounting framework. Considering the fact that all form of wealth⁵ in an economy comes from somewhere and goes somewhere, these models have an advantage above other techniques: they are capable of describing the mechanism underlying a shock, either coming from the financial or the real side of the economy, and its effect on macroeconomic aggregates⁶. They are especially well suited to study a finance-led growth regime.

In Minsky's (1986) model, the surge in investment in bull phase of the business cycle is allowed by an increase in external financing (debt only in the present model) which explains the endogenous fragility of firms, *i.e.* the increase in default risk. In the ascending phase of a cycle, the reduction of investors' liquidity preference on financial markets, that is to say the decrease in the risk perceived by investors, allows the increase of the debt share in firms' balance sheets. Firms thus take advantage of this situation to increase their financial leverage. But this process ends because of an endogenous reversal of the liquidity preference which corresponds to a reversal of collective opinion in financial markets. As a consequence, credit risk is revised upward, which generates the fall in investment. When investors in financial markets start having doubts about the value of collateral (the sum of retained earnings here) liquidity preference starts rising and this generates a fall in prices on financial markets. These doubts generate a revaluation of credit risk. Investors run towards liquidity, which thus leads firms to run strong insolvency risks since the refinancing of debt becomes extremely difficult.

The Stock Flow Consistent (SFC) approach is well suited to analyze these issues. Thanks to a complete description of the balance sheets of each agent and of the associated flows of funds, the main components of Post-Keynesian macroeconomic models can be incorporated in a consistent way: relations between capital accumulation and income distribution, wealth effects (especially for rentiers), valorization effects (due to capital gains or losses), and a debt-led growth regime under a Minskyan perspective.

Lavoie and Godley (2001), Godley and Lavoie (2007), Taylor (2004, 2012), Dos Santos and Zezza (2004) have proposed SFC models including most of these factors. Though similar in spirit, these models differ in some aspects from ours. Godley and Lavoie (2007) use computer simulations to study the nature of growth regimes while Taylor (2004, 2012) and Dos Santos and Zezza (2004) study analytically the dynamics of their models. Beyond this methodological divergence, the models differ in the way they deal with debt and equity issuing, on which we focus.

Godley and Lavoie, Dos Santos and Zezza, as well as Taylor in some of his models, retain an equation describing equities issued. Consequently, credit demand by firms is simply determined as a residual of the firms' financing account. In Taylor (2012) asset prices display positive own-feedback but must eventually be reversed by other forces. The growth rate of the price of equity depends positively on the financial rate of return and the valuation ratio (or Tobin's Q), and negatively on the dividends-capital stock ratio. Financial accumulation depends positively on the rate of capital accumulation and on the share of newly issued equities on the capital stock, and negatively on the valuation ratio. Investment can stabilize the valuation ratio which negatively affects equities, but positively their price.

⁵ This includes capital gains and valuation effects.

⁶ Impulse response functions analyzed through econometric models are another form of analyzing shocks of this type. Despite the usefulness of this technique, however, the inconvenience is that they are able to trace out the shocks of the series included in the model, leaving other (*i.e.* intra and inter-sector) variables ignored.

Alternatively, Taylor (2004), in two other versions of his models, retains an explicit firms' credit demand equation with no issued equities or with equities determined as a residual of the firms' budget constraint.

These issues are not discussed in detail in the SFC literature and do not seem to be central for the models' properties. However, this trade-off between debt, equity and retained profits is important in the growth regime which prevailed since the 1990s. Under this perspective, a simplified SFC framework is outlined below with two versions of the model corresponding to the main closures previously discussed, one with an indebtedness norm (or loan demand), the other with an own funds norm (or equities issued).

The following section describes the model we built and tested for a fictitious financialized economy. It must be noticed, however, that our main aim is to test actual economies using real data. With this in mind, we propose the following system of equations, but we acknowledge that some elements must be introduced in further extensions of the model⁷ which, at this stage, we decided to omit for simplification and better focus on financialization as explained above. Moreover, an advantage of our model is that, as it includes explicitly the balance sheet of firms, it is of potential use to analyze "Balance Sheet Recessions" à la Koo.

3. The Model

We assume there are five sectors in the economy: households, non financial firms (NFCs), the government, private banks and a Central Bank. In this first highly simplified model the price level is assumed to be constant across all periods. The price of equities plays a market-clearing role, since it comes from supply of equity (by firms) and demand for it (from firms and households) equations.

Table 1. Simplified Matrix of Stocks for a Closed Economy

	<i>Households</i>	<i>NFCs</i>	<i>Govt.</i>	<i>Banks</i>	<i>Central Bank</i>
<i>Capital</i>		K			
<i>Money</i>	Hh			Hb	$-H$
<i>Deposits</i>	BD			$-BD$	
<i>Loans</i>		$-L$		L	
<i>Bonds</i>	$pb*B$		$-pb*B$		
<i>Equities</i>	$pe*Eh$	$pe*Ee$ $-pe*E$			
<i>Bills</i>			$-BT$	BT	
<i>Refinancing</i>				$-RF$	RF
	$-Vh$	$-Ve$	$-Vg$	$-Vb$	

The second column of Table 1 describes the stock of wealth held by households ($-Vh$)⁸, which is made up of cash (Hh), bank deposits (BD), bonds ($pb*B$, where pb is their price) and equities ($pe*Eh$, with pe their price and Eh the amount they hold). In the same vein (third column) firms contract debts ($-L$), hold equities ($pe*Ee$, with Ee the volume) and issue equities ($-pe*E$) in order to finance capital (K). NFCs hold an outstanding amount of wealth ($-Ve$).

The government (fourth column) issues the bonds ($-pb*B$) households retain⁹ and the Treasury bills ($-BT$) held by private banks. Total government debt (Vg) is the sum of the last

⁷ For instance; the housing sector, households' debt, the evolution of wages and prices, foreign trade, and capital movements.

⁸ The last row of the table is the outstanding value held by each sector, and is shown with a minus sign because the accounting tells us that assets must equal liabilities plus capital, thus as liabilities are presented with a minus sign and the total must be zero, each sector's value is also shown with a minus sign. This "Total" row (as well as the last column, which plays the same role) is omitted in order to save space.

two terms with a minus sign. Private banks (fifth column) hold a total amount of wealth ($-Vb$) which comes from holding reserves (Hb), making loans to firms ($-L$), lending to the government (BT) and getting refinanced by the Central Bank ($-RF$). To this it must be deducted the deposits they issue for households. The Central Bank (last column) in turn issues all the money (H) in the economy and holds no wealth.

Turning now to the real side of the economy, the first equation of the model is the national income identity and, as we assume a closed economy, the equation says that national income is equal to the sum of consumption (C), investment (I) and government spending¹⁰ (G):

$$(1) \quad Y = C + I + G$$

3. 1. Households' behavior

Equations (2)-(11) describe households' allocation decisions. Disposable income (YDh) is the sum of wages (W), interests on bank deposits ($id*BD_{-1}$) and on bonds (B_{-1}) one period before, and dividends ($DIVh$) net of taxes (T). The Haig-Simons definition of income is the sum of disposable income and households' capital gains (CGh). Taxes are a proportion (θ) of gross disposable income. The consumption function (eq. 5) depends on the Haig-Simons definition of income; a_0 is autonomous consumption; a_1 is the marginal propensity to consume, and a_2 is a (lagged) 'wealth effect'.

$$(2) \quad YDh = W + id*BD_{-1} + B_{-1} + DIVh - T$$

$$(3) \quad YHSh = YDh + CGh$$

$$(4) \quad T = \theta*(W + id*BD_{-1} + B_{-1} + DIVh)$$

$$(5) \quad C = a_0 + a_1*YHSh + a_2*Vh_{-1}$$

Bonds as a proportion of households' wealth (eq. 6) is a linear function of the interest rate on bills (rb), the interest rate on deposits (id) and the rate of return on issued equities (re), with the last two affecting it negatively. The proportion of the value of equities held by households ($pe*Eh$) out of their total wealth¹¹ is negatively influenced by the interest rates and has positive own feedback through its rate of return. The cash held by households are a fixed proportion (λ_0) of consumption. The change (Δ) in the stock of bank deposits (or bank deposits flow) is calculated as a residual of other forms of incoming wealth. Households' capital gains are defined as the revaluation effects of bonds and equities, respectively. Revaluation effects are the change in the prices of the bonds and equities they hold multiplied by their corresponding amounts lagged one period. Total households' wealth was defined above as the sum of assets in column 2 of Table 1.

$$(6) \quad pb*B = Vh*(v_0 + v_1*rb - v_2*id - v_3*re)$$

$$(7) \quad pe*Eh = Vh*(w_0 - w_1*rb - w_2*id + w_3*re)$$

$$(8) \quad Hh = \lambda_0*C$$

$$(9) \quad \Delta BD = YDh - C - pb*\Delta B - pe*\Delta Eh - \Delta Hh$$

$$(10) \quad CGh = B_{-1}*\Delta pb + Eh_{-1}*\Delta pe$$

$$(11) \quad Vh = BD + pb*B + pe*Eh + Hh$$

⁹ For France this is unrealistic, given that private banks hold the majority of bonds issued by the government. Nevertheless, we prefer to maintain this assumption (at this stage) in order to make our model comparable to other SFC models.

¹⁰ Government spending is assumed to grow at a constant 2.5% rate.

¹¹ This equation is solved for pe , see the section Simulations.

3. 2. Firms' behavior

Firms' decisions are described in equations (12)-(27). Following a Kaleckian framework, the investment function (equations 12-14) is assumed to depend positively on the lagged profit rate (UP_{-1}/K_{-2}) and the growth rate of the economy¹² ($\Delta Y/Y_{-1}$) with k_2 being the accelerator effect. Physical capital accumulation depends negatively on the debt ratio (L_{-1}/K_{-1} , given the increasing risk effect as debt grows above the stock of capital), and on the interest rate on loans (rl). Finally, the financial rate of return on equities held (ree) also has a negative impact on accumulation, reflecting an arbitrage between real and financial accumulation. δ is the depreciation rate of capital.

$$(12) \quad g = k_0 + k_1*(UP_{-1}/K_{-2}) + k_2*(\Delta Y/Y_{-1}) - k_3*(L_{-1}/K_{-1}) - k_4*rl - k_5*ree$$

$$(13) \quad I = g*K_{-1}$$

$$(14) \quad \Delta K = I - \delta K_{-1}$$

Financial accumulation might either be described via the share of the value of equities held by firms out of their total capital, real and financial, (eq. 15) or as financial accumulation (eq. 15bis). It is assumed a linear function of the rate of return on equities held (ree) and the profit rate which reflects the economic environment of the firms. The debt ratio also has a positive influence on financial accumulation, given that leverage effects favor financial accumulation, in contrast with the negative impact of higher risk on real investment. In this simulation exercise we retained equation (15), solving for Ee .

$$(15) \quad pe*Ee = (K + pe*Ee)*(f_0 + f_1*ree + f_2*(UP/K_{-1}))$$

$$(15bis) \quad \frac{pe \Delta Ee}{pe_{-1} Ee_{-1}} = f_0 + f_1*ree + f_2*\left(\frac{UP}{K_{-1}}\right) + f_3*\left(\frac{L_{-1}}{K_{-1}}\right)$$

3. 3. Two alternative closures

As mentioned in the introduction and in the section Stylized facts, we want to focus on the way non financial companies finance their investment. We proceed in this fashion to analyze possible Minsky-type cycles when firms finance investment by external funds (debt) and by internal funds (undistributed profits or issuing equities). Analyzing both items at the same time would imply leaving either physical capital or financial accumulation as a residual for accounting consistency to hold, which we do not do in this exercise.

Equations (16) and (16bis) are, respectively, the debt ratio and the own funds norm equations. Model 1 uses equation (16), while the amount of equities issued (E) is deducted from (17), solving for ΔE . Similarly, Model 2 uses (16bis), while debt is deducted from (17), solving for ΔL . The left-hand side of (17) is the spending (or portfolio) decision of firms (between investing and holding equities), whereas the right-hand side represents their resources (from profits, issuing equities or contracting loans).

The debt ratio, interpreted as an indebtedness norm (eq. 16), depends positively on the rate of profit (as higher profitability makes it easier to borrow from banks)¹³, on the rate of return on equities (as a higher cost of issued equities makes credit more attractive) and lastly, as usual, on its rate of interest.

The own funds ratio, in its turn, is measured as a percentage of the total real and financial assets (eq. 16bis). It depends positively on the interest rate on lending (because a higher cost of credit makes equities issuing more attractive), on the debt ratio (an increase of the

¹² This element might be replaced, for instance, by capacity utilization.

¹³ As mentioned above, the profit rate may be treated as a proxy of the value of collateral.

indebtedness forces firms to use more internal funds), and negatively on the rate of return of equities (a higher cost of issuing equities discourages their creation).

$$(16) \quad L/K = g_0 + g_1*(UP_{-1}/K_{-1}) + g_2*re_{-1} - g_3*rl \quad (\text{Model 1})$$

$$(16\text{bis}) \quad \frac{pe*E}{K + pe*Ee} = z_0 + z_1*rl + z_2*\left(\frac{L_{-1}}{K_{-1}}\right) - z_3*re \quad (\text{Model 2})$$

$$(17) \quad I + pe*\Delta Ee = UP + pe*\Delta E + \Delta L$$

Undistributed profits (UP) are the difference between total income (Y) and costs (interest payments, as well as wages and dividends paid to households). Wages (W) are a constant (r_0) share of income. The rate of return of equities issued (re), as in Lavoie and Godley (2001), is equal to the growth rate of the price of equities plus the share of distributed dividends out of total equities previously issued. Dividends, in turn, are calculated (also as in Lavoie and Godley, 2001) as a proportion ($1 - sf$) (where sf is the firms' saving rate) of profits realized the previous period. Dividends paid to firms ($DIVe$) are here defined as the share of equities held by firms out of total equities issued the previous period (Ee_{-1}/E_{-1}). Dividends paid to households, as well as the amount of equities they hold, are calculated as a residual of what firms issue and hold. Firms' capital gains (CGe) come from changes in the price of equities multiplied by the amount held by them (revaluation effect). The outstanding amount of wealth held by firms was defined through the matrix of stocks.

$$(18) \quad UP = Y - W - rl*L_{-1} - DIVh$$

$$(19) \quad W = r_0*Y$$

$$(20) \quad re = (\Delta pe/pe_{-1}) + DIV/(pe_{-1}*E_{-1})$$

$$(21) \quad DIV = (1 - sf)*(Y_{-1} - W_{-1} - rl_{-1}*L_{-2})$$

$$(22) \quad DIVe = DIV*(Ee_{-1}/E_{-1})$$

$$(23) \quad DIVh = DIV - DIVe$$

$$(24) \quad Eh = E - Ee$$

$$(25) \quad CGe = Ee_{-1}*\Delta pe$$

$$(26) \quad Ve = K + pe*Ee - L - pe*E$$

3. 4. Government

Equation (27) describes Treasury bills (ΔBT) newly issued by the government, which are a residual of its expenditures –on current spending (G), interests on its long- and short-term debt– and its revenues –from taxes on personal income (T), taxes on banks (TB) and taxes on the Central Bank (TCB) and from newly issued bonds ($pb*\Delta B$). The price of bonds is assumed to vary inversely with respect to the interest rate paid, which is assumed to be equal to interest rate on bills (short-run). The total wealth held by the government is equal to its debt with a minus sign.

$$(27) \quad \Delta BT = G + r*BT_{-1} + B_{-1} - T - TB - TCB - pb*\Delta B$$

$$(28) \quad pb = 1/rb$$

$$(29) \quad Vg = -D = -BT - pb*B$$

3. 5. Banking sector

Private banks make profits (BP) and pay taxes (TB) out of their income. The latter is made up of interests on loans to non financial firms and to the government minus interest paid on deposits, and refinancing from the Central Bank. θ_b is the tax rate they pay. Banks' refinancing as a flow (ΔRF) comes from the flow of mandatory reserves (ΔHb) issued by the Central Bank, loans (ΔL , paid by NFCs) and Treasury bills (ΔBT , paid by the government), minus their retained profits (BP) and deposits (ΔBD) they pay to households. This refinancing is granted without restriction by the Central Bank. Mandatory reserves are a fixed proportion (λ) of bank deposits. The change in the wealth held by them (ΔVb) is their profits, as seen in equation (34).

$$(30) \quad BP = (1 - \theta_b)(rl*L_{-1} + r*BT_{-1} - id*BD_{-1} - ib*RF_{-1})$$

$$(31) \quad TB = \theta_b*(rl*L_{-1} + r*BT_{-1} - id*BD_{-1} - ib*RF_{-1})$$

$$(32) \quad \Delta RF = \Delta Hb + \Delta L + \Delta BT - BP - \Delta BD$$

$$(33) \quad Hb = \lambda*BD$$

$$(34) \quad \Delta Vb = BP$$

The Central Bank receives interests from private banks out of previous refinancing and transfers them as taxes to the government (TCB). As a consequence, the Central Bank makes no profits and its net wealth remains constant, equal to zero. Total high-powered-money (H) is the sum of cash held by households and reserves made by commercial banks, which is issued by the Central Bank. The interest rate on loans (rl) is assumed higher than the short term interest rate controlled by the Central Bank (ib) and supposed exogenous, where m_1b (here assumed equal to m_2b) is the spread. Inversely, the interest rate on deposits (id) is supposed at a lower level than the latter, which is at the origin of banks' profit. The interest rate on Treasury bills (r) is assumed to be equal to the interest rate on loans (rl), which is in turn equal to the yield on long-term bonds (rb).

$$(35) \quad TCB = ib*RF_{-1}$$

$$(36) \quad H = Hh + Hb$$

$$(37) \quad rl = ib + m_1b$$

$$(38) \quad id = ib - m_2b$$

$$(39) \quad r = rl$$

$$(40) \quad rb = r$$

In order to ensure that in our model all flows come from somewhere and go somewhere, we make sure that in both models $H = RF$ (the Central Bank's equilibrium; the unwritten equation). The final condition for the model to be consistent in its accounting structure is that the capital stock must equal the sum of all wealth held by all the economic agents in the model; $Vh + Ve + Vg + Vb = K$.

3. 6. The working of the model

Table 2 summarizes in a simplified way the main determinants of fixed and financial accumulation on the one hand, and of equity issuing and indebtedness on the other, since they result from the outlined SFC model and from econometric estimations obtained in Clévenot *et al.* (2010; 2012). These relations characterize some of the main features of the finance-led

growth regime regarding firms in France. They allow us to describe financial cycles under a Minskyan approach, as it is illustrated in Figure 5¹⁴.

In order to illustrate the causal mechanism of our model, let us begin by assuming a rise in the financial rate of return. This will stimulate financial accumulation at the same time that equity issuing will be reduced. The fall in the supply of equity will lead to an increase in the price of equities, which will in turn further increase the financial rate of return.

Table 2. Main Financial Determinants of Firms' Behavior

	<i>Fixed capital accumulation</i>	<i>Financial accumulation</i>	<i>Equity issuing</i>	<i>Debt ratio</i>
<i>Profit rate</i>	+	+		+
<i>Real interest rate</i>	-	-	+	-
<i>Debt ratio</i>	-	+	+	
<i>Financial rate of return</i>	-	+	-	+

Signs of partial derivative of explained variables (columns) regarding each explaining variable (rows) according to each equation.

On the other hand, higher financial profitability will induce firms to borrow more, thus increasing their indebtedness. The latter sustains financial accumulation through the leverage effect. In this setting, fixed capital accumulation suffers a slowdown via negative impacts of (1) the rise in the financial rate of return and (2) the debt ratio, which reflects an increasing risk.

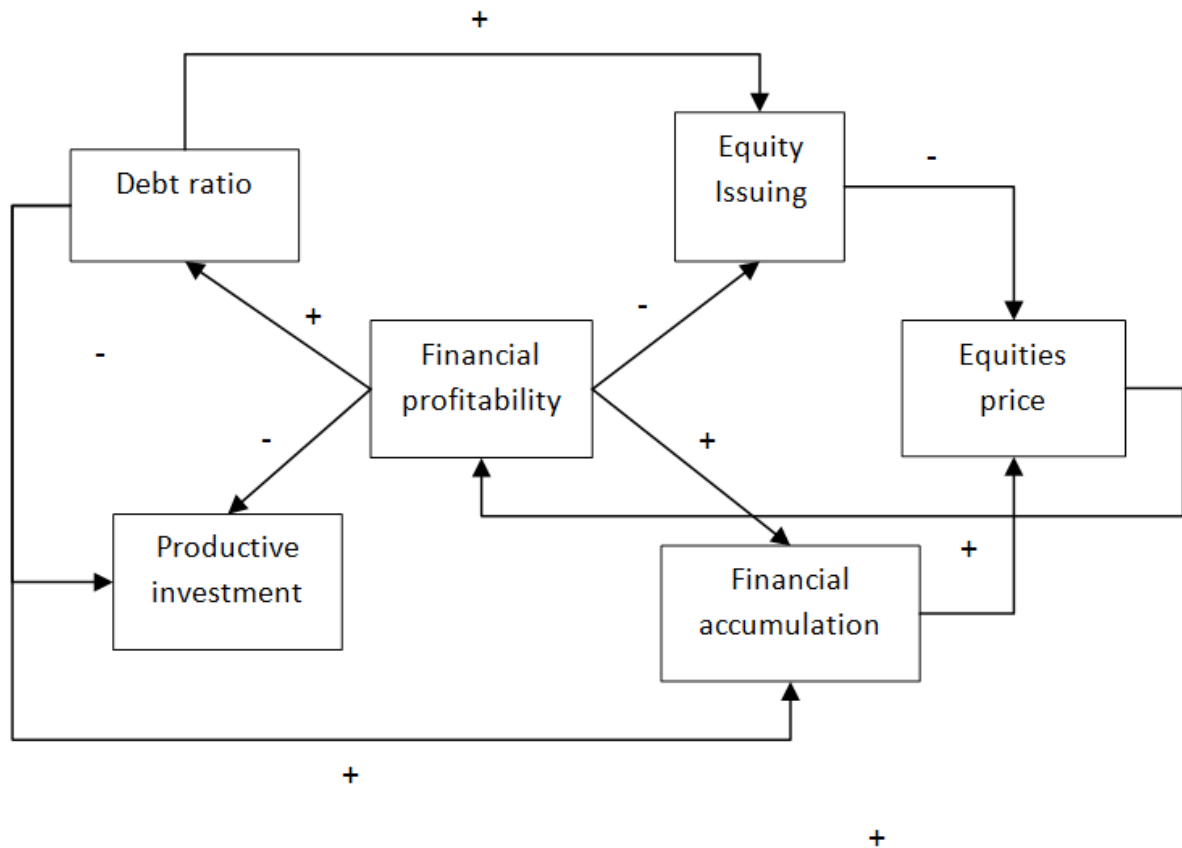
The contrast between booming financial accumulation and the halfway recovery of fixed capital accumulation has been a common feature of the nineties and 2000s in many industrialized countries, as we saw above with French data.

In this ascending phase of the financial cycle, the main stabilizing mechanism is the positive effect of rising indebtedness (induced by higher financial profitability) which leads firms to issue more equities, contributing to impose a limit to the increase in their price. This leads to a fall in the financial rate of profit which limits financial accumulation and reinforces the adjustment mechanism. The impact of the financial sphere on the real sector is realized via two effects of opposite direction, one negative of the financial rate of profit on real investment, the other positive of capital gains on households' income and consumption. A last feedback of the real economic activity goes from households' demand for equities to the price of equity and the financial sphere. In that sense, our model would describe how the process could end in an endogenous reversal. But it might not be always the case if the stabilizing mechanisms appear insufficient. This can reflect the instability of financialized growth regimes¹⁵. Simulations in the next section will help to clarify this issue.

Figure 5. The interaction between the main firms' parameters in the framework of a financial cycle

¹⁴ The two closures of the model are presented simultaneously in Figure 5 for the sake of simplification, although equities issuing or debt are alternatively determined as a residual through an accounting equation.

¹⁵ A full description of the cycle deserves much more than a few lines. This lies, however, beyond the scope of our paper.



Three points can be added with respect to our model's properties. First, a *restrictive* monetary policy may contribute to stabilize the system. A rise in interest rates imposes a halt to financial accumulation, given that the cost of external financing rises. At the same time it favors the issuing of equities whose cost appears relatively more attractive. A higher supply of equities helps in setting their price and financial profitability at a lower level. On the other hand, with higher interest rates, indebtedness is naturally reduced, which in turn limits financial accumulation. The overall effect on fixed investment and growth is, most of the time, negative due to the rising cost of credit. This also contributes to limit the dynamics of the financial sphere as the demand for equity is reduced.

Second, the economic environment and the demand side can be analyzed through our model. A rise in the price of equities induces capital gains and increases households' wealth, which in turn sustains their consumption and, indirectly, demand and fixed investment. A higher profit rate stimulates both fixed investment and financial accumulation and encourages firms to incur into higher levels of indebtedness, which indirectly favors the issuing of equities and contributes to stabilize the system.

Third, our model focuses only on the relations between firms and finance, which is a key link of a finance-led growth regime. At this initial stage, however, the model provides a simplified representation of households, since it ignores their debt and investment in housing, which has played an important role in the current financial crisis. Households' portfolio behavior would also have to be adapted with two types of households, according to the level of their wealth and income. The behavior of banks is also highly simplified and does not reflect their active role in the economy, neither in financial accumulation nor in financialization. Despite these simplifications, the model remains rather comprehensive and allows us to take into account the capital structure of firms, which is our main objective.

4. Simulations

A first set of simulations of our SFC model is proposed to provide a better understanding of the working of the model. At this first stage, calibration has been loosely based on French national accounts in stocks and flows for 2009. For firms' equations (real and financial investment, debt and equity) the corresponding parameters are taken from Clévenot *et al.* (2010; 2012) and some preliminary informal estimates¹⁶.

Two models will be examined; Model 1 with an indebtedness norm and Model 2 with an own-funds norm (see the previous section). In order to study the mechanisms of these two models, shocks on the demand, supply and financial sides are carried out. Before proceeding with the description of these shocks, it seems useful to say a few words about the reference baseline output growth and capital accumulation rates of each model. Model 1 with the indebtedness norm exhibits 5-period cycles from peak to peak (upper panel of Figure 6), which diminish in size over time, as the series approach the steady-state. On the other hand, Model 2 with an own-funds norm also exhibits cycles, though over a much longer span (from peak to trough there is more than 50 periods), as shown in the lower panel of Figure 6.

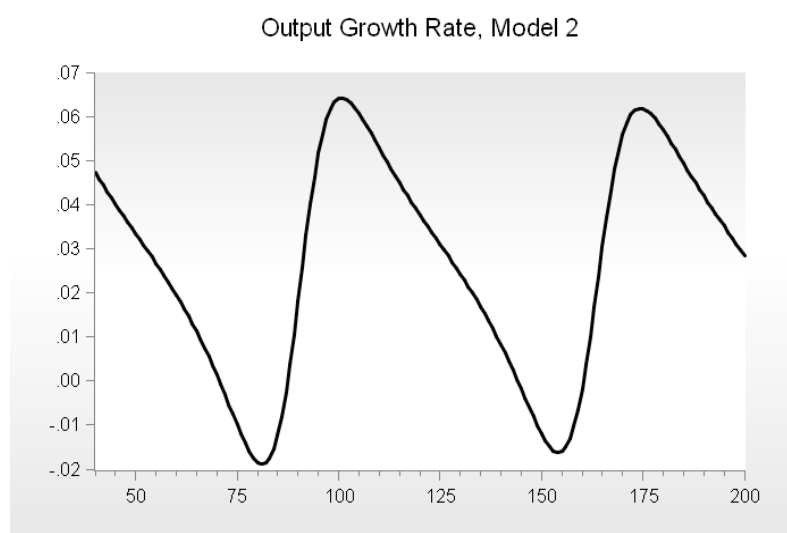
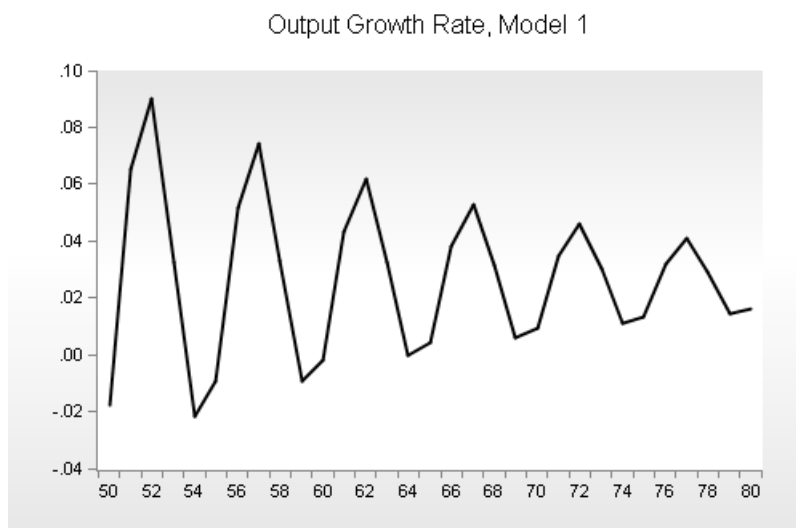
The nature of these contrasted cyclical behaviors¹⁷ lies in the functional forms of the two closures and their lags. In Model 1 the indebtedness norm (which is naturally excluded in Model 2) depends on the profit rate lagged one period (eq. 16), at the same time that undistributed profits (eq. 18) are reduced when firms' credit demand augments. The capital accumulation function (eq. 12) includes both with different lag orders as its determinants. The cycle in Model 1 may be better understood if we take as an example an increase in the profit rate, after which there is a corresponding increase in capital accumulation and indebtedness in about the same period. The latter has a negative effect on the former one period later. This fall in capital accumulation, in its turn, depresses demand and profits. The fall in profits curtails credit demand but makes accumulation increase via lower leverage effects. Given that investment is affected by the lagged profit rate and the lagged debt-ratio, high growth rates of income, *i.e.* in period 52, coincide with low rates of capital accumulation, and vice versa, *i.e.* period 54. This process is carried over monotonically every five periods, as seen in the upper panel of Figure 6.

In Model 2 the own funds norm do not depend directly on the profit rate (we do not see a clear reason why this should be the case), nor does the profit rate depend directly on the value of equities issued. The reversal takes place indirectly and on a much longer span through the evolution of financial profitability and accumulation, which are negatively linked through the coefficient k_5 (eq. 12).

Figure 6. Baseline output growth paths

¹⁶ Our agenda includes, for the future, more solid statistical evidence regarding the size of the parameters in the behavioral equations.

¹⁷ We do not claim that any set of parameters and/or starting values in our (or any other) model will yield cyclical monotonous behavior as ours. Indeed, the presence or absence of cycles and the behavior of the variables in any simulated model will depend (at least) on (1) the behavioral functions imposed on the model, (2) the size of the parameters and (3) the lags in those equations.



We now carry out our simulation experiments, which consist in five scenarios, which are exogenous increases (or shocks) in: (1) consumption, (2) the wage share, (3) the investment function, (4) the demand for equities from firms, and (5) the demand for equities from households. Shocks 1, 2 and 3 are on the demand side and Shocks 4 and 5 on the financial side. The effects of these shocks are analyzed graphically for Model 1 (indebtedness norm) and Model 2 (own funds norm), as compared to the evolution of the corresponding baseline solution, on the following variables: output (Y), personal consumption (CP), the price of equities (pe)¹⁸, capital accumulation (I/K), the profit rate (UP/K), the share of equities held by firms out of their total assets ($pe * Ee / (K + pe * Ee)$), the debt ratio (L/K) and the financial rate of return (re)¹⁹. Although shocks run from $t = 45$ to the end of the sample, the reader must bear in mind that what we analyze here are once-and-for-all shocks on single variables, which in turn imply no other change in economic policy or other exogenous factors. The possibility of policy responses (*i.e.* a ‘Taylor’ rule) is also left for further research.

4. 1. Increase in households’ consumption

We begin by describing a shock on the demand side. We assume that autonomous consumption increases 2.5% out of total personal consumption ($\Delta a_{\theta} = 1.5$).

¹⁸ All three as ratios of the baseline solution.

¹⁹ Since these are ratios, we present them as differences, with respect to the baseline solution.

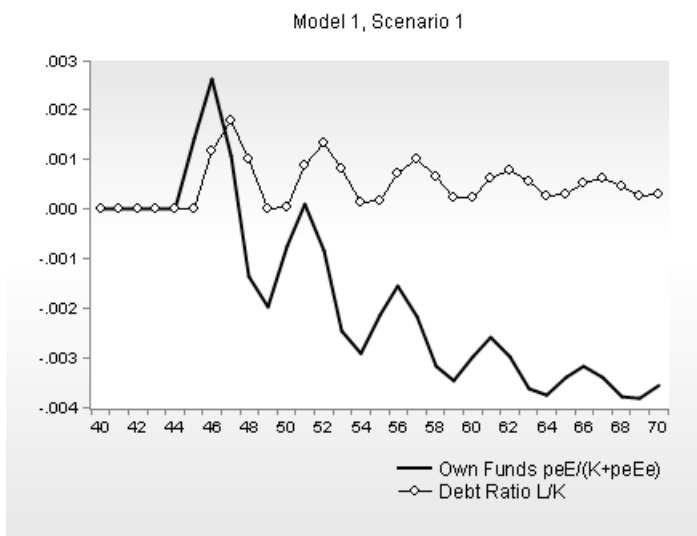
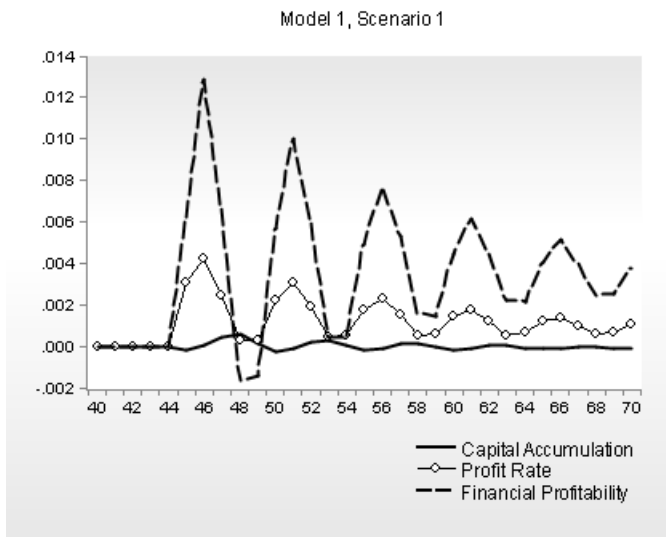
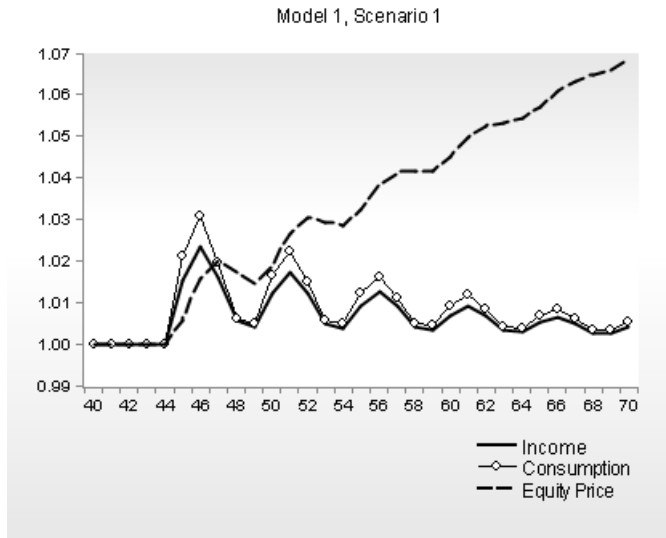
4. 1. 1. Model 1 with indebtedness norm

Figure 7 illustrates what happens in Model 1 with the indebtedness norm. As can be seen from the top panel, an increase in personal consumption has the expected positive effect on output which, although less than proportional, takes place immediately and extends to the longer-run, following a traditional Keynesian recovery. This brings about an increase in the price of equities, as firms gradually curtail their issuing of equity (middle panel) thanks to the economic recovery and the improvement of undistributed profits. Two periods after the shock the first economic downturn occurs, followed by a three period fall of profits and demand, and a subsequent recovery to lower levels than those achieved the former peak, still higher than those achieved in the baseline model. The price of equities reaches its peaks one period after output does. The downturn of the price of equities is the consequence of the fall in output and profit which induces firms to issue new equities in order to finance investment facing the falling debt ratio. With the slowdown investment declines and firms reduce their issuing of equities. This allows a new upturn in equities' price. Consequently a financial cycle can be observed but business cycles become progressively milder.

The other variables provide further information. The accumulation rate (I/K) decreases slightly in the first period after the increase in autonomous consumption, due to the improvement in the financial rate of return which has a negative effect on it. But it then increases significantly along with the recovery, for up to four more periods until profits fall enough for firms to begin issuing equities, which again makes output fall. These differences then become less and less important. For the same reasons just described, the rate of return on equities held and the rate of financial accumulation evolve cyclically. With the indebtedness norm, fluctuations of the debt ratio are of limited size.

Overall, financial cycles can be observed in the market for equities, with acceleration and deceleration of growth in their price and in the financial rate of return. This is mainly explained by the variation of issued equities facing the financing constraint with the indebtedness norm and by the role played by equities' price to clear the market. The equity price bubble does not burst properly as the periodic price falls are unable to compensate for previous increases. Stabilizing forces are insufficient. It may be recalled, however, that in the real world equities prices have been growing in the long run in spite of periodic financial crisis (see Figure 2).

Figure 7. Increase of 2.5% in consumption, Indebtedness Norm



4. 1. 2. Model 2 with own funds norm

The same shock is carried out in Model 2, with an own funds norm. The top panel of Figure 8 also shows, in the short term, a positive effect of an increase in personal

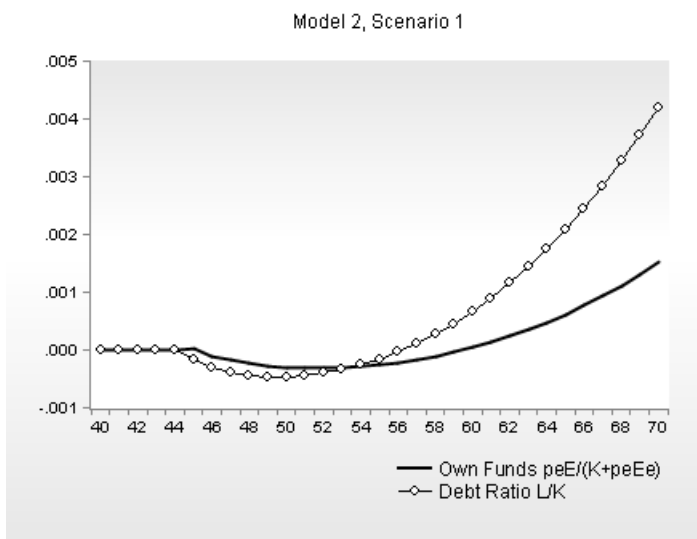
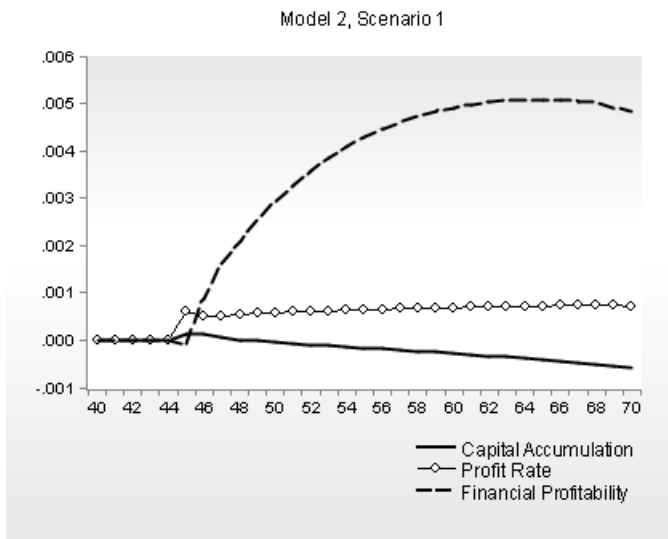
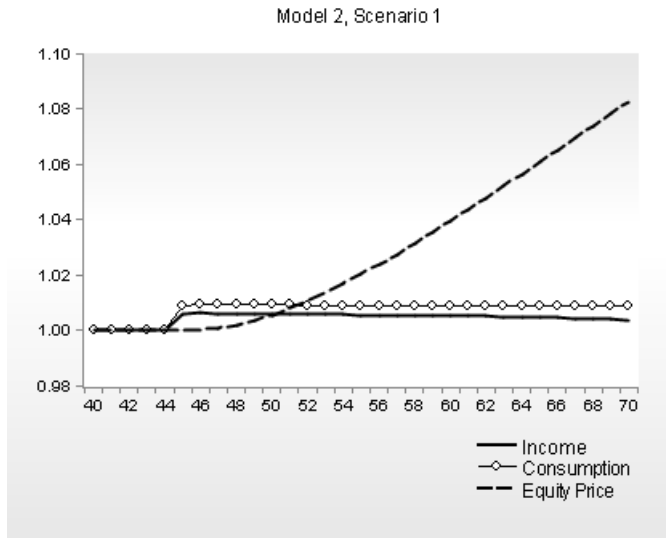
consumption on output, although of more limited amplitude than in Model 1. The price of equities, the profit rate, the equities held by firms and the rate of return on equities are all at higher levels than the baseline. In the short term the debt ratio decreases slightly then grows above the baseline solution, unlike what was observed in Model 1. The reader must bear in mind that in Model 2 loans to firms are determined as a residual. In the short-term firms need less credit thanks to the improvement of profits with the recovery –and preservation of– equities issued with the own funds norm.

But in the medium term the evolution is quite different. There is a financial bubble²⁰ with a higher financial rate of return, increasing financial accumulation and a permanent (though small) decline of the real rate of accumulation. This opposition between real and financial accumulation is close to what has been observed during the 1990s and 2000s (see the section Stylized Facts). Firms' indebtedness increases without limit which stimulates financial accumulation and the growth of the price of equities but reinforces the slowdown in investment and production. More than in Model 1 (with the indebtedness norm), the feedback mechanism is insufficient in Model 2 (with the own funds norm) to make the financial bubble burst. However, the magnitude of the rise in the price of equity remains rather limited (just 0.5% higher than the baseline around period 1970).

Indeed, the two versions of the model show contrasted mechanisms. In Model 1 with the indebtedness norm, there are short-term financial cycles with equities issued determined as a residual and the price of equities clearing the market. In Model 2 with the own funds norm there is a financial bubble with increasing financial accumulation and the price of equity. There is, however, no stabilizing mechanism in the latter. Loans are determined as a residual and the debt ratio increases without limit.

Figure 8. Increase of 2.5% in consumption, Own Funds Norm

²⁰ Financial bubble is here defined as a permanent increase in the price of equity.



4. 2. Increase in the wage share

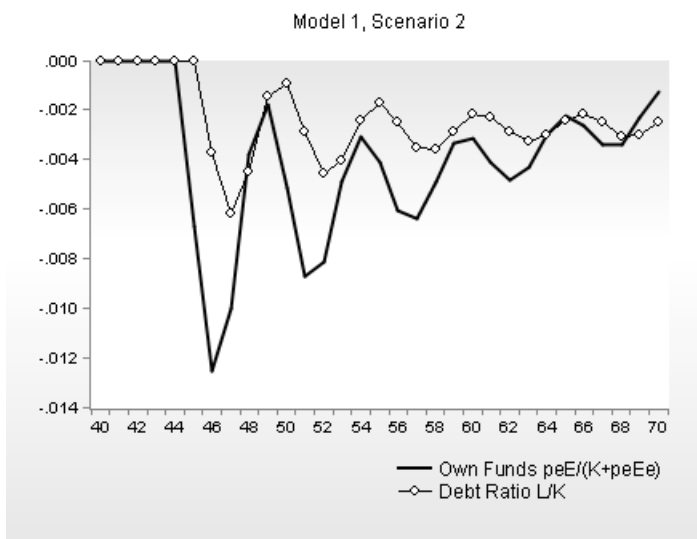
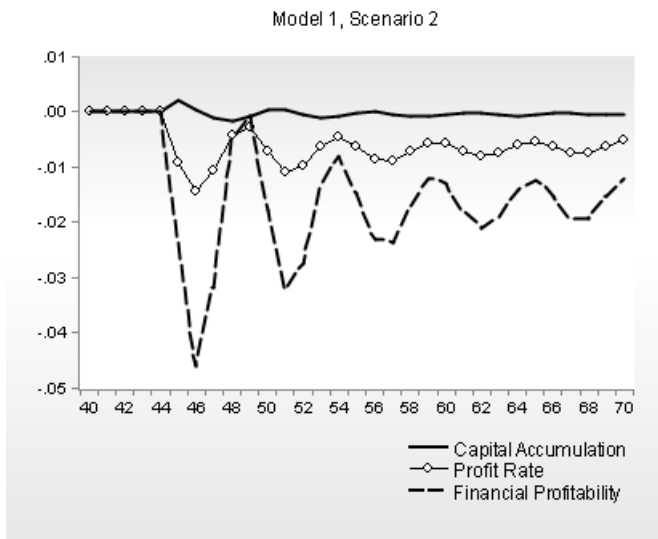
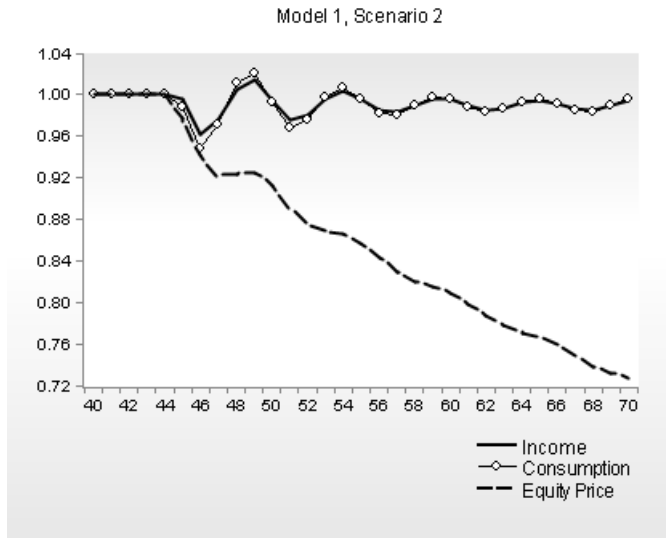
In shock 2 (on the demand side) it is assumed that the wage share is 2% higher.

4. 2. 1. Model 1 with indebtedness norm

Figure 9 shows the after-shock evolution of the selected variables under this specification. With the indebtedness norm the increase in the wage share implies lower output because investment is sensitive to the fall in the profit rate and consumption does not increase sufficiently in order to offset the fall in investment. The profit fall, along with the diminishing debt-ratio under this specification, pushes firms to issue more equities which are here determined as a residual. This induces a decline of the price of equities to clear the market and a drastic decline in financial profitability. Indeed consumption decreases despite the increase in the wage share, because household's capital gains are drastically reduced²¹. The slowdown of economic activity and the accumulation rate reduce the supply of equities, which contributes to stabilize their price and, as a consequence, the financial rate of return. As a consequence, a financial cycle can be once again observed with a debt ratio moderately fluctuating with the constraint of the indebtedness norm. Overall, given the current calibration, the economy behaves as a profit-led demand regime with financial fluctuations.

Figure 9. Increase of 2% in the wage share, Indebtedness Norm

²¹ The wage share increase has a negative effect on consumption under this specification, but the reader must be aware that this is due to the important amount of equities held by households out of their wealth. This detail shall be improved in further work.



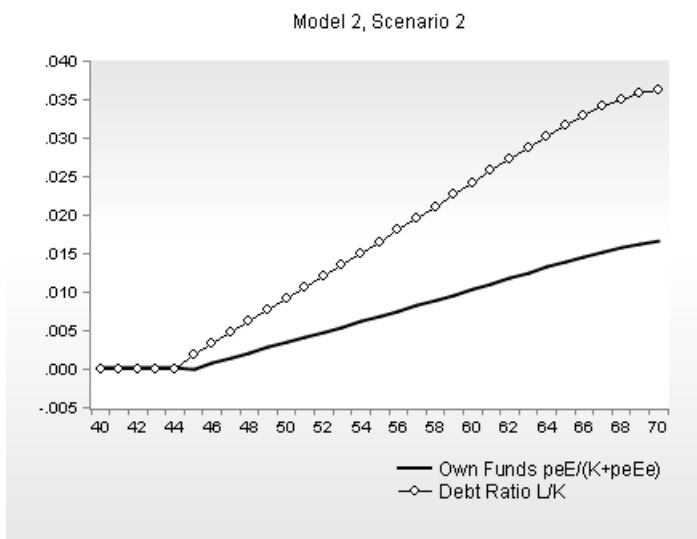
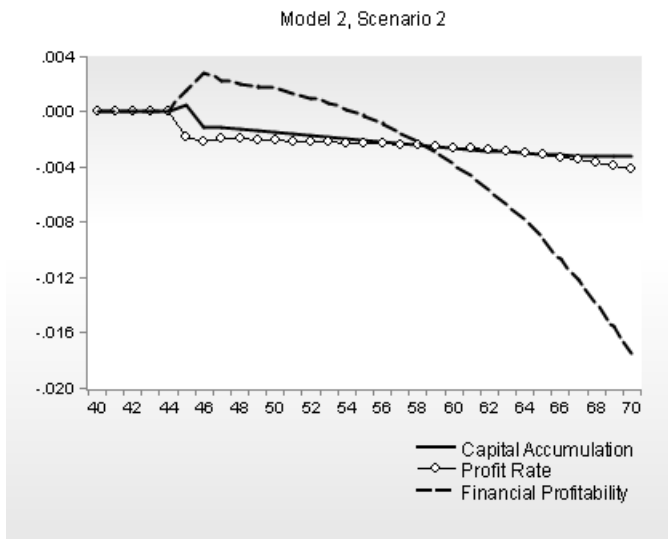
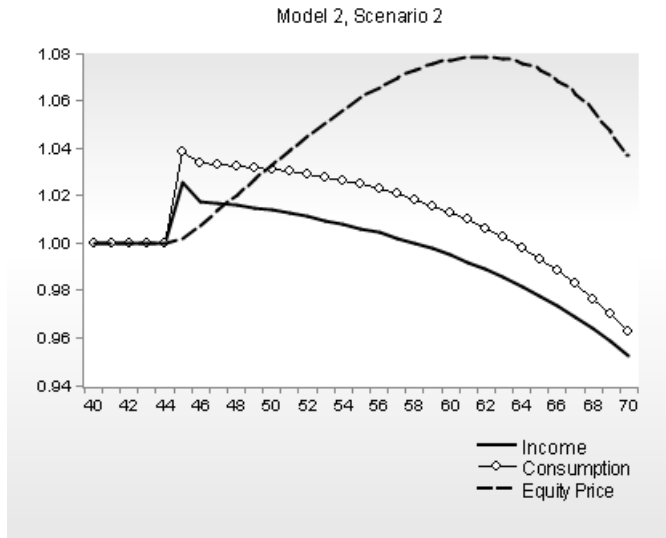
4. 2. 2. Model 2 with own funds norm

On the contrary, Model 2 with the own-funds norm appears wage-led in the short to medium term (Figure 10). It shows that the switch from capitalists' to workers' income

implies a short- to medium-run increase in output more in line with the Post-Keynesian wage-led tradition. In order to offset the declining rate of profit, firms now get more indebted. This is possible because loans are determined under this specification as a residual, which contributes to limit the fall in investment. Debt also sustains financial accumulation with a growing price of equities. In the longer-run the decrease in investment weighs on output growth, which, in the absence of any appropriate policy response, falls.

Overall, the contrast between the two models is confirmed, Model 1 with the indebtedness norm is more financial-cycles driven with the price of equities clearing the market, whereas Model 2 with the own funds norm financial accumulation prevails with growing price of equities at work.

Figure 10. Increase of 2% in the wage share, Own Funds Norm



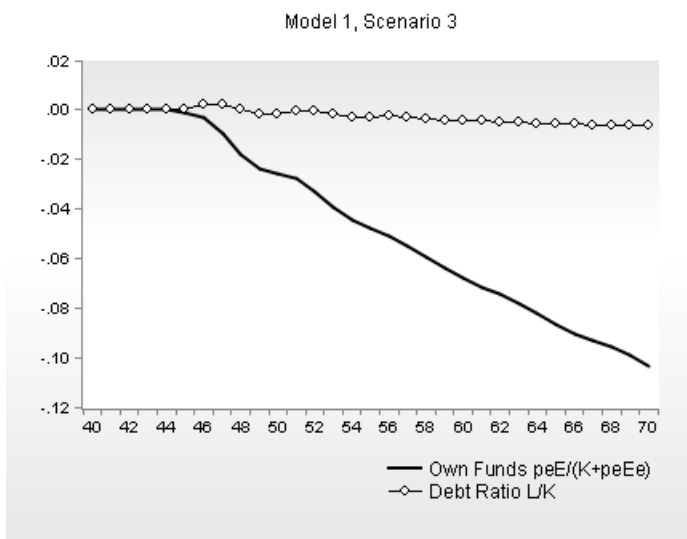
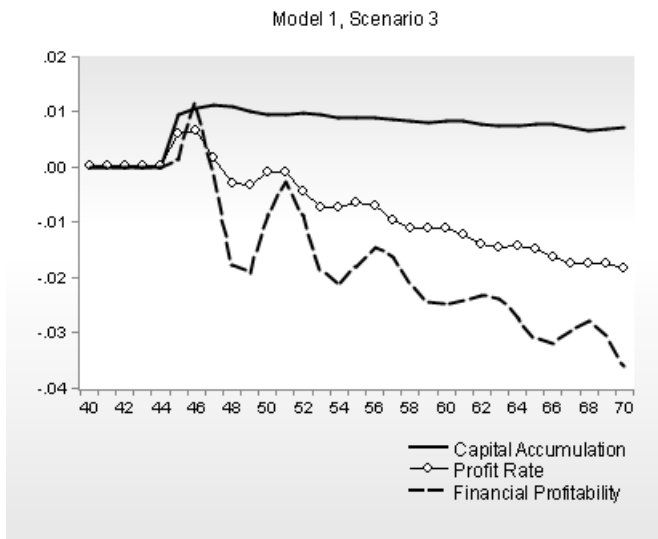
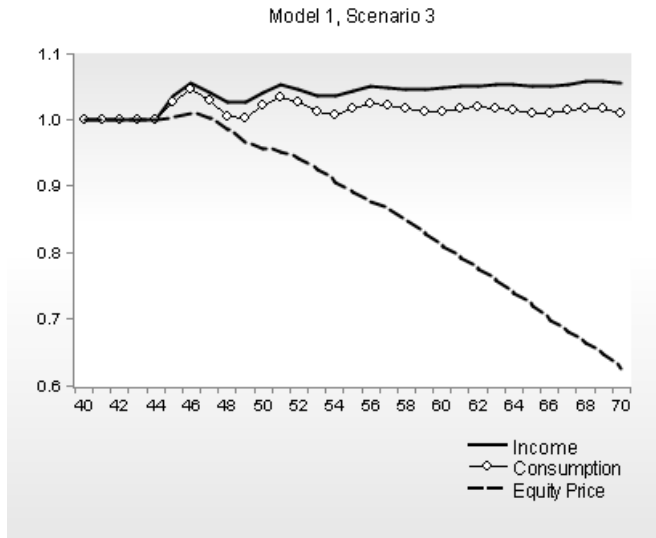
4. 3. Increase in investment

Figures 11 and 12 show what happens to the economy under a shock which implies a 1% increase in the rate of capital accumulation ($\Delta k_0 = 0.01$).

4. 3. 1. Model 1 with indebtedness norm

Figure 11 shows the after-shock evolution of the selected variables under the indebtedness norm. This demand shock implies a permanent increase in output driven by investment and a permanent fall in the price of equities. The consequent decrease in financial profitability keeps investment from falling, which in turn makes the capital stock grow proportionally more than undistributed profits, thus gradually reducing the profit rate. This is explained by the fact that firms are constrained by their indebtedness norm and issue more equities which, following an insufficient demand for these, makes their price fall. In the medium-run, financial accumulation by firms is reduced due to the worsening of the rate of return on equities issued. Demand is sustained by consumption and investment at the expense of capitalists' income coming from both the real and financial sides. In this shock the financial cyclical behavior retains the market clearing role played by the price of equities but is partly offset by the general growth trend.

Figure 11. Increase of 1% in the capital accumulation rate, Indebtedness Norm



4. 3. 2. Model 2 with own funds norm

In Model 2 the shock on investment has a longer-lasting effect in the economy (Figure 12). The price of equity rises due to the own funds norm which limits their supply. This in turn

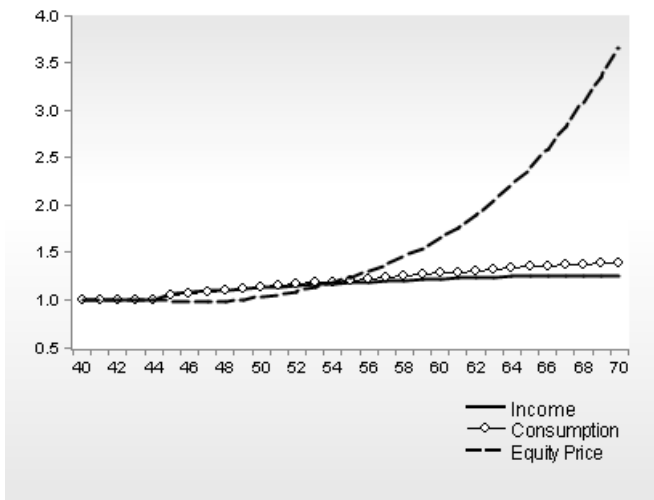
implies an increase in the financial rate of return which sustains financial accumulation and the financial bubble. Firms' indebtedness grows so as to finance supplementary real and financial investment. The debt ratio grows without limit as loans are determined as a residual and can be obtained without restriction. The increase in the price of equities brings about capital gains capable of holding demand at high levels in spite of a decreasing rate of accumulation in the long run. This fall is due to the sensitiveness of the investment function to the negative effect of financial profitability and of the debt ratio, as seen in equation 12. The profit rate remains higher than in the corresponding baseline solution but accumulation eventually falls in the medium-run, both as a consequence of the financial boom and the growing indebtedness. Growth in the long run is sustained by households' consumption, which benefit of wealth effects²². This shock illustrates a combination of a finance-led growth with increasing indebtedness.

This shock on the accumulation rate provides another illustration of the opposition between the two models. In Model 1 with indebtedness norm growth is mainly driven by investment with limited financial accumulation and declining financial rate of return. The financial cyclical behavior remains under constraint in the short term thanks to the general growth trend. In Model 2 with the own funds norm growth is more finance-led with a financial bubble and increasing indebtedness which limits investment in the long run but supports growth thanks to wealth effects.

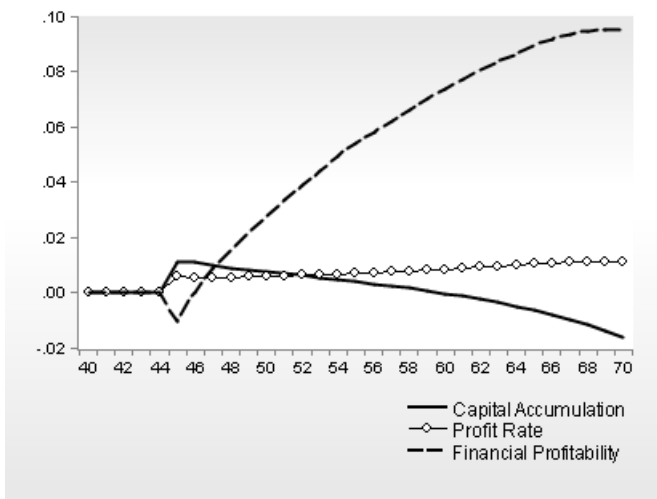
Figure 12. Increase of 1% in the capital accumulation rate, Own Funds Norm

²² This wealth effect could be revised in another calibration reducing the amount of equities held by households.

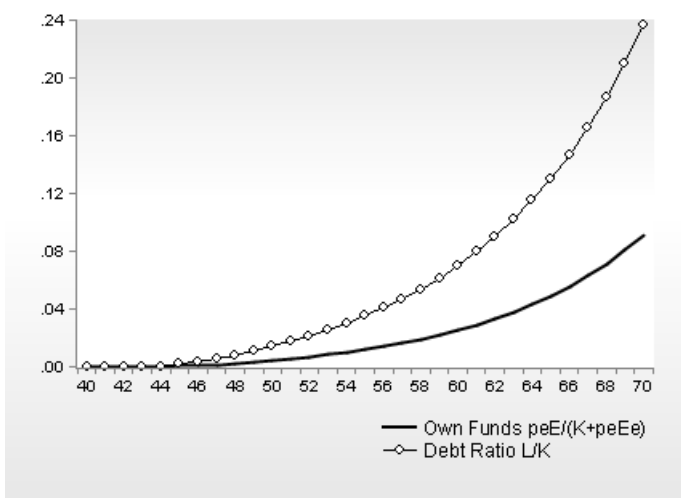
Model 2, Scenario 3



Model 2, Scenario 3



Model 2, Scenario 3



4. 4. Increase in firms' financial accumulation

Figures 13 and 14 are for Models 1 and 2, and show the evolution of the chosen series following a 1% increase in the share of financial accumulation out of their total (physical and financial) wealth: $\Delta f_{\theta} = 0.01$ in equation (15).

4. 4. 1. Model 1 with indebtedness norm

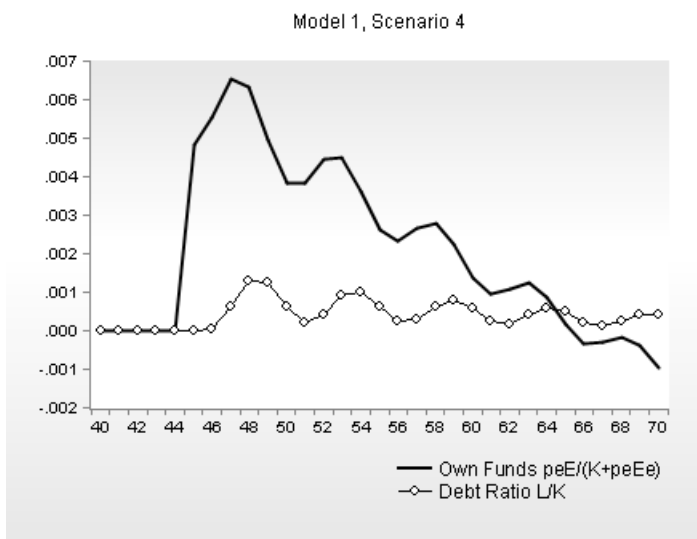
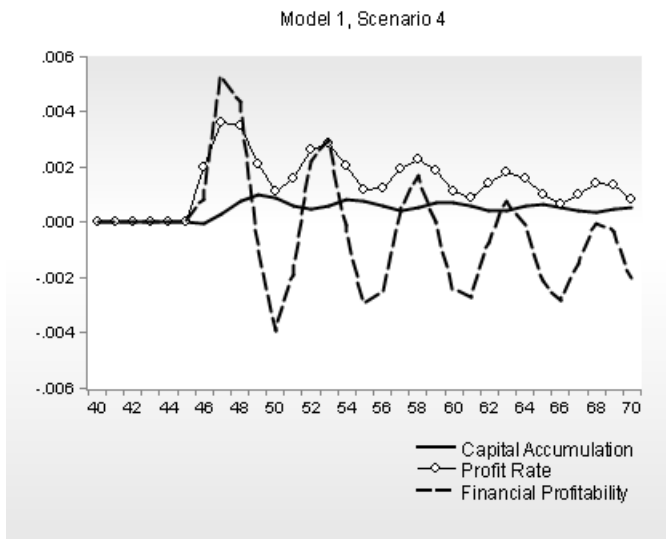
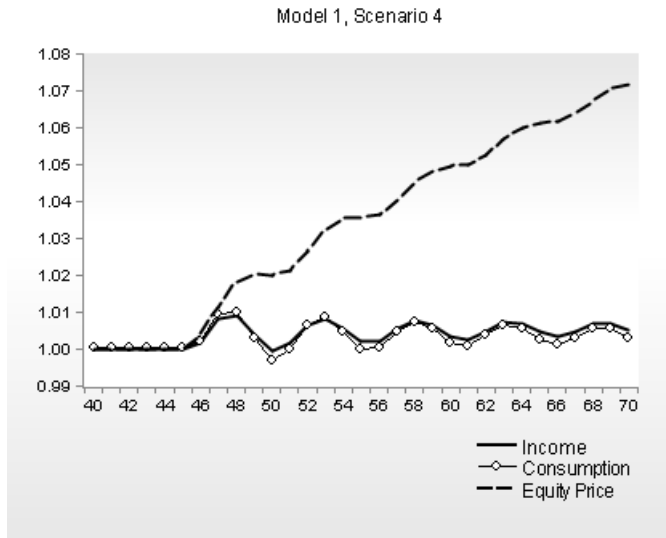
In Model 1 the financial shock on firms' demand for equities implies a cyclical increase in output of limited amplitude, thanks to a stock market boom seen through the rise of the price of equity and of the financial rate of return. Capital gains stimulate households' demand. However, this is followed by a gradual decline in financial profitability due to the new equities issued by firms, which is the denominator in re (see eq. 20). This is a consequence of the specification of the indebtedness norm, which makes investment more dependent on own funds (see the bottom panel of Figure 13). Troughs are not as deep so as to erase the initial gains achieved during peaks, and variations in the profit rate remain above the variations of the accumulation rate. A financial cycle is observed later on, as in the previous shocks, with the price of equity clearing the market.

4. 4. 2. Model 2 with own funds norm

Model 2 shows that, following the rise in firms' financial accumulation as a proportion of their total wealth (physical and financial, K and $pe*Ee$ respectively) under this specification, there is a drastic fall of financial profitability, mainly due to the fall in the price of equity (see below for an explanation), and a correspondingly higher rate of capital accumulation, which is more modest than the fall in the rate of financial return due to the size of the coefficients of re in the corresponding equations which it determines²³. It must be noticed that the scale of both variables is not the straightforwardly comparable. The rate of capital accumulation (a growth rate) in the first period is 0.2% higher, whereas financial profitability (a profit rate) is 3% lower.

Figure 13. Increase of 1% in the firms' financial rate of accumulation, Indebtedness Norm

²³ The coefficient of re in the capital accumulation function is $k_5 = -0.1$, whereas the coefficient of re in the financial accumulation function is $f_j = 0.2$. See the Appendix.



With this increase in the demand for equities one would normally expect a financial bubble. This, however, does not occur under this specification. The equity price falls because of a particular property of our model. Recall that in equation (7) the share of equities held by households out of their outstanding wealth ($pe \cdot Eh/Vh$) tends towards a constant f_0 and as Eh

increases²⁴, this forces the fall in pe (for the 0.5 share to be respected), and this drags down with it financial profitability.

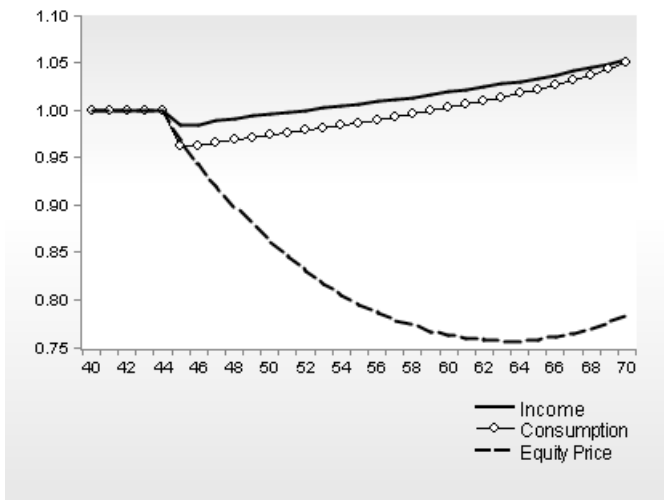
Despite the increase in physical accumulation, income and consequently consumption fall at first due to the financial losses suffered by households. This negative effect is reversed after 10 periods, when the continuous fall in the price of equity is more than offset by the increase in dividends, which is mainly due to the fall in debt (see bottom panel of Figure 14 and equation 21). In period 55 and later, income and consumption rise above the baseline path. The profit rate (middle panel) declines slightly in the first period following the shock as the capital stock increases while undistributed profits fall (via demand) at first. This double effect is fully offset and makes the profit rate equal to that of the baseline path. Own funds fall as a consequence of the increase in K , via the capital accumulation rate, and the fall in pe . Indebtedness falls too given the initial fall in the profit rate and the rise in demand for equities (see equation 17, solving for ΔL).

This and the following shock (also under Model 2) share the particularity that both are led by a fall in the price of equity. This fall is followed by a fall in the debt ratio (*i.e.* a fall in the demand for credit) and this is at the origin of a recession (fall in demand). This is quite parallel to Koo's story of Balance Sheet Recessions, which is possible to model because we respect an accounting structure.

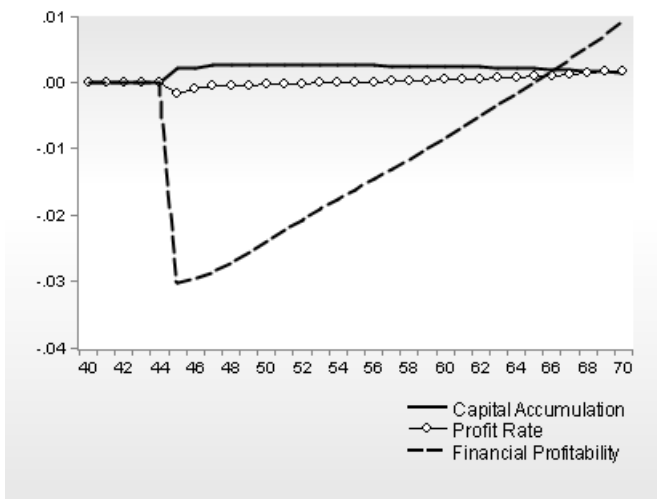
Figure 14. Increase of 1% in the firms' financial rate of accumulation, Own Funds Norm

²⁴ Because E (the supply of equity) increases above Ee (the demand for equity from firms). See eq. 24.

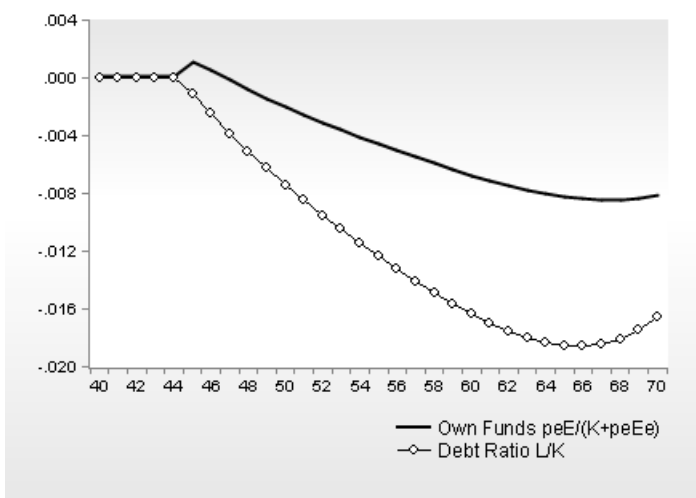
Model 2, Scenario 4



Model 2, Scenario 4



Model 2, Scenario 4



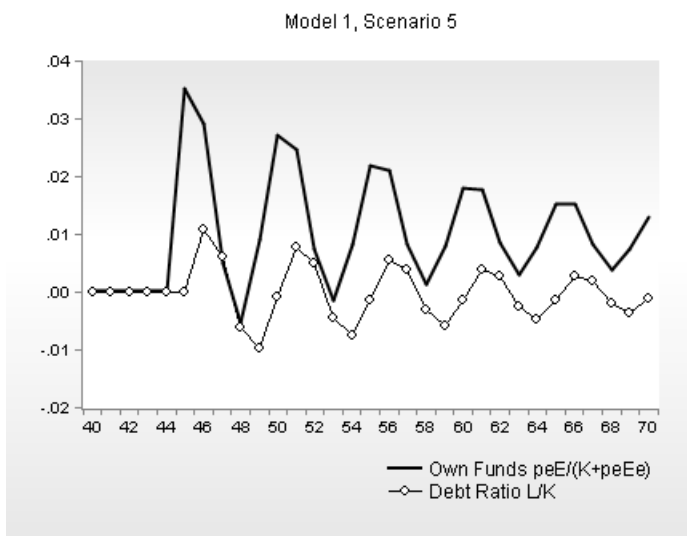
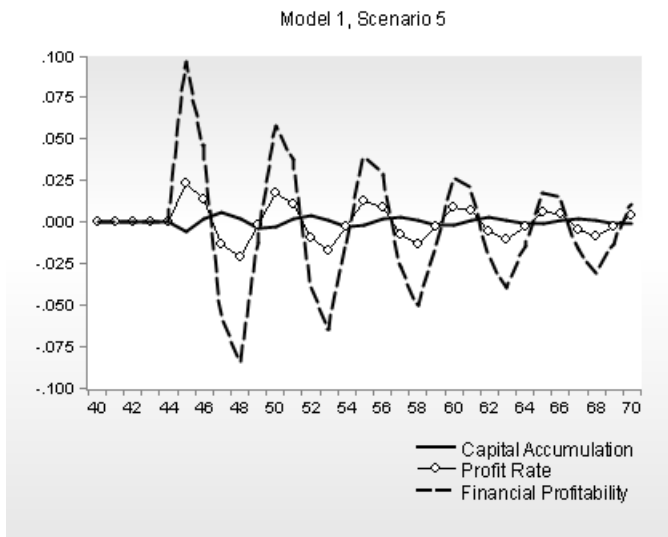
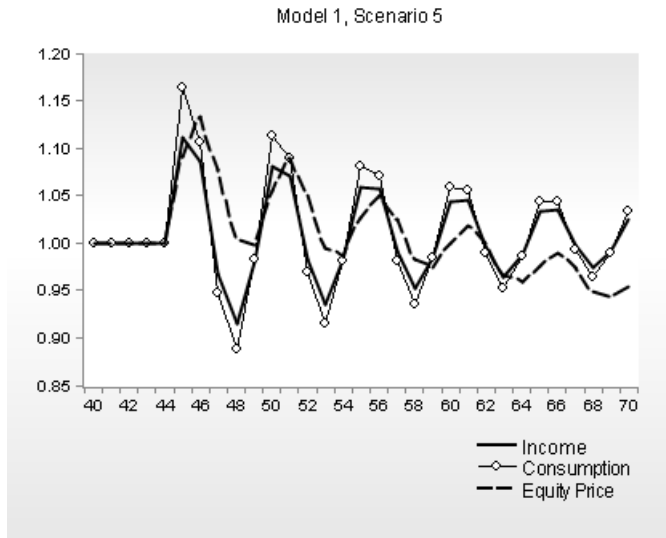
4. 5. Increase in households' demand for equities

This scenario assumes a 1% increase in the share of equities held by households out of their wealth. Figures 15 and 16 show graphically what happens for Models 1 and 2, respectively.

4. 5. 1. Model 1 with indebtedness norm

This financial shock generates large financial cycles with a strong impact on the real side of the economy, clearly led by the price of equity. pe is boosted by the stronger equity demand which increases the financial rate of return. Capital gains improve households' income and demand, while firms' investment is reduced to the benefit of financial accumulation. However, a reversal appears a few periods later. Given the indebtedness norm function the issuing of equities increases. This depresses the financial market and induces a decline of the price of equities and of the financial rate of return. This in turn has a negative impact on households' income and demand and, more broadly, on growth. Financial cycles follow as in the preceding scenarios, but in a more unstable way than in the previous cases. In the longer-run, the increase in the price of equities is unsustainable and thus tends to fall despite the peaks which occur every 5 periods. This happens because non financial firms must issue more equities to finance investment, due to the indebtedness constraint they face. Broadly speaking, what we see is a succession of financial cycles with similar effects on the real side of the economy which appears unstable without any gain in terms of output growth in the medium- to long-run.

Figure 15. Increase of 1% in households' share of financial accumulation, Indebtedness Norm



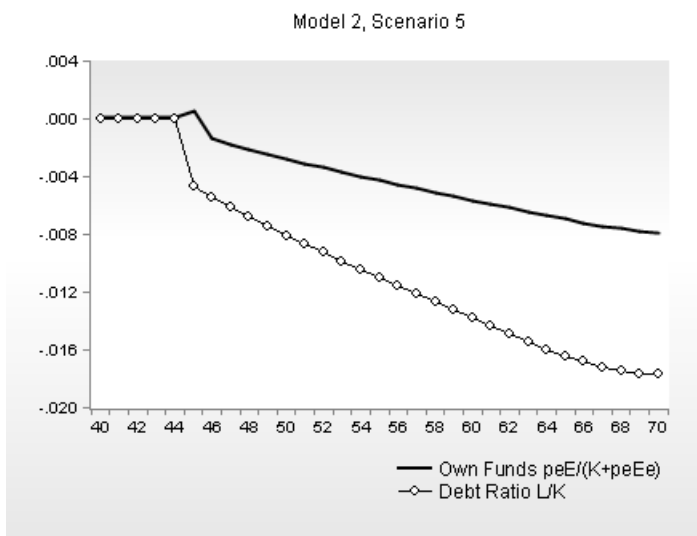
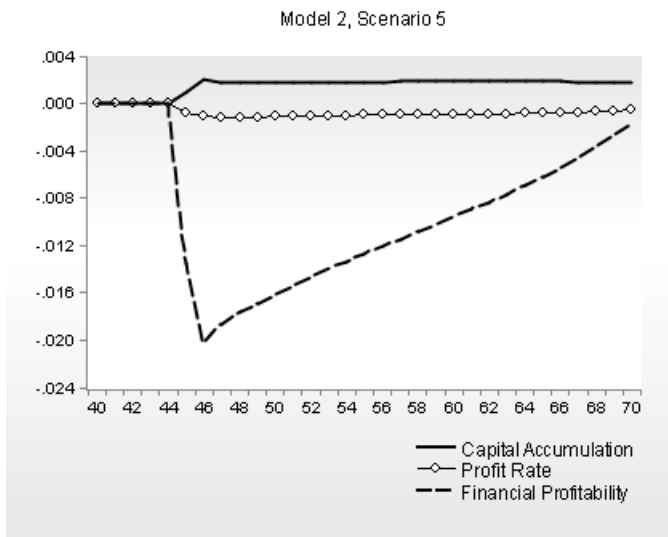
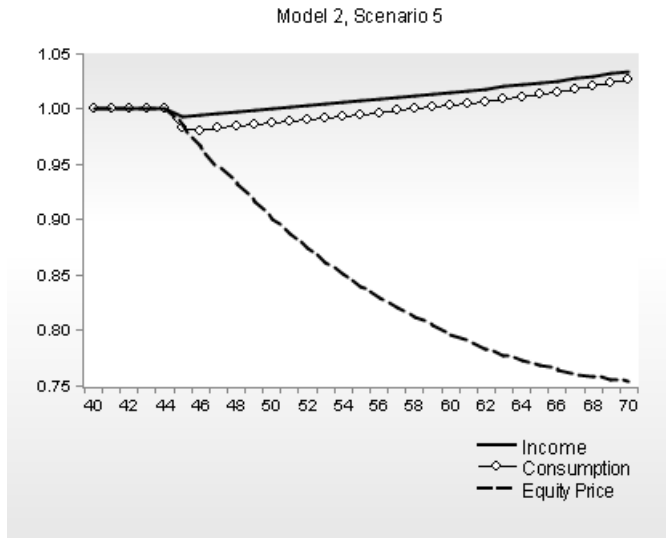
4. 5. 2. Model 2 with own funds norm

In Figure 16 we see that the supplementary demand for equities from households yields identical results to those observed in case of increasing financial accumulation by firms (see

above), though with a slight difference in timing, under this specification. Thus, the evolution of the price of equity is explained along the same lines. What is interesting to highlight in this and the former shock for Model 2 is the opposition between the financial and the real sectors. In this model, a falling price of equity drags down with it the real economy in the short run, but in the medium run this initial negative effect in demand is fully offset and overcome.

Under a long-run perspective, this is representative of financialized regimes. As mentioned above, the set of policies implemented in the eighties gave large predominance to the financial sector, and as it initially grew in importance it made the real sector dependent of it. As it was shown in Figures 1 and 2 in the first section, by 2000 the value of equities issued greatly surpassed that of physical capital, at the same time that the aggregate profit and accumulation rates started falling. This and the former shocks under Model 2 show that higher levels of financial accumulation tend to depress the economy. As a consequence, it also suggests that if capitalists reallocate their investment towards physical capital to the detriment of financial instruments (the opposite of what we have observed for the last thirty years), this would imply short-run losses and a longer-run sustainable demand regime.

**Figure 16. Increase of 1% in households' share of financial accumulation,
Own Funds Norm**



Conclusion

We have studied a “finance-led” growth regime using a Stock-Flow Consistent model with two alternative closures, one with an indebtedness norm (where equities issued are determined

as a residual) and another with an own funds norm (where loans to firms are in turn determined as a residual). Simulations with shocks on the demand side or on the financial side have helped to give a better understanding of the working of the model.

Indeed, the two versions of the model have shown contrasted mechanisms. In Model 1 with the indebtedness norm there are short-term business cycles with equities issued (or own funds) determined as a residual. The price of equity clears the market. Consequently, financial fluctuations, with ups and downs more or less pronounced depending on the scenario and size of the corresponding shock, are the normal regulation mode of this financial regime. In contrast, in Model 2 with the own funds norm there is a financial bubble with increasing financial accumulation and a rising price of equities or a permanent financial deflation, depending on the scenario. There is no stabilizing mechanism under this specification. Loans are determined as a residual and the debt ratio increases or decreases without limit. This financial regime appears structurally unstable.

These differences have appeared clearly, both in the shocks on households' consumption demand and on the wage share. The shock on investment has given another illustration of the opposition between the two models. In Model 1 with the indebtedness norm, growth is mainly driven by investment with limited financial accumulation and a declining financial rate of return. The financial cyclical behavior remains under constraint thanks to the general growth trend. In Model 2 with the own funds norm, growth is more finance-led with a financial bubble and increasing indebtedness which limits investment in the long run but supports growth thanks to wealth effects.

Shocks on the financial sector, on firms' financial accumulation or households' demand for equity, have confirmed the previous observations in the case of Model 1 with the indebtedness norm. Financial cycles with a succession of financial crises are observed in both cases. Model 2 with the own funds norm yields paradoxical, though enlightening, results, which are useful to understand Balance Sheet Recessions under Stock-Flow Consistent models.

These results must be regarded as preliminary. It would be useful to verify the robustness of these conclusions according to the specifications used to characterize the two types of indebtedness or own funds functions. The importance of the wealth effect in households' behavior is another factor to examine. Lastly, the hypothesis of a closed economy will have to be revised by introducing a foreign sector.

Aglietta M. (1998), « Le Capitalisme de demain », Notes de la fondation Saint-Simon, n° 101.

Backus D., Brainard W., Smith G. and Tobin J. (1980), "A model of U.S. financial and non financial economic behavior", *Journal of Money, Credit, and Banking*, May, 12(2), p. 259-293.

Blinder A. and Solow R. (1973), "Does fiscal policy matter?", *Journal of Public Economics*, vol. 2, issue 4, p. 319-337.

Boyer R. (2000), "Is a finance-led growth regime a viable alternative to Fordism? A preliminary analysis", *Economy and Society*, 29 (1), p. 111-145.

Brainard W.C. and Tobin J. (1968), "Pitfalls in financial model building", *American Economic Review*, 58 (2), May, p. 99-122.

Clévenot M., Guy Y. and Mazier J. (2010), "Investment and the rate of profit in a financial context: the French case", *International Review of Applied Economics*, vol. 24, issue 6.

Clévenot M., Guy Y. and Mazier J. (2012), « Financiarisation de l'économie française et modélisation postkeynésienne », *Économie appliquée*, 65 (4), p. 39-78.

Davis E. P. (1987), "A Stock-Flow Consistent macro-econometric model of the UK economy" (parts I and II), *Journal of Applied Econometrics*, vol. 2.

Dimand R. W. (2003), "James Tobin and the Transformation of the IS/LM Model", presented to the History of Political Economy conference on "The IS/LM Model: Its Rise, Fall, and Strange Persistence", Duke University.

Dos Santos, C. and Zezza, G. (2004) "The role of monetary policy in post-Keynesian stock-flow consistent macroeconomic growth models" in Marc Lavoie, Matio Seccareccia (eds.), *Central Banking in the modern world: alternative perspectives*, Edward Elgar, Aldershot, USA, pp. 183-210.

Duwicquet V. and Mazier J. (2011), "Financial integration and macroeconomic adjustments in a monetary union", *Journal of Post Keynesian Economics*, vol. 33, no. 2, pp. 331-368.

Godley W. and Lavoie M. (2007), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, Palgrave Macmillan.

Koo R. (2009), *The Holy Grail of Macroeconomics: lessons from Japan's great recession*, , Singapore: John Wiley & Sons.

Lavoie M. and Godley W. (2001), "Kaleckian Growth Models in a Stock and Flow Monetary Framework: A Kaldorian View", *Journal of Post Keynesian Economics*, 24 (2) (winter), p. 277-312.

Minsky H. (1986), *Stabilizing an Unstable Economy*, McGraw Hill.

Taylor L. (2004) *Reconstructing macroeconomics. Structuralist proposals and critiques of the mainstream*, Harvard University Press.

Taylor L. (2012), "Growth, cycles, asset prices and finance", *Metroeconomica*, vol. 63, issue 1, p. 40-63.

Tobin J. (1969), "A general equilibrium approach to monetary theory", *Journal of Money, Credit, and Banking*, 1 (1), February, p. 15-29.

Initial values of parameters

$$a_0 = 0.5658628$$

$$a_1 = 0.83$$

$$a_2 = 0.04$$

$$k_0 = 0.1086334242\dots$$

$$k_1 = 0.35$$

$$k_2 = 0.025$$

$$k_3 = 0.1$$

$$k_4 = 0.5$$

$$k_5 = 0.1$$

$$v_0 = 0.22382378$$

$$v_1 = 0.2$$

$$v_2 = 0.2$$

$$v_3 = 0.1$$

$$w_0 = 0.38973415 \text{ (Model 1)}$$

$$w_0 = 0.5 \text{ (Model 2)}$$

$$w_1 = 0.01$$

$$w_2 = 0.02$$

$$w_3 = 0.02$$

$$f_0 = 0.09826265506$$

$$f_1 = 0.2$$

$$f_2 = 0.6$$

$$g_0 = 0.2352693030\dots$$

$$g_1 = 0.3$$

$$g_2 = 0.04$$

$g_3 = 0$
 $z_0 = 0.3$
 $z_1 = 0.5$
 $z_2 = 0.45$
 $z_3 = 0.033333\dots$
 $\theta = 0.1$
 $\lambda = 0.050005$
 $\lambda_0 = 0.159143$
 $\delta = 0.0625$
 $r_0 = 0.67652$
 $sf = 0.34097798866$
 $\theta_b = 0.2862767$

Interest Rates

$ib = 0.015$
 $m_1b = 0.005$
 $m_2b = 0.005$

Initial values

$Y = 100$
 $C = 60$
 $I = 25$
 $G = 15$
 $BD = 45$
 $B = 0$
 $BP = 0.979955$
 $BT = 0$
 $DIV = 20$
 $DIVe = 13.33\dots$
 $DIVh = 6.66\dots$
 $Vg = 0$
 $E = 3$
 $Ee = 2$
 $Eh = 1$
 $g = 0.0625$
 $Hh = 9.54858$
 $Hb = 2.250225$
 $K = 400$
 $L = 100$
 $pe = 35$
 $rl = 0.02$
 $r = 0.02$
 $rb = 0.02$
 $TB = 0.393063$
 $TCB = 0.176982075$
 $T = 7.47687$
 $UP = 23.6813$
 $Vh = 89.54858$
 $YHSh = 67.2918$
 $YDh = 67.2918$

$W= 67.652$
 $H= 11.798805$
 $RF= 11.798805$
 $pb= 50$