Título: Financialization, Housing Bubble, and the Great Recession: an interpretation based on a circuit of capital model

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Resumo: Este artigo propõe uma interpretação da Grande Recessão baseada no modelo de Foley do circuito do capital. Argumenta-se que os efeitos contracionistas da financeirização foram compensados pela bolha imobiliária, entre meados da década de 1990 e o início de 2006. O estouro da bolha foi, então, seguido da crise. O modelo é calibrado com base em dados trimestrais das *Flow of Funds Accounts*, entre 1960 e 1995. A interação entre a financeirização e a bolha imobiliária, entre 1996 e 2006 e entre 2006 e 2009, é examinada através da simulação de uma versão de referência do modelo, à qual impõe-se os choques observados.

Palavras-chave: circuito do capital; modelos *stock-flow consistent*; financeirização; bolha imobiliária; Grande Recessão

Classificação JEL: B51, E11, E15, N12

Abstract: This paper offers an interpretation of the Great Recession based on Foley's circuit of capital model. It is maintained that the contractionary effects of financialization were compensated by the housing bubble, from the mid-1990s to the early 2006. The busting of the bubble, then, was followed by the crisis. The model is calibrated with reference to quarterly data from the Flow of Funds Accounts, from 1960 to 1995. The interaction of financialization and the housing bubble, from 1996 to 2006 and from 2006 to 2009, is examined by simulating a baseline version of the model and imposing the observed shocks.

Keywords: circuit of capital; stock-flow consistent models; financialization; housing bubble; Great Recession

JEL Codes: B51, E11, E15, N12

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1. Introduction[1]

The aim of this essay is to offer a partial interpretation for the onset of the Great Recession based on Duncan Foley's (2013b) circuit of capital model with endogenous spending lags. This model, similarly to the stock-flow consistent (SFC) models proposed Wynne Godley and his followers, takes into consideration the interaction of flow and stock variables, allowing one to consider some unsustainable trajectories that seem to have been behind the current crisis. Particularly, the increasing financialization of nonfinancial firms and the housing bubble are arguably two developments that contributed to the crisis and that cannot be grasped by an exclusive focus on flow variables[2].

Despite these advantages, the limits of an attempt of this sort cannot be overstated. First, the necessary simplifications involved in a formal model always bear the risk of assuming away what can plausibly be interpreted as crucial aspects of the crisis. Second, for simplification purposes, this model is linear, although it could incorporate non-linearities (something that is left for future research). And there is growing empirical evidence that capitalist economies present non-linear dynamics (see, for instance, Barbosa-Filho and Taylor, 2006, and Nikiforos and Foley, 2012). Finally, the present exercise is focused on financialization and the housing bubble and overlooks (at least) two issues that might also have played fundamental roles at the onset of the Great Recession, that is, international imbalances and increasing income inequality[3].

With that note of caution in mind, the model is introduced in the following section (Section 2). Then, the calibration of its parameters is described, with reference to data from the Flow of Funds Accounts (Section 3). After that, it is examined how financialization and the housing bubble could be incorporated in the model and some simulations are made to analyze their interaction and their effects on some variables (Section 4). These simulations are done in two steps in order to illuminate, first, the run-up to the Great Recession, from the mid-1990s to the early 2006, and then its onset, from 2006 onwards.

2. Marx meets Godley: a circuit of capital with endogenous spending lags

The tradition of macroeconomic thought that stems from the works of John Maynard Keynes and Michal Kalecki generally begins by positing identities between variables grounded on definitions taken from national accounting. In fact, the development of national accounting in itself owes a great deal to Keynes, who struggled to provide a bridge between his theoretical formulations and economic statistics, with the aim of devising precise tools to guide economic policy (Tily, 2009). The focus, in these pioneering attempts, was on flow variables, like consumption, saving, and investment. Subsequent work, both on the determinants of each of the components of aggregate demand and on the dynamic trajectory of the economy, pointed out to the need to also take into account stock variables[4]. Saving flows gradually accumulate into a wealth stock for those who do not consume their entire income. Similarly, continuous investment in fixed capital builds up a capital stock, the level of which has important implications for the dynamics of the economy as a whole. It is not surprising that this eventually led to the formulation of comprehensive models that aimed at overall consistency between stocks and flows – not only within a

[1] This essay builds extensively on Foley's (2013b) *Mathematica* notebook on the circuit of capital with endogenous spending lags. Not only the model, but also the programming codes used to calibrate it and to simulate it are available in this notebook. My contribution, then, is restricted to the empirical research on which the calibration of the parameters is based and to proposing a simulation of changes of parameters that is intended to illustrate the developments that led to the Great Recession. Thus, I am greatly indebted to Professor Duncan Foley for giving me access to his notebook and stimulating me to engage with it in my research.

[2] Some brief comments about the possibilities and limitations of examining the crisis by resorting to SFC models can de found in Taylor (2008: 643-644) and Macedo e Silva and dos Santos (2011: 114).

[3] See on the former De Cecco (2012), and on the latter van Treeck (2013) and Wisman (2013).

[4] The theories of consumption developed in the 1950s, like Franco Modigliani's life cycle model and Milton Friedman's permanent income hypothesis, are examples of this attempt to integrate stock variables, taking into account in these particular cases consumption out of accumulated wealth besides consumption out of current income. See, on this development and its limits, Taylor (2004: 161-166). Another examples, from about the same time, are the stability issues raised by Roy Harrod and Evsey Domar in the early days of modern growth theory.

sector, but throughout all sectors. Godley's SFC approach is the most famous example of an attempt of this sort[5].

Bearing this in mind, it is interesting to look back to Karl Marx's (1884/1978) earlier attempt to formulate a representation of the entire economy in Volume 2 of *Capital*, where he analyses the circuit of capital: M–C…P…C'–M'[6]. In the early 1980s, Foley (1982, 1986a: 62-90) proposed a mathematical formalization of the circuit of capital, which, he argued, should be read as "an alternative method of macroeconomic analysis based on the labor theory of value in Marx's interpretation." (1982: 318) Since Marx understood capital as value in motion, which temporarily fixes itself in different forms (such as money capital, productive capital, and commodity capital), his circuit was a very useful approach to consider the relations between stocks and flows. Foley's model was precisely an effort in that direction, formalizing the time lags during which value flows got tied-up in different phases of circuit, forming stocks of money, productive capital, and commodities[7]. In the original version of his model, Foley assumed the lags to be exogenous and examined how they impacted reproduction and accumulation. In a more recent version (Foley, 2013b), however, he makes them endogenous by positing behavior equations for the expenditure decisions of firms, households (both worker and capitalist), and a sector that combines government, financial sector, and rest of the world[8]. This version not only makes the circuit of capital framework more easily comparable to other macroeconomic theories, due to the behavior equations, but also brings it closer to Godley's SFC approach, since each "sector" is assumed to aim at target levels of stock-flow ratios, in their expenditure decisions[9]. The present essay resorts to this version of Foley's circuit of capital model in order to provide an interpretation of the developments behind the Great Recession[10]. The first step is to briefly sketch the model, starting from the behavior of each of the "sectors."

2.1. Firms

For simplification purposes, all the variables in the model are normalized by the value of nonfinancial capital, K, that is, the sum of the value of the stock of capital tied-up in production and the value of the stock of finished commodities awaiting sale at cost. All lower-case variables referred below, thus, are the ratio of the respective variables to K. Firms decide the level of their capital outlays, z^F, their net financial position, f^F, and the dividends they pay to their shareholders (the capitalist households), η. Capital outlays are determined in the following away:

$$z^F(t) = r(t) + \gamma + \alpha^F[\gamma - g(t)] - \mu^F[\lambda^F z^F(t) - f^F(t)] \tag{1}$$

[5] See Godley and Lavoie (2007). Taylor (2008: 640-644) provides an account of this transition from flow-flow consistency to stock-flow models, where he mentions, besides the work of Godley, the "Yale" variant, represented by James Tobin, and more recent developments, like real business cycle theories, the work of Carl Chiarella and his colleagues, and computable general equilibrium models. In addition, Godley himself discusses the similarities and differences between his work and Tobin's in Godley and Lavoie (2007: 11-16).

[6] It is important to notice that this effort by Marx did not submerge entirely into the "underworld," as Keynes (1936/1997: 32) claimed, but influenced more or less directly some of the early macroeconomic theories, including Kalecki's. See, for instance, Kalecki (1968). According to Ernest Mandel (1978: 13), "Volume 2 may be seen in a very real sense as the predecessor and initiator of modern aggregation techniques, which were sometimes even directly inspired by the book. On the road from Quesnay through Marx, Walras, Leontiev and Keynes, the leap forward made by Marx is immediately apparent. And the movement away from Marx in neo-classical and vulgar 'macro-economics' contains elements of enormous regression, of which contemporary economists are only now slowly beginning to take note."

[7] Gérard Duménil and Dominique Lévy (2012: 175) also point out this similarity between the SFC approach and models based on Marx's circuit of capital, like Foley's and some of their own.

[8] Other modifications and developments of Foley's original model can be found in Foley (1986b), Basu (2011), and Dos Santos (2011). Empirical exercises based on the model, in their turn, were made by Matthews (2000), Alemi and Foley (2010), and Dos Santos (2013).

[9] On the centrality of these "stock-flow norms" in Godley's approach, see Godley and Lavoie (2007: 16) and Taylor (2008: 644-648).

[10] The entire model presented below was developed by Foley (2013b) and is available in his notebook, as mentioned above.

where r stands for sales revenue at cost of production; γ, for a target capital accumulation rate; g, the actual growth of the value of the capital stock, which is, by definition, equal to $z^F - r$; λ^F, the target ratio of net financial position to total capital outlays; and α^F and μ^F are speeds of adjustment. Thus, firms are assumed to recommit to production the entire sales revenue at cost of production plus a target capital accumulation rate. In addition, fluctuations in sales and in the net financial position of firms are compensated by the two stock-adjustment terms, by which firms aim to reach their target capital accumulation rate and their target ratio of net financial position to total capital outlays. While the first amounts to the usual accelerator effect, the latter represents what Foley (1986a: 68) calls the finance lag, that is, the time it takes for realized value to get recommitted to production in the form of capital outlays – this lag will be a crucial parameter in the simulation exercise below, an increase in it representing the so-called financialization of nonfinancial firms. From this, the determination of the variation of the firms' net financial position follows logically:

$$f^{F\prime}(t) = \beta^F[\lambda^F z^F(t) - f^F(t)] \tag{2}$$

Firms adjust their financial position in order to attain the above-mentioned target ratio of net financial position to total capital outlays, λ^F, that is, their target finance lag. Notice, however, that μ^F and β^F may be different from each other. Finally, payment of dividends is the adjusting variable, meaning that whatever is left over of the firms' cash inflows after the capital outlays and the adjustment of their financial position is paid out as dividends:

$$\eta(t) = (1+q)r(t) + [i - g(t)]f^F(t) - z^F(t) - \beta^F[\lambda^F z^F(t) - f^F(t)] \tag{3}$$

where q is the mark-up of sales price on cost[11]; and i, the interest rate. While $if^F(t)$ stands for interest income on the net financial position of firms, $g(t)f^F(t)$ is the change of the net financial position required to keep the ratio of the net financial position to K constant[12].

2.2. Capitalist households

The behavior of capitalist households is simpler. It is assumed that they merely spend a fixed share, ρ, of their accumulated wealth, which consists exclusively of equities:

$$z^C(t) = \rho\phi a^C(t) \tag{4}$$

where a^C stands for equities and ϕ, their price. Capitalist households have as income only the above-mentioned dividends, which they receive from the firms, and they use what is left of it after deducting z^C to buy more equities (or, if they spend more than what they receive as dividends, they will, of course, sell part of their equities to pay for the difference):

$$\phi a^{C\prime}(t) = \eta(t) - z^C(t) - \phi a^C(t)g(t) \tag{5}$$

2.3. Worker households

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[11] Since 1982, Foley has been defining the mark-up as the rate of surplus value times the composition of capital (wage share of total capital outlays), that is, $q = ek$. This avoids the typical Kaleckian grounding of the mark-up on imperfect competition, shifts its determination to the sphere of production, and, according to him (1982: 301), "integrates the markup with the labor theory of value." See also Foley (1986a: 44-46) and chapter I, above.

[12] A constant level of the intensive variable, that is, of the ratio of the respective variable to the value of nonfinancial capital stock, means that it is growing at the same rate as the value of nonfinancial capital stock. If $f^{F\prime} = 0$, then $\left(\frac{F^F}{K}\right)\prime = \frac{F^F\prime K - F^F K\prime}{K^2} = \frac{F^F\prime}{K} - f^F g = 0$. Hence, $\frac{F^F\prime}{F^F} = g$.

Worker households divide their expenditure into consumption and purchase of newly built houses, a distinction that will be useful to deal with the housing bubble, below. Consumption expenditure, c^W, is determined by workers' wage income, kz^F (k is the composition of capital, that is, the wage share of total capital outlays), interest income in their net financial position, f^W, and a stock-adjustment term, by which worker households aim to maintain a target ratio, ν^W, of net worth to wage income – net worth being the sum of their net financial position and the market value of their housing stock:

$$c^W(t) = kz^F(t) + if^W(t) - [a^W(t) + f^W(t)]g(t) - \alpha^W[\nu^W kz^F(t) - \psi a^W(t) - f^W(t)] \quad (6)$$

where a^W is the housing stock valued at cost of production and ψ, the ratio of market prices of houses to their production cost. The purchase of newly built houses, in its turn, is determined by the attempt by worker households to attain a given target ratio, λ^W, of the market value of the housing stock to wage income, in the following way:

$$a^{W\prime}(t) = \beta^W[\lambda^W kz^F(t) - \psi a^W(t)] \quad (7)$$

Thus, total spending by worker households is the sum consumption and the purchase of houses:

$$z^W(t) = c^W(t) + a^{W\prime}(t) + a^W(t)g(t)$$

which, after some algebraic manipulations, can be transformed to:

$$z^W(t) = (1 - \alpha^W\nu^W + \beta^W\lambda^W)kz^F(t) + [(\alpha^W - \beta^W)\psi]a^W(t) + [\alpha^W + i - g(t)]f^W \quad (8)$$

where $(1 - \alpha^W\nu^W + \beta^W\lambda^W)$ is the marginal propensity to spend out of wages; $[(\alpha^W - \beta^W)\psi]$, the marginal propensity to spend out of the housing stock; and $[\alpha^W + i - g(t)]$, the marginal propensity to spend out of the net financial position.

Finally, the net financial position of worker households is the adjusting variable, in the sense that it varies according to the difference between wage and interest income, on the one hand, and total spending, on the other:

$$f^{W\prime}(t) = kz^F(t) + [i - g(t)]f^W(t) - z^W(t) \quad (9)$$

2.4. Government, financial sector, and rest of the world

The counterpart of the firms' and worker households' net financial position is a sector that represents the government, the financial sector, and the rest of the world combined together. It is assumed to passively absorb the demand of the other "sectors" for financial assets and liabilities, with the result that at any given time:

$$f^G(t) = -[f^F(t) + a^C(t) + f^W(t)]$$

where f^G is the net financial debt of this sector. The growth of this net financial debt depends on this sector expenditure, z^G, and the interest it pays on its debt:

$$f^{G\prime}(t) = z^G(t) + [i - g(t)]f^G(t) \quad (10)$$

To close the model, then, it is assumed that this sector expenditure is determined by its aim to attain a target financial position, λ^G, in the following way:

$$z^G(t) = \beta^G[\lambda^G - f^G(t)] - [i - g(t)]f^G \quad (11)$$

2.5. Aggregate demand, capital accumulation, and profit rate

Aggregate demand, in this model, is the sum of the expenditures of all the "sectors," excluding only firms' payment of wages to avoid double counting:

$$(1+q)r(t) = (1-k)z^F(t) + z^C(t) + z^W(t) + z^G(t) \tag{12}$$

While the finance lag is straightforwardly represented by λ^F in the model, as mentioned above, the realization lag (Foley, 1986a: 68), that is, the time it takes for a finished commodity to be sold, has a more complex interpretation. It is the outcome of the parameters that determine the expenditure decisions of all the "sectors," which determine, in other words, the time it takes for each of them to spend the value flow that they receive at any moment. Moreover, equation 12 is the circuit of capital version of the traditional Keynesian equation for aggregate demand, that is, $Y = I + C + G$. It is useful, as well, to repeat the definition of capital accumulation, g, and to state the definition of the profit rate, $profrate$:

$$g(t) = z^F(t) - r(t) \tag{13}$$
$$profrate(t) = qr(t) \tag{14}$$

In addition, if wages and profits are added together, the result is total income or, to use the more common phrase, gross domestic product (GDP):

$$gdp(t) = qr(t) + kz^F(t) \qquad (15)^{13}$$

In order to clarify the behavior of the model as a whole, one might examine the value of some of its variables at the steady state. The steady-state value of the rate of capital accumulation is simply its desired level, γ, since by definition firms, like all other "sectors," manage to attain their targets in the steady state. The steady-state values of the profit rate and of GDP are, however, not as straightforward, depending on several parameters:

$$profrate^* = \frac{q[\gamma^2(q+1) - \lambda^G(\gamma+\rho)(i-\gamma)]}{k(\lambda^W - \nu^W)(\gamma+\rho)(i-\gamma) - \rho\lambda^F(i-\gamma) + \gamma q} - q\gamma \tag{16}$$
$$gdp^* = \frac{(k+q)[\gamma^2(q+1) - \lambda^G(\gamma+\rho)(i-\gamma)]}{k(\lambda^W - \nu^W)(\gamma+\rho)(i-\gamma) - \rho\lambda^F(i-\gamma) + \gamma q} - q\gamma \tag{17}$$

Those expressions will be important below, to base analytically the simulation results for the effects of financialization and the housing bubble on these two variables. Finally, for the benefit of those familiar with the SFC approach, it might be useful to present the model's transactions flow and balance-sheet matrices.

[MATRIX 1 HERE]
[MATRIX 2 HERE]

3. Calibration with flow-of-funds data

The previous presentation might have surprised the reader by the relative absence of justification for the behavior assumptions proposed alongside the accounting relationships. On the one hand, this approach – like, for that matter, all nonmainstream approaches – is deliberately not grounded on agents that attempt to maximize utility or profit, being gifted with what Shaikh (2012b: 3-9) calls "hyperrationality." Thus, no constrained optimization will be resorted to in order to base the behavior

[13] Wages, profits and GDP are normalized by the value of nonfinancial capital stock, as all variables in the model.

equations on "sound foundations." On the other hand, however, it does assume that the behavior of firms, households, and the government is rational, in the sense that it follows some conscious procedure. That is what authors have called "goal-oriented behavior" (Skott, 2012:111) or "procedural rationality" (Godley and Lavoie, 2007: 16)[14]. In the context of the SFC approach, this form of rationality is embodied on so-called stock-flow norms, that is, on stock-flow targets that the agents set to themselves, like the above model's λs and ν^W:

> "[Agents] set themselves norms and targets, and act in line with these and the expectations that they may hold about the future. These norms, held by agents, produce a kind of autopilot. Mistakes, or mistaken expectations, bring about piled-up (or depleted) stock – real inventories, money balances, or wealth – that signal a required change in behavior." (Godley and Lavoie, 2007: 16)

But claiming that agents rationally set themselves this kind of targets is still a far cry from claiming that the specific targets adopted in the model are reasonable or justifiable. This is where empirical research comes in[15]. The main task involved in the calibration of the model is establishing convincing values for the parameters that represent the stock-flow norms. In case the fluctuations of the ratios in the data are contained within a reasonable narrow range, it becomes easier to choose a value for the parameter and, at the same time, to argue that it is a reasonable target, at which the agents might actually aim[16]. The empirical effort cannot stop at that, however. It is necessary to choose plausible values for all the other parameters of the model: the speeds of adjustment of the stock-adjustment terms (that is, the αs, the βs and μ^F), the interest rate, the price of equities, the ratio of market prices of houses to their production cost, the mark-up, the composition of capital, and capitalist households' propensity to consume out of wealth. Most of these parameters were estimated using the Federal Reserve's "Flow of Funds Accounts of the United States," which have the advantage of comprising payments flows and accumulated stocks related to households and nonfinancial corporate business firms, among other "sectors." Since most parameters were generally more stable until the mid-1990s than afterwards, they were chosen using as reference their mean and the range of their fluctuation between 1960 and 1995[17]. The simulation of the Great Recession, in its turn, attempted in the next section, will precisely start from shifts in some parameters that took place after 1995[18].

3.1. Firms

The ratio of nonfinancial corporate business (NFCB) firms' net financial assets to total capital outlays is not trendless, but, before the mid-1990s, fluctuates within a relatively narrow range[19]. Its

[14] Lavoie (2006: 93) argues that Duménil and Lévy's "principle of adjustment" is a similar conception of rational action. See also Godley and Lavoie (2007: 16, fn. 21).

[15] According to Godley and Lavoie (2007: 10), "[i]t is an implication of our method that, by virtue of its comprehensive nature, it will ultimately enforce empirical study of the entire range of macroeconomic relationships, both accounting and functional, all dancing together as one."

[16] It is important to clarify, however, that stock-flow norms do not mean that agents aim to attain these stock-flow ratios in every period. It simply means that, when taken out of equilibrium, they adjust their behavior to converge back to their targets, during a period that can be shorter or longer, depending of the speeds of adjustment included in the stock-adjustment terms.

[17] In order to have a larger number of observations, quarterly data is used. Even though the flow of funds accounts have quarterly data since 1952, for most variables, we restrict our calibration to data starting in 1960 because the "compensation of employees paid" series is available only from then on and it is used to estimate λ^F, q, and k. This does not affect much the results, however, since the trajectory of the parameters (for which there is available data) in the 1950s is not very different from their trajectory from 1960 to 1995. Moreover, the time unit for the calibration and simulations is taken to be a year and, thus, the stock-flow ratios estimated from quarterly data are divided by four. The estimation of the interest rate and of the ratio of market prices of houses to their production cost is done resorting to different datasets.

[18] More details about the data sources can be obtained with the author, upon request.

[19] Net financial assets are calculated by subtracting total liabilities from total financial assets. Total capital outlays comprise, in their turn, compensation of employees paid, gross fixed investment, inventories (including inventory valuation adjustment – IVA), and net acquisition of nonproduced nonfinancial assets.

average, between 1960 and 1995, is -0.36, meaning that firms finance about a third of their capital outlays by incurring in debt. From 1960 to the third quarter of 1973, the ratio slowly declines from about -0.20 to around -0.30. Then, it falls to around -0.43 and fluctuates around this level until the third quarter of 1993, when it begins a steep rise that will be examined in the next section (Figure 1). The value of λ^F chosen for the baseline version of the model, then, is -0.36.

Both the mark-up and the composition of capital seem to be much more stable, fluctuating around an apparently trendless mean. The former, defined as NFCB firms' gross value added minus compensation of employees paid divided by total capital outlays, has an average of 0.43 between 1960 and 1995 and ranges between 0.36 and 0.48. The latter, defined in its turn as NFCB firms' compensation of employees paid divided by total capital outlays, has an average of 0.81 and ranges between 0.77 and 0.87 (Figure 1)[20]. These two averages, 0.43 and 0.81, are chosen as the values of respectively q and k in the baseline version of the model.

Finally, γ is estimated with reference to the actual rate of accumulation of nonfinancial capital, g, which comprises nonresidential structures, equipment and software, and inventories (excluding IVA), all at current cost. Its trajectory between 1960 and 1995 is not stable, presenting strong fluctuations. From the early 1980s onwards, however, it appears to be relatively trendless and to fluctuate more mildly. Its average from 1960 to 1995 is 7.59 percent, while it ranges between -0.73 percent to 26.62 percent. Between the second quarter of 1982 and the end of 1995, however, its average is 4.40 percent and it ranges between -0.73 and 8.10 (Figure 1). The value of γ is set as 6.25 percent in the baseline version of the model[21].

[FIGURE 1 HERE]

3.2. Worker households

A brief caveat must be made before examining the data for households. The model's distinction between capitalist and worker households, following an established tradition in heterodox economics, allows it to incorporate the issue of inequality. Increasingly divergent incomes, wealth, and expenditure behaviors between the wealthiest part of society and the majority of working-class households is something that clearly characterizes the neoliberal period, specially in countries like the United States and the United Kingdom. Moreover, the common claim that the dispersion of stock ownership has made the distinction between capitalists and workers obsolete has been proved to be false. Duménil and Lévy's (2004) interpretation of the data presented in the groundbreaking work by Thomas Piketty and Emmanuel Saez's (2003) shows that while the 2 percent wealthiest individuals in the U.S. received, in 2001, almost half of their income from ownership (sole proprietor income, partnership income, capital income, and capital gains), the remainder 98 percent of the population received almost 90 percent of their income in the form of wages. Considering, in addition, that part of what is reported as wage income, like part of CEO pay, for instance, can arguably be considered to be disguised distribution of profits, one cannot avoid the conclusion that the distinction between capitalists and workers is far from obsolete[22].

However, statistics available to explore this distinction are still very limited and separating the consumption behavior and the portfolio decisions of capitalist and worker households from the data presented in the Flow of Funds Accounts would require extremely rough approximations. So, leaving this

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[20] This longer-term stability of q and k overcasts, however, their cyclical behavior. Interestingly, the former appears to move procyclically, while the latter present a countercyclical behavior. Since q is defined as k multiplied by e (the rate of surplus value), it is clear that the strong procyclical pattern of e dominates the pattern presented by k, giving q its procyclical pattern. This decomposition might be useful to reexamine the Post-Keynesian literature on the cyclicality of the markup, summarized by Lima (2004: 392-393) and Taylor (2004: 61-64). On the related issue of fluctuations of profit rates and business cycle dynamics, see Duménil and Lévy (2011b: 39-44).

[21] In order to obtain a set of parameters for which the model works, using the software *Mathematica*, some of the parameters are defined beforehand and some are left to be determined by the software within a defined range, using its *Findinstance* command. The latter was the case for γ and the resulting value, 6.25 percent, seemed reasonable in light of the data. The programming code for this calibration procedure can be found in Foley (2013b).

[22] Not only in the United States, as can be concluded from Palma (2011).

very important extension for future research, the simplification adopted in the present work is to calibrate the parameters related to worker households using data for households in general and choose a reasonable value for the only parameter related to capitalist households, ρ, their propensity to consume out of accumulated wealth[23].

Thus, λ^W is calibrated with reference to the ratio of households' owner-occupied real estate including vacant land and mobile homes at market value to compensation of employees received. The ratio is very stable between 1960 and 1995, with an average of 1.67 and ranging between 1.30 and 2.21, households owning, therefore, real estate worth about 170 percent of their annual wage income. The ratio declines very mildly during the 1960s and increases slowly during the 1970s and 1980s (Figure 2). The other target, ν^W, in its turn, is broader, comprising in the numerator not only real estate, but households' net worth. The data for this ratio (net worth to compensation of employees received) is similar, albeit a bit less flat, decreasing more markedly from 1960s to the mid-1970s, and recovering between the 1980s and the mid-1990s. Its average, between 1960 and 1995, is 5.48 and its fluctuations range between 4.71 and 6.83, meaning that households have accumulated wealth (net of liabilities) of about 550 percent of their annual wage income (Figure 2)[24]. The values chosen for λ^W and ν^W, in the baseline version of the model, are respectively 1.67 and 5.48.

[FIGURE 2 HERE]

Data for housing prices, needed to calibrate ψ, is a little more difficult to obtain. An inflation-adjusted housing price index provided by the Federal Housing Finance Agency is taken to be a proxy of the ratio of market prices of houses to their production cost[25]. It is available on a monthly basis from 1991 to 2012. In the period between 1991 and 1995, it remains remarkably flat, with an average of 100.01 and fluctuating between 98.23 and 101.13 (January 1991 is defined as 100). From 1997 onwards, it clearly indicates the development of a housing price bubble (Figure 3), which will be discussed in the following section. The value chosen for ψ, in the baseline version of the model, is 1 (the average of the index divided by 100).

[FIGURE 3 HERE]

3.3. Remaining parameters

The reader would be well advised to take the values given to the remaining parameters of the model with a grain of salt, since further research is still necessary to establish a reasonable basis for their choice. The interest rate, i, is set as 3.125 percent, with reference to a real interest rate, specifically the volatile trajectory of the real Federal Funds effective rate, which averages 2.49, between 1960 and 1995, and fluctuates between -3.63 and 7.02. The price of equities, ϕ, in its turn, is set as 1, similarly to the ratio of the market prices of houses to their production cost. The government, financial sector, and rest of the world combined target financial position, λ^G, is set as 2[26]. And, finally, the speeds of adjustment, that is, α^F, α^W, β^F, β^W, β^G, and μ^F, receive respectively the following values: 0.3, 0.25, 0.5, 0.5, 0.05, and 0.05. Worker households, for instance, adjust their purchase of housing due to a difference between the ratio of

[23] In the baseline version of the model, it is set as 0.25, meaning that capitalist households consume per year one fourth of their accumulated wealth. This level is, once more, determined by *Mathematica*'s *Findinstance* command, as in the case of γ, mentioned above. An important effort in the direction of examining the impact of inequality on macroeconomic variables and of calibrating a SFC model without disregarding the size distribution of income can be found in Taylor et al. (2013).

[24] Notice that the parameter ν^W is a slightly modified version of the common stock-flow norm net worth to personal disposable income (see Taylor, 2008: 644-645). The denominator of the latter, personal disposable income, is larger than compensation of employees received, including not only wage income.

[25] The index is the OFHEO (Office of Federal Housing Enterprise Oversight) purchase-only price index, which was adjusted to compensate for inflation. It is based on the well-known Case-Shiller home price index, but has broader coverage (made possible by using data from Fannie Mae and Freddie Mac) and a different weighting procedure.

[26] The levels of i and λ^G are also determined by *Mathematica*'s *Findinstance* command.

market value of housing to annual wage income in relation to its target level, λ^W, two times as fast as they adjust their level of consumption due to a difference between the ratio of net worth to annual wage income in relation to ν^W[27]. A table summarizing the statistics used to calibrate the main parameters is available upon request. Finally, by checking the Eigenvalues of the baseline version of the model, which are all negative real numbers, it is possible to confirm that it is stable[28].

4. Simulating the Great Recession

With the model described and calibrated, it is possible now to turn to the potential insights it might give on the Great Recession. So far, the absence of historical distance has hindered the emergence of hegemonic interpretations about its causes. As Deepankar Basu and Ramaa Vasudevan (2013) argue in a recent paper, even among the limited group of economists who adopt a Marxian framework, there is no sign of agreement about what led to the crisis. Since profitability is given such a great centrality in this theoretical tradition, an obvious question is whether the crisis can be attributed to falling profit rates. Their conclusion, after an exhaustive examination of different definitions of profit rates and after investigating some possible decompositions of the latter, is that "the current crisis was *not* preceded by a prolonged period of declining profitability. In fact, the current crisis was preceded by a period of rising profitability, buoyed by favourable trends in both the profit share and technology." (2013: 83)[29]

Excluding profitability as a cause, then, the competing explanations diverge about what to put in its place. The empirical analysis of the parameters of the present model suggests two possible issues: financialization and the housing bubble. The former has been given attention by many, in the context of the crisis, like Lapavitsas (2009), Duménil and Lévy (2011a), Basu (2011) and, in a slightly different guise, Palma (2009). Identifying important causes, however, is only the first step: the actual challenge lies in indicating how they interact and in providing a convincing explanation for the sequence of events that led to the crisis. In what follows, it is suggested how a circuit of capital model can contribute parsimoniously to this goal, first by analyzing how financialization and the housing bubble can be incorporated in the model and, then, by describing, with the help of the simulations, how they interacted in two subsequent periods (the decade between 1996 and the first quarter of 2006 and the period between 2006 and 2009)[30].

4.1. Financialization

The concentration of power by finance, since the beginning of the neoliberal juggernaut, was so overwhelming that the term financialization has been used to refer to many different developments. Several of them are related to the financial sector itself, like the increasing share of GDP for which it is responsible and the increasing share of total corporate profits that it appropriates (Krippner, 2005: esp. 177-181, 186-188). Another aspect concerns the relation between financial and nonfinancial firms. The increasing importance of the stock market as a source of funding for business, especially in the U.S. and the U.K., has required nonfinancial firms to base their decisions increasingly on financial criteria, something that has been termed the rise of the shareholder-value ideology (Glyn, 2006: 54-63). This is reinforced by actual ownership patterns: Andrew Glyn (2006: 56) reported, in the mid-2000s, that about 40 percent of the equity of the largest 500 companies in the U.S. and the U.K. was owned by financial institutions. The effect of these developments on the operations of the nonfinancial firms was doomed to be substantial. One of the measures of the financialization of the U.S. economy that Greta Krippner

[27] It is important to clarify that these speeds of adjustment have no impact on the steady-state values of the system, affecting only its dynamics.

[28] Once more, the programming code used to obtain the model's Eigenvalues was developed in Foley (2013b).

[29] This question is also analyzed thoroughly by Duménil and Lévy (2011b: esp. 21-44), who share Basu and Vasudevan's conclusion. See also Shaikh (2011), for another interpretation that identifies rising profitability in the run-up to the crisis.

[30] These simulations were made using the programming code written by Foley (2013b), which allows one to plot the figures related to the simulation, to calculate the new steady state, to obtain the new Eigenvalues, among other things.

(2005: 182-186) proposes is the share of portfolio income in the cash flow of nonfinancial corporations, which has grown markedly since the 1970s. This means that nonfinancial firms rely more and more on financial activities for their profits[31]. Hence, the common jibe according to which, due to the rise of GMAC, General Motors had turned into a bank with a car business on the side.

It is precisely this issue, the financialization of the nonfinancial firms, which might be usefully incorporated in the model. One of its consequences is the marked shift in λ^F, which went from -0.32 in 1996 (just above its average from 1960 to 1995) to 0.15 in the first quarter of 2006 (Figure 1, above). Thus, in that decade, NFCB firms, in the aggregate, moved from a borrower to a lender position, increasing substantially the finance lag. Digging deeper into the components of the ratio of net financial position to total capital outlays might provide some clues about the characteristics of this shift. The net financial position is calculated by deducting total liabilities from total financial assets. Between 1960 and 1995, both of them grew at almost exactly the same pace: total financial assets grew on average 2.36 percent per quarter, whereas total liabilities grew on average 2.37 percent per quarter. Between 1996 and the first quarter of 2006, however, the rates of growth of the two stocks diverged significantly: total financial assets growing on average 2.21 percent per quarter and total liabilities growing on average only 1.56 percent per quarter.

In order to understand why total financial assets outpaced total liabilities, it is useful to examine the several kinds of assets that constitute it. Around 20 percent of the growth of total financial assets between 1996 and the first quarter of 2006 can be accounted by the growth of credit and equity market instruments, trade receivables, and money market mutual fund shares (Figure 4). This is in line with the financialization of nonfinancial firms, indicating an accumulation of financial instruments that can potentially be a source of revenue, of surplus value appropriation. The other 80 percent, however, is a bit puzzling, being divided in the following way: 21 percent of the growth of total financial assets between 1996 and the first quarter of 2006 can be accounted by the growth of assets related to U.S. direct investment abroad (Figure 4), while more than 49 percent of the growth of total financial assets in the period can be accounted by the growth of assets identified as “unidentified miscellaneous assets.”

[FIGURE 4 HERE]

While the classification of such a large share of the NFCB firms’ financial assets as “unidentified miscellaneous” simply indicates that the data is inadequate for a thorough examination of the shift of λ^F, the growth of assets related to U.S. direct investment abroad suggests a deeply significant phenomenon. The accumulation of this sort of assets does not mean that firms are reorienting their investments away from productive activities and towards financial instruments, but rather that they are partly shifting their productive activities abroad. The magnitude of this dislocation is astounding: between 1996 and the first quarter of 2006, assets related to U.S. direct investment abroad increased their share of NFCB firms’ total financial assets from 15.72 to 19.02 percent, almost tripling in value (from around 800 billion to just above 2.3 trillion dollars). It might be even more significant to notice that the stock of assets related to U.S. direct investment abroad was equivalent, in 1996, to around 12 percent of the total value of nonfinancial capital stock of the NFCB firms. By the first quarter of 2006, it had grown to the equivalent value of 21 percent of the total value of nonfinancial capital stock. William Milberg and Deborah Winkler (2010) had already suggested this link between financialization and offshoring, using different evidence. The data examined here strengthens their claim.

4.2. Housing bubble

[31] According to Foley (2013a: 4-8), capitalist competition is above all about appropriating the largest possible share of the (for the individual capitalist) given pool of surplus value produced. If firms can divert a larger share of this pool to themselves by investing in financial instruments than by expanding their productive activities, they will probably do so. The relevant question behind financialization is, then, why finance became relatively more profitable than production. See Foley (2013a: 8-13) for some suggestions of how to address it.

The pattern of the data related to households can be misleading and must be examined carefully. One could assume, for instance, that households' savings increased significantly from the mid-1990s to the mid-2000s, since the ratios of households' net worth and housing stock to annual wage income increased markedly during this period (Figure 2, above). After all, isn't it by saving more of your annual income that you can increase your accumulated wealth? However, the exact opposite was the case: between 1996 and the first quarter of 2006, the saving rate as defined in the U.S. Bureau of Economic Analysis' National Income and Product Accounts – that is, personal saving as a percentage of disposable personal income – decreased substantially, reaching in the second quarter of 2005 its lowest level in the entire series since 1952, 1.3 percent. The average saving rate between 1960 and 1995 was 8.39 percent, whereas the average between 1996 and the first quarter of 2006 was 3.53 percent[32]. How, then, the ratios of households' net worth and housing stock to annual wage income could increase so much in this same period? The answer can only lay on the dynamics of prices during this period, characterized as it was by successive asset bubbles, both in the stock market and in the housing market.

Increases in the prices of the assets that households' owned made them wealthier. As a consequence, they tended to increase their consumption expenditures (what could be called a "wealth effect"), in line with the behavior suggested by equation 6, above. The fall of the saving rate indicates they did precisely that. In addition, given that their larger wealth represented a larger potential collateral for borrowing – and that, then, they could borrow more easily –, their expenditures were less limited by their current income flows. Borrowing, as many pointed out, expanded dramatically[33]. When this enlarged expenditure went into the purchase of houses, demand for them outpaced their supply and their prices went through the roof. The inflation-adjusted OFHEO purchase-only price index, presented in Figure 3, above, suggests that housing prices increased by more than 50 percent between 1996 and the first quarter of 2006, discounting the period's inflation. The consequence, of course, was to increase even more the accumulated wealth of the homeowners, reinforcing their impulse to increase their consumption and their borrowing.

A pressing question concerns what unleashed this process in the first place, bearing in mind Duménil and Lévy's (2011b: 18) remark that "[w]hitin such cumulative processes, it is difficult to disentangle reciprocal directions of causation from lending to prices, and from prices to lending.". Analyzing the stock market bubble of the late 1990s, Robert Brenner (2002: 171-217) argues that it was stimulated by the U.S. government's policy in order to keep demand high and compensate for falling profitability and reduced demand for exports, caused, in their turn, by declining competitiveness of U.S. production. The causation goes from rising asset prices to increased borrowing. In his words, "there was simply no alternative to the wealth effect of rising share prices to take over the economy's driving engine." (2002: 175)[34] He calls this policy, thus, "stock market Keynesianism:"

> "[T]he strategy (…) might usefully be called 'stock market, or asset-price, Keynesianism.' In traditional Keynesian policy, demand is 'subsidized' by means of the federal government's incurring of rising *public* deficits so as to spend more than it takes in taxes. By contrast, in Greenspan's version, demand increased by means of corporations and wealthy households taking on rising *private* deficits so as to spend more than they make, encouraged to do so by the increased paper wealth that they effortlessly accrue by virtue of the appreciation of the value of their stock, or other assets." (Brenner, 2006: 293)

[32] Even though there is some controversy about the adequacy of different measurements of the saving rate, Guidolin and La Jeunesse (2007) argue that the significant downward trend observed in the U.S. is not a measurement artifact, but is confirmed by several alternative definitions to the one mentioned above (including one based on the Flow of Funds Accounts).

[33] The "fall in private [especially household] saving" and "the rise in the flow of net lending to the private [especially household] sector" were two of Godley's (1999: 2) "seven unsustainable processes." See also Barbosa-Filho et al. (2008) and Shaikh (2012a).

[34] Godley (1999: 1) puts less emphasis on the wealth effect and more on the rise in borrowing, but the reasoning is similar: "During the last seven years a persistently restrictive fiscal policy has coincided with sluggish net export demand, so rapid growth could come about only as a result of a spectacular rise in private expenditure *relative to income*."

And he would later argue that the housing bubble represented a reenactment, in an enlarged scale, of the same process (as, for instance, in Brenner, 2006: 314-332, and Brenner, 2009: 34-61). The dynamics of the "wealth effect," according to this interpretation, was unleashed by policy[35].

Another interpretation focuses on increasing inequality. Given the long-term wage repression and weakening of trade unions, which goes back to the 1980s, worker households were looking for a way to maintain their standard of living in face of stagnant wages. Their solution was going into debt. In Shaikh's (2011: 53) words, "[f]rom the side of workers, the decline in the interest rate spurred the increase in household borrowing which for a while helped them maintain the path of their standard of living despite the slowdown in real wages." According to this interpretation, then, it was the increase of borrowing as a reaction to wage repression that unleashed the bubbles in the first place[36].

Be that as it may, these asset bubbles can be incorporated in the model as, for instance, an increase in λ^{W}[37]. The effect of housing prices on households' wealth pushes them to aim a larger target of housing stock to annual wage income and, in fact, the ratio went from 1.98 in 1996 (already higher than the average between 1960 and 1995, of 1.67) to 3.45 in the first quarter of 2006, its higher level in the entire series. Their increasing wealth (and rising housing prices) made them willing to own housing worth 345 percent their annual wage income. In order to examine this shift, it is possible to compare the growth rates of the denominator and the numerator of the ratio. Between 1960 and 1995, while compensation of employees received grew on average 2.11 percent per quarter, the market value of households' housing stock (actually, "owner-occupied real estate including vacant land and mobile homes at market value") grew on average 2.01 percent per quarter. However, from 1996 to the first quarter of 2006, the growth rate of compensation of employees received decelerated to, on average, 1.49 percent per quarter, at the same time that the growth rate of the market value of households' housing stock accelerated to, on average, 2.56 percent per year.

4.3. From mid-1990s to early 2006: the run-up to the crisis

To examine the impacts resulting from these developments, the financialization of nonfinancial firms and the housing bubble, and, moreover, to examine how they interacted, an alternative is simulating the model, incorporating the shocks. In the words of Godley and Lavoie (2007: 9), "via the experience of simulating increasingly complex models it becomes possible to build up knowledge, or 'informed intuition,' as to the way monetary economies must and do function." In these simulations, the focus will be on the comparison between the steady-state values of some variables, before and after the shocks. This is simply a way to analyze the direction of the effects of the developments under consideration and does not imply an assumption about the actual convergence of the economy to these steady states: "The steady state is just an analytical device never in practice reached, because parameters and exogenous variables

[35] Duménil and Lévy (2011b: 19-21) question this interpretation, arguing that the trajectories of the Federal Funds rate and of stock market indices do not confirm the impact of the former on the latter, implied by Brenner's analysis. Considering that the asset bubbles cannot be imputed to the government alone, but also to the practices of the financial institutions, they agree, however, with Brenner on the role that the bubbles played: "the [housing] boom was *necessary* given the narrow range of alternative policies proper to neoliberalism. It was the neoliberal response to the shift of demand towards the rest of the world in the context of high demand levels." (2011b: 19) See also Duménil and Lévy (2011a: 195-203).

[36] This interpretation is also defended by Basu (2011: 30), who claims that "stagnant wages increased the demand for net credit by working class households to maintain historical patterns of consumption growth." Similarly, Colin Crouch (2009: 382) argues that this increase in debt was neoliberalism's way of reconciling "the uncertainties and instabilities of a capitalist economy with democracy's need for stability for people's lives and capitalism's own need for confident mass consumers." It consisted, according to him, of a "policy regime" that he calls "privatised Keynesianism." Brenner (2002: 191, 199) questions this reasoning, pointing out that, even though increasing inequality was an unquestionable fact, the increasing borrowing and declining saving was done, above all, by the 20 percent wealthiest households (who are usually responsible for most of the aggregate saving). See also Duménil and Lévy (2011b: 12-13, 17-18).

[37] The present exercise focuses only on λ^{W} due to parsimony. But it would be interesting to also examine the interaction between the shift in this parameter and the parallel shift in ν^{W} and think through its implications. Focusing on the dynamics of the housing market, however, might not be too restrictive, since not only the main asset bubble of the 2000s took place in this market, but also, according to Duménil and Lévy (2011b: 13, fn. 12), the wealth effect seems to be stronger on housing than on the stock market.

are actually changing all the time. This implies that steady states should be treated as a reference point." (Godley and Lavoie, 2007: 10)[38]

The contractionary effect of the financialization of nonfinancial firms has already been object of several investigations (see, for instance, Stockhammer, 2004, and Skott and Ryoo, 2008). In the present model, if this phenomenon is incorporated as an upward shift in λ^F, thus increasing the finance lag, it will also have a contractionary effect (see equations 16 and 17, above)[39]. That is because it reduces capital outlays and dividend payments and, consequentially, reduces both worker and capitalist households' expenditures. The decline in the expenditure level of all "sectors" also pushes down GDP and the profit rate. By simulating a shock in λ^F from -0.36 to 0.15, which is what the data suggests for the period from 1996 to the first quarter of 2006, the model indicates the following reductions of the steady-state levels of capital outlays, GDP, and the profit rate: 6.85, 7.18, and 7.92 percent (Table 1). The steady-state values of worker household expenditures and of the housing stock at market value would also decline, both of them, by 6.85 percent. The dynamic of adjustment for the new steady state can be seen in Figure 5, below.

[TABLE 1 HERE]
[FIGURE 5 HERE]

Except for the intervening recession that followed the busting of the stock market bubble of the late 1990s, the decade between 1996 and 2006 was not characterized by such macroeconomic contraction. In fact, in the first quarter of 2006 the ratio of GDP to the value of NFCB firms' total (nonfinancial) capital stock was actually 1.61 percent higher than its average for the period between 1960 and 1995[40]. Nonfinancial firms' profit rate had increased even more and was 11.25 percent higher than its average between 1960 and 1995. Moreover, the ratio of households' total personal outlays to the value of NFCB firms' nonfinancial capital stock had become 16.09 higher than its long-term average. The most substantial increase, as could be expected, occurred on the ratio of the market value of households' housing stock to the value of nonfinancial capital stock: in the first quarter of 2006 it was 94.73 percent higher than its long-term average[41].

It is plausible to assume that this divergence between the expected effects of financialization and the actual trajectory of the macroeconomic variables can be explained by the housing bubble. In this sense, the substantial increase in households' consumption and purchase of houses might have more than compensated the financialization of nonfinancial firms. In order to assess this argument in the context of the present model, one has to impose two simultaneous shocks on the baseline version of the model: the increase in λ^F from -0.36 to 0.15 and the increase in λ^W from 1.67 to 3.45 (which is what the data suggest for the ratio of the market value of households' housing stock to annual wage income, between 1996 and the first quarter of 2006).

The simulation shows that the housing bubble, as represented, does in fact compensates for financialization (see equations 16 and 17). The steady-state values of capital outlays, GDP, and the profit rate all increase more than 20 percent: 22.89, 24.01, and 26.46 percent, respectively (Figure 6). While the steady-state values of worker households' expenditures and of their housing stock at market value increase even more: respectively, 30.65 and 153.88 percent. It is true that the actual increases in these variables from 1996 to 2006, mentioned above, were smaller than those predicted. Probably, the reason for that is that, in the model, the housing bubble pulls up capital outlays substantially, through the accelerator mechanism, while in practice this was not the case. As the data referred to above shows, the housing bubble avoided that the slowdown of accumulation resulting from financialization caused a

[38] See also Macedo e Silva and dos Santos (2011: 117-121), who attempt to reconcile theoretically the steady states of SFC models with Keynes' long-period equilibrium.

[39] Basu (2011) has already interpreted financialization as an increase in the finance lag, in the context of a circuit of capital model.

[40] GDP, in the context of the model, refers only to gross value added by NFCB firms.

[41] It has to be noticed, however, that the ratio of capital outlays to the value of nonfinancial capital stock did indeed decline from its long-term average and was, in the first quarter of 2006, 1.65 percent lower than it.

extended contraction, but did not hinder the ratio of capital outlays to the value of nonfinancial capital stock from falling.[42]

[FIGURE 6 HERE]

4.4. From early 2006 to 2009: the reversal

This interpretation of the period from 1996 to 2006 already indicates its sequel, the unfolding of the crisis itself. As examined above, the dynamics of the housing bubble is inherently contradictory, since it is crucially based on asset inflation that underpins increasing expenditure and growing borrowing. As soon as a reversal of expectations takes place, something that might be caused by any disseminated preoccupation about the future, the virtuous cycle turns vicious with a vengeance. Falling housing prices squeezes households' wealth and leads to declining expenditures. These houses being used as collateral to borrowing, as they were, their falling prices put pressure on the financial system and financial institutions reduce their extension of credit, leading to a further fall of expenditures all around. This decline simply reinforces the trend of falling house prices, feeding the contraction. And the contraction, in its turn, leads to piling up of inventories, reduction of capital outlays, and unemployment, reducing further aggregate demand. The social violence of this process, with the associated wave of foreclosures, cannot be emphasized enough.

It goes without saying that a reversal of this sort is exactly what happened from 2006 onwards. It began with the reversal of the housing market. In 2007, the busting of the real estate bubble reached some financial institutions, through the so-called subprime mortgages, causing a credit crunch. The effects of the latter gradually disseminated to the entire financial system (especially to the shadow banking system) and, in 2008, the bail out of Northern Rock, in the U.K., and the failure of Lehman Brothers showed that the problem could not be easily contained and brought down the house of cards. In 2009, almost the entire world economy found itself in recession[43].

This reversal can be simulated by imposing a downward shift in λ^W on the model, the parameters of which reflected financialization and the housing bubble. That is, the shock is not imposed in the baseline version of the model, but in the version that already had λ^F at 0.15 and λ^W at 3.45. According to the data, between early 2006 and the second quarter of 2009 (the quarter which saw the largest fall in the rate of accumulation), the ratio of market value of households' housing stock to annual wage income was reduced from 3.45 to 1.92. The dynamics of adjustment to the new steady state can be examined in Figure 7, below. The changes in the steady-state level of capital outlays, GDP and the profit rate, predicted by the model, were the following: -21.53, -22.38, and -24.19 percent, between the first quarter of 2006 and the second quarter of 2009 (Table 1). Worker households' expenditures and the market value of their housing stock, in their turn, fall respectively 25.54 and 56.33 percent. The actual decline of these five variables (normalized by the value of nonfinancial capital stock, as usual) was respectively of 18.75, 14.89, 18.56, 4.80, and 35.80 percent, during the same period[44].

[FIGURE 7 HERE]

[42] Another issue is that we are keeping the ratio of the market prices of houses to their production cost, ψ, fixed, when in fact it increased substantially over this period. If we also change it in the simulation (increasing it from 1 to 1.54, which is what the data suggests), the increase in the steady-state value of a^W is reduced to 64.85 percent. The actual change, of 94.73 percent, mentioned above, is interestingly somewhat in the middle of the changes predicted by the two simulations (respectively, 64.85 and 153.88 percent). Besides this change in a^W, only the steady-state value of worker consumption changes, all the other values remaining the same. Thus, the price shock causes simply a substitution, by worker households, of consumption for the purchase of houses.

[43] For narratives of the sequence of events, see among others Blackburn (2008) and Duménil and Lévy (2011a: 207-263).

[44] In this case, if the fall in house prices is included in the simulation (as a decline of ψ, from 1.54 to 1.28, which is what the data suggests), the predicted fall in the market value of the housing stock is reduced to 47.89 percent, closer to what actually happened.

5. Concluding remarks

The present work has the limited scope of providing a partial explanation for the onset of the Great Recession by focusing on two developments, financialization and the housing bubble. It is undeniable, however, that crises like this one are very complex phenomena, combining economic, political, and cultural aspects, and eluding explanations based on simplified models. The reversal examined above, for instance, was followed by the crisis related to the sovereign debt of the countries in the European periphery and the worldwide downturn ended up affecting even the underdeveloped countries, like China, which were responsible for the greater part of the economic dynamism of the last decade. No interpretation of the crisis will be satisfactory, thus, if it restricts itself to the U.S. economy. However, even this limited purview suggests that the end of the difficulties is not near and that the overcoming of the fragility of a financialised economy driven by asset bubbles might require more profound transformations.

After the second quarter of 2009, for instance, the ratio of the market value of the housing stock to wage income did not rise much, fluctuating for the following three years around a mean of 2.05 and ending 2012, at 1.91, even lower than it was on the second quarter of 2009 (Figure 2, above). The rate of NFCB firms' net financial position to total capital outlays, in its turn, temporarily fell in 2008 and early 2009, but resumed its ascent from then on, recovering to its pre-crisis level of 0.15 in the last quarter of 2010 and reaching its highest level in the entire series, 0.29, by the end of 2012 (Figure 1, above). What that seems to mean is that, on the one hand, households' are far from done from the long-overdue process of deleveraging and will probably take a while before increasing their expenditures significantly. Nonfinancial firms, on the other hand, seem to have only deepened their financialization and the resulting increase in the finance lag puts downward pressure on aggregate demand. The other two potential sources of demand, the government and exports, have their own limitations: the ideologically-driven political constraints on the former and the lack of competitiveness of U.S. production on the latter. There is no sign that the U.S. economy will return, at least not in the medium run, to a performance comparable to the one it presented, on average, between the 1960s and the mid-1990s.

APPENDIX 1: MODEL

Calibration of the baseline version

$\lambda^F = -0.35$
$q = 0.43$
$k = 0.81$
$\gamma = 0.0625$
$\alpha^F = 0.3$
$\beta^F = 0.5$

$\mu^F = 0.05$
$\rho = 0.25$
$\phi = 1$
$\lambda^W = 1.67$
$\nu^W = 5.48$
$\psi = 1$

$\alpha^W = 0.25$
$\beta^W = 0.5$
$i = 0.03125$
$\lambda^G = 2$
$\beta^G = 0.05$

Steady-state values

SIMULATIONS (STEADY-STATE VALUES)					
		Baseline	Financialization	Combined	Reversal
1	fF	-0.16683	0.06475	0.08542	0.06703
2	aW	0.62686	0.58394	1.59145	0.69497
3	fW	1.43015	1.33221	0.93642	1.28859
4	aC	0.36834	0.30152	0.48908	0.32219
5	fG	2.00000	2.00000	2.00000	2.00000
6	cW	0.29150	0.27153	0.33256	0.27826
7	zW	0.33067	0.30803	0.43203	0.32170
8	zC	0.09209	0.07538	0.12227	0.08055
9	zG	0.06250	0.06250	0.06250	0.06250
10	η	0.11511	0.09422	0.15284	0.10068
11	zF	0.46342	0.43168	0.56949	0.44687
12	r	0.40092	0.36918	0.50699	0.38437
13	g	0.06250	0.06250	0.06250	0.06250
14	gdp	0.54776	0.50841	0.67930	0.52724
15	profrate	0.17239	0.15875	0.21801	0.16528

Financialization: lambdaF shifts from -0.36 to 0.15
Combined: lambdaF shift from -0.36 to 0.15 and lambdaW shifts from 1.67 to 3.45
Reversal: a decline of lambdaW to 1.92 is imposed in the model that had gone through the combined shock

SIMULATIONS (STEADY-STATE VALUES, AS PERCENTAGES OF GDP)					
		Baseline	Financialization	Combined	Reversal
1	fF	-30.46	12.74	12.57	12.71
2	aW	114.44	114.86	234.28	131.81
3	fW	261.09	262.03	137.85	244.40
4	aC	67.24	59.31	72.00	61.11
5	fG	365.12	393.38	294.42	379.33
6	cW	53.22	53.41	48.96	52.78
7	zW	60.37	60.59	63.60	61.01
8	zC	16.81	14.83	18.00	15.28
9	zG	11.41	12.29	9.20	11.85
10	η	21.01	18.53	22.50	19.10
11	zF	84.60	84.91	83.83	84.76
12	r	73.19	72.61	74.63	72.90
13	g	11.41	12.29	9.20	11.85
14	gdp	100.00	100.00	100.00	100.00
15	profrate	31.47	31.22	32.09	31.35

Financialization: lambdaF shifts from -0.36 to 0.15
Combined: lambdaF shift from -0.36 to 0.15 and lambdaW shifts from 1.67 to 3.45
Reversal: a decline of lambdaW to 1.92 is imposed in the model that had gone through the combined shock

Eigenvalues

Baseline: {-0.646236, -0.5, -0.304848, -0.05, -0.0411535}
Financialization: {-0.700153, -0.5, -0.295854, -0.05, -0.0401064}
Combined: {-2.71977, -0.5, -0.297409, -0.05, -0.0434571}
Reversal: {-0.757203, -0.5, -0.296083, -0.05, -0.040465}

APPENDIX 2: MATRICES

MATRIX 1 : TRANSACTIONS FLOW

	Worker households	Capitalist households	Firms		Government/Finance/ROW	Σ
	(1)	(2)	Current (3)	Capital (4)	(5)	
Consumption	-zW	-zC	+zW+zC			0
Investment			+(1-k)zF	-(1-k)zF		0
Government Expenditures			+zG		-zG	0
Wages	+kzF		-kzF			0
Interest income	+(i-g)fW		+(i-g)fF		-(i-g)fG	0
Profits		+η	-qr	+qr-η		0
Change in net financial position	-ΔfW	-ΔϕaC		-ΔfF	+ΔfG	0
Σ	0	0	0	0	0	0

MATRIX 2: BALANCE-SHEET

	Worker households	Capitalist households	Firms	Government/Finance/ROW	Σ
Net financial position	+fW	+aC	+fF	-fG	0
Housing stock	+aW				+aW
Nonfinancial capital			1(=K/K)		1(=K/K)
Sum (net worth)	+fW+aW	+aC	+fF+1	-fG	+aW+1

APPENDIX 3: FIGURES

FIGURE 1: NONFINANCIAL CORPORATE BUSINESS FIRMS (1960-2012)

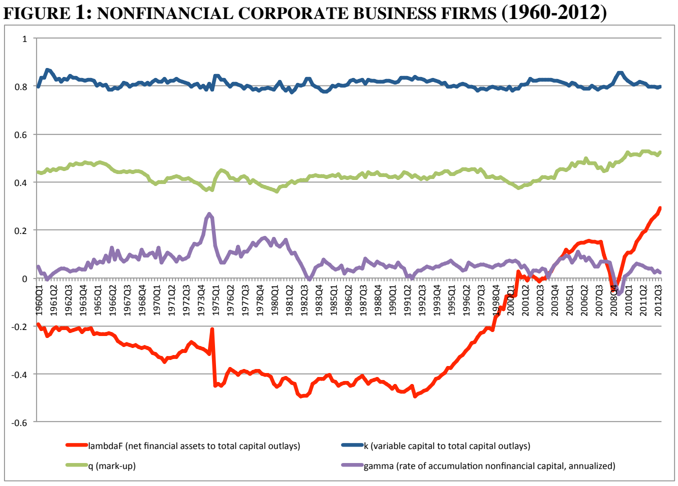


FIGURE 3: HOUSING PRICES (1991-2013) ***[1991=100]***

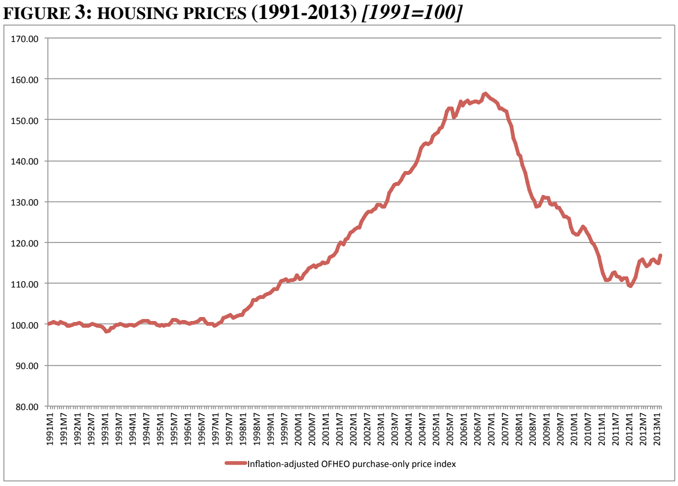


FIGURE 2: HOUSEHOLDS' STOCK-FLOW RATIOS (1960-2012)

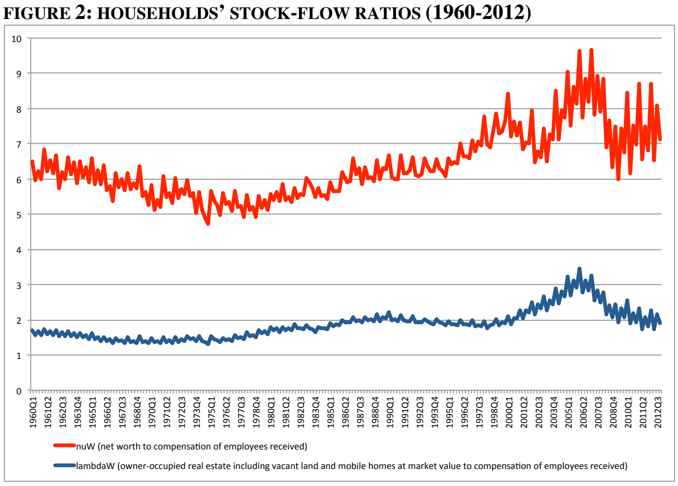


FIGURE 4: NONFINANCIAL CORPORATE BUSINESS FIRMS' FINANCIAL ASSETS (1960-2013) ***[MILLIONS OF DOLLARS]***

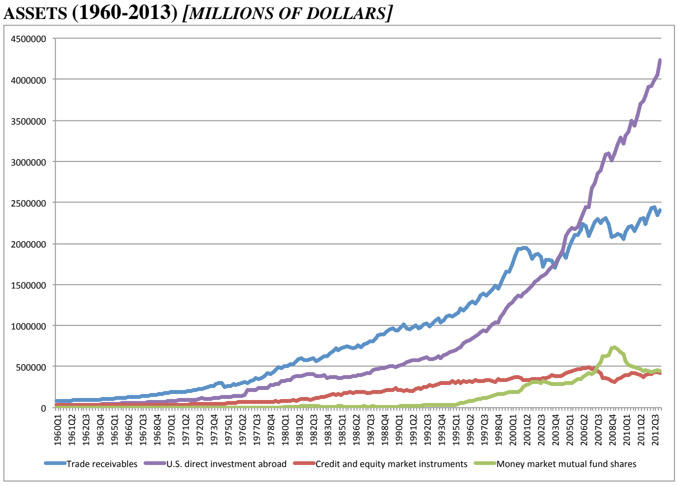


FIGURE 5: FINANCIALIZATION (VARIABLES' CHANGE)

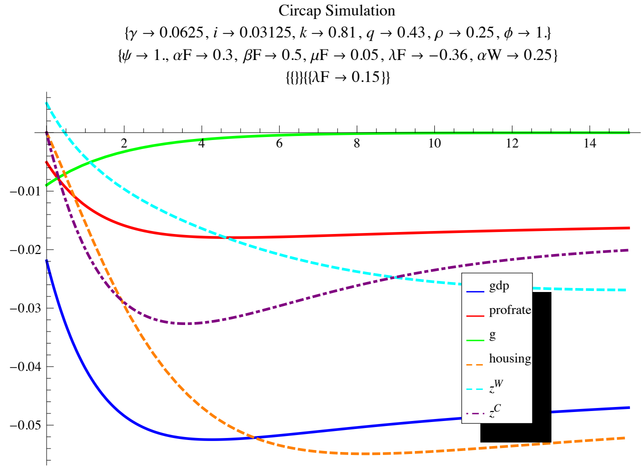


FIGURE 6: FINANCIALIZATION AND HOUSING BUBBLE COMBINED (VARIABLES' CHANGE)

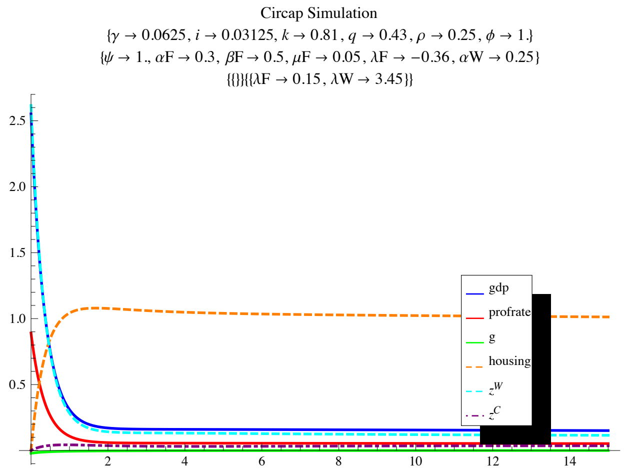
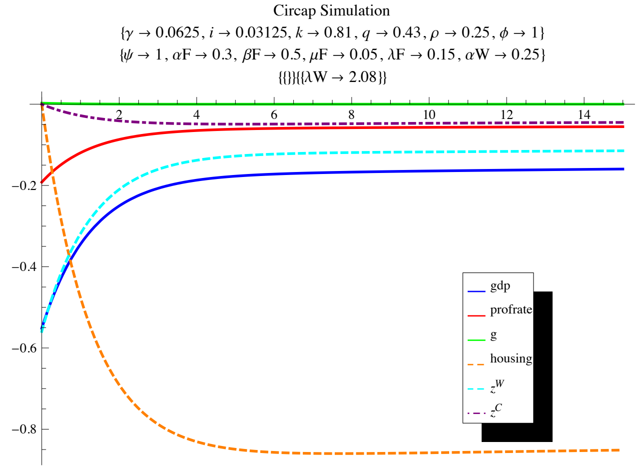


FIGURE 7: REVERSAL (VARIABLES' CHANGE)



APPENDIX 4: TABLE

TABLE 1: SIMULATIONS (RATES OF CHANGE, PERCENT)

		Financialization	Combined	Reversal
1	aW	-6.85	153.88	-56.33
2	zW	-6.85	30.65	-25.54
3	zF	-6.85	22.89	-21.53
4	gdp	-7.18	24.01	-22.38
5	profrate	-7.92	26.46	-24.19

Financialization: lambdaF shifts from -0.36 to 0.15

Combined: lambdaF shift from -0.36 to 0.15 and lambdaW shifts from 1.67 to 3.45

Reversal: a decline of lambdaW to 1.92 is imposed in the model that had gone through the combined shock

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