

COLOQUIO INTERNACIONAL – COLLOQUE INTERNACIONAL**O CAPITALISMO COM DOMINÂNCIA FINANCEIRA****UMA ANÁLISE COMPARADA DOS PAÍSES AVANÇADOS E EMERGENTES****INSTITUTO DE ECONOMIA – UNICAMP - CAMPINAS - BRAZIL****1 E 2 DE OUTUBRO DE 2009***O CAPITALISMO CONTEMPORÂNEO: A CONTRIBUIÇÃO DA ABORDAGEM ESTOQUE-FLUXO CONSISTENTE***CONFIDENCE, BANKING BEHAVIOUR AND ECONOMIC POLICY
IN A POST-KEYNESIAN STOCK-FLOW CONSISTENT MODEL***Edwin Le Heron*

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While in 2007 it was only a financial crisis and particularly, a banking crisis, now economic growth and employment are deteriorating sharply. The aim of this paper is to understand how the financial crisis was transformed in a global real economic crisis and how it passed through the banking behaviour. We try to understand the special features of a ‘financiarized’ economy. We are particularly interested in psychological variables such as the state of confidence, because these variables play a key role in the Post-Keynesian tradition through expectations, but also in the finance-led capitalism. In order to do so, we develop a two-country model of a ‘financiarized’ economy suffering a fall in the state of confidence of banks, firms and households. We contrast a rule on public expenditures with a rule on public deficits and a usual Taylor rule with a truncated Taylor rule. In the first country, the government implements a fiscal policy with automatic stabilizers and a central bank has a dual mandate: inflation and growth. There is a co-ordination between fiscal and monetary policies. The second country implements an orthodox fiscal policy (balanced budget) and independent the central bank implements inflation targeting.

In the first part of the paper, we build a Post Keynesian stock-flow consistent (SFC) model (Lavoie-Godley, 2001, 2007, Dos Santos-Zezza, 2004, Mouakil, 2006, Le Heron-Mouakil, 2008, Le Heron, 2009) with a private banks sector introducing more realistic features (4 financial assets). We introduce the borrower’s and the lender’s risks from the Minskian approach. In the second part, we simulate the model to study the effects of a financial crisis that involves a confidence crisis. The aim is to analyze the consequences of a fall in the state of confidence of private sectors on the banking behaviour within our two assumptions on the policy mix. We make some comparison between two level of ‘financiarization’ and we analyze the channel of transmission from the financial crisis to the real world.

A POST KEYNESIAN STOCK-FLOW CONSISTENT GROWTH MODEL WITH A FULL BANKING SECTOR, A TAYLOR RULE AND A SPECIAL PHILLIPS CURVE

Building a stock-flow consistent model requires three steps: writing the matrices, counting the variables and the accounting identities issued from the matrices, and defining each unknown with an equation (accounting identity or behavioural equation).

Matrices

Five sectors form our economy: government, firms, households, private banks and central bank. All production must be financed. However, current production is financed by the working capital of entrepreneurs (retained earnings) and by contracted revolving funds granted by banks at the current rate of interest. These two factors constitute a shock absorber to possible monetary rationing by banks. We are essentially limiting our study to the effects that monetary policy might have on new financing for investment and growth of production.

Let us proceed to examine the gross supply (φ) and the net supply (ΔF) of finance by banks – that is to say, the new flow of money, as opposed to the existing stock of money (D). Also, there is a stock of money demand equal to transaction, precaution, finance and speculative motives, whereas the desired gross finance demand (φ^d) represents the new flow of financing required by firms (I^d) plus the redemption of the debt (amortization = amort) minus the undistributed profits (P^u). Thus the internal funds of firms (IF) represent the undistributed profits (P^u) minus the redemption of the debt (amort). Assuming a closed economy, demand for money can be satisfied by banks, either by the stock markets or by credit. At the end of the period, net financing demand (ΔF_D) can be constrained by net money supply from banks (ΔF) (granted financing - paid off financing - amortization). ΔF determines monetary creation in the period.

We discuss here a closed economy. Firms issue equities, bonds with fixed rates of interest and commercial papers, and borrow money from banks to finance investments but they neither hold money balance. They have excess capacity but no inventories.¹ Two factors are involved in producing goods (fixed capital and labour), but we deal with a vertically integrated sector and hence ignore all intermediate goods. Banks have no operating costs and they don't make loans to households. Contrary to Lavoie-Godley (2001), private banks own a net wealth and retain all their profits.

The central bank has neither operating costs nor net worth. The central bank pays all its profits to the government, which collects taxes from households and finances its deficit by issuing Treasury bills. Government expenditures are only final sales of consumption goods: there is neither operating costs (like wages for state employees) nor transfers between households. The financial behaviour of households is simplified: they hold only banking deposit account (current accounts and time deposits).

¹ Excess capacity exists because of expectations of future demand, entry barriers, cost minimization, time-taking production. For the role of inventories see Godley and Lavoie (2007: chapter 9).

SFC modelling is based on two tables: a balance sheet matrix (stocks) and a transactions matrix (flows). Table 1 gives the transactions matrix that describes monetary flows between the five sectors of the economy. Every row represents a monetary transaction, and every column corresponds to a sector, which is fragmented in a current and a capital account, except in basic cases such as the government and that of households. Sources of funds appear with plus signs and uses of funds with negative signs, so every row must sum to zero seeing that each transaction corresponds always simultaneously to a source and a use of funds. The sum of each column must also be zero since each account (or sub-account) is balanced.

Sector Operation	Govt	Firms		Households	Private banks		Central Bank (CB)		Σ
		Current	Capital		Current	Capital	Current	Capital	
Consumption		+ C		- C					0
Government expenditures	- G	+ G							0
Net investment		+ I	- I						0
Wages		- W		+ W					0
Taxes	+ T			- T					0
Interest on Treasury Bills	$- i_{b-1} \cdot B_{-1}$				$+ i_{b-1} \cdot B_{-1}$				0
Interest on loans		$- i_{l-1} \cdot L_{-1}$			$+ i_{l-1} \cdot L_{-1}$				0
Interest on comm. paper		$- i_{cp-1} \cdot CP_{-1}$			$+ i_{cp-1} \cdot CP_{-1}$				0
Interest on bonds		$- i_{of} \cdot of_{-1}$			$+ i_{of} \cdot of_{-1}$				0
Interest on bank deposits				$+ i_{d-1} \cdot D_{-1}$	$- i_{d-1} \cdot D_{-1}$				0
Interest on CB advances					$- i_{cb-1} \cdot REF_{-1}$		$+ i_{cb-1} \cdot REF_{-1}$		0
Profits of firms		- P	+ P ^u		+ P ^d				0
Profits of banks					- P _b	+ P _b			0
Profits of CB	+ P _{cb}						- P _{cb}		0
Δ HPM						- ΔH		+ ΔH	0
Δ T Bills	+ ΔB					- ΔB			0
Δ equities			+ $\Delta e \cdot p_e$			- $\Delta e \cdot p_e$			0
Δ loans			+ ΔL			- ΔL			0
Δ commercial paper			+ ΔCP			- ΔCP			0
Δ bonds			+ $\Delta of \cdot p_{of}$			- $\Delta of \cdot p_{of}$			0
Δ bank deposits				- ΔD		+ ΔD			0
Δ CB advances						+ ΔREF		- ΔREF	0
Σ	0	0	0	0	0	0	0	0	0

Table 1: Transactions matrix

Table 2 gives the balance sheet matrix of our economy. Symbols with plus describe assets and negative signs indicate liabilities. The sum of every row is again zero except in the case of accumulated capital in the industrial sector. The last row presents the net wealth of each sector.

Table 2: Balance sheet matrix

Sector Assets	Government	Firms	Households	Private banks	Central Bank	Σ
Capital		+ K				+ K
HPM high powered money				+ H	- H	0
Treasury Bills	- B			+ B		0
Equities		- e · p _e		+ e · p _e		0
Loans		- L		+ L		0
Commercial paper		- CP		+ CP		0
Bonds (fixed-yield)		- of · p _{of}		+ of · p _{of}		0
Bank deposits			+ D	- D		0
CB advances				- REF	+ REF	0
Net wealth	- B	+ V _f	+ D	+ V _b	0	+ K

Variables and accounting identities

Building a model that describes the monetary economy of production discussed above in a consistent way requires that the transactions matrix should be properly translated into equations. First, the model must contain the 26 variables of the matrix. Each of these 26 variables can be associated with the behaviour of one of the five sectors of our economy.

- Government: G, T, B, i_b
- Firms: I, W, P, P^u, P^d, e
- Households: C, D
- Private banks: i_l, L, i_{cp}, CP, i_{of}, p_{of}, of, p_e, i_d, P_b
- Central Bank: H, i_{cb}, REF, P_{cb}

Second, we must use the accounting identities resulting from each row and each column sum to zero. We have nine accounting identities corresponding to the eight columns of the transactions matrix and to the non-ordinary row². To start we transcribe the identities (uses of funds on the left side, sources of funds on the right side) without being precise how we will use them in the model:

- (i) $G + (i_{b-1} \cdot B_{-1}) \equiv T + P_{cb} + \Delta B$
- (ii) $W + (i_{l-1} \cdot L_{-1}) + (i_{cp-1} \cdot CP_{-1}) + (i_{of} \cdot of_{-1}) + P \equiv C + I + G$
- (iii) $I \equiv P^u + (\Delta e \cdot p_e) + \Delta L + \Delta CP + (\Delta of \cdot p_{of}) \equiv \varphi + P^u - \text{amort}$
- (iv) $C + T + \Delta D \equiv W + (i_{d-1} \cdot D_{-1})$
- (v) $(i_{d-1} \cdot D_{-1}) + (i_{cb-1} \cdot REF_{-1}) + P_b \equiv (i_{b-1} \cdot B_{-1}) + (i_{l-1} \cdot L_{-1}) + (i_{cp-1} \cdot CP_{-1}) + (i_{of} \cdot of_{-1}) + P^d$
- (vi) $\Delta H + \Delta B + (\Delta e \cdot p_e) + \Delta L + \Delta CP + (\Delta of \cdot p_{of}) \equiv P_b + \Delta D + \Delta REF$

² What we call non-ordinary row is the row concerning profits of banks that includes three different variables (see ix).

- (vii) $P_{cb} \equiv i_{cb-1} \cdot REF_{-1}$
 (viii) $\Delta REF \equiv \Delta H$
 (ix) $P \equiv P^u + P^d$

A feature of SFC models is that if there are M columns and N non ordinary rows in the transactions matrix, then there are only $(M + N - 1)$ independent accounting identities in the model. Because of this one equation must be dropped: we shall use exactly eight accounting identities in the model. Concerning the balance sheet matrix, it is simpler: we just make sure that initial values of stocks are consistent with the matrix. In the following periods, stocks will stay consistent since our eight identities will generate consistent flows. Now we must define every variable relative to the five sectors using an accounting identity³ or a behavioural equation. When we introduce new unknowns in a behavioural equation we define them immediately so that our model should have the same number of equations as unknowns.

The national income (Y) adds the household consumption (C), investment of the firms (I) and the public expenditure (G). The rate of growth of the national income is gr_y :

- (1) $Y = C + I + G$
 (2) $gr_y = \Delta Y / Y_{-1}$

Two fiscal policies for the Government: G , T , B , i_b

The government collects only taxes from households (on wages):

- (3) $T = \tau \cdot W_{-1}$ With τ : constant

The government finances any deficit issuing bills, so that the supply of treasury bills (B) in the economy is identical to the stock of government debt. In other words, it is given by the pre-existing stock of debt plus its current deficit (GD). The current deficit of the Government includes the redemption of the National debt. We assume that private banks give limitless credit to government at the long-term rate of interest:

- (4) $B = B_{-1} + GD$
 (5) $i_b = i_l$

To analyze the consequences of a supply shock, we assume two different assumptions for the fiscal policy. We contrast a rule on public expenditures ($F1$) with a rule on public deficits ($F2$).

Assumption 1 (F1): A stabilizing effect of the fiscal policy

First, we assume that public expenditure (G) is always growing at the same rate (gr_y) as the national income (Y). With $F1$, public expenditure is pro-cyclical, because G falls with the GDP. But the final effect of the fiscal policy is measured by the government deficit (GD). Tax revenue is proportional to income and hence varies in line with the public expenditure. But with a contractionary monetary policy and its higher interest rate, the financial costs of the national debt increase. The global impact is linked to the key interest rate and, then, to the monetary policy. It looks like a co-ordination between the monetary and the fiscal policies. With $F1$, the economy has a

³ When we use an accounting identity we often need to rewrite it so we will always recall its number (using Roman numeral), rendering it more easily recognizable by the reader.

self-stabilizing tendency due to the fiscal policy, though the fiscal policy effect comes through the effects of interest rate on the budget deficit.

$$(6-F1) \quad G = G_{-1} \cdot (1 + gr_{y,-1})$$

$$(7-i-F1) \quad GD = G + (i_{b,-1} \cdot B_{-1}) - T - P_{cb}$$

Assumption 2 (F2): a 'neutral' fiscal policy

Second, we assume that a 'neutral' fiscal policy corresponds to a constant ratio (r_{GD}) of government deficit-to-the last national income: DB/Y_{-1} . It is more or less the case of the Maastricht treaty of the European Union. The stability and growth pact of the Treaty decrees that 'Member States shall avoid excessive government deficits'. Then we use the first accounting identity to calculate the adequate public expenditure. In experiences, we shall take the ratio (r_{GD}) equal to zero as is required by the Maastricht treaty. Contrary to the previous assumption, the public debt is zero, since the budget is balanced. As the interest rate does not act on fiscal policy, there is no coordination between the fiscal and the monetary policies.

$$(6-F2) \quad GD = r_{GD} \cdot Y_{-1} \quad \text{With } r_{GD}: \text{ constant}$$

$$(7-i-F2) \quad G \equiv GD - (i_{b,-1} \cdot B_{-1}) + T + P_{cb}$$

With these assumptions, we should better understand the links between monetary policy and fiscal policy (Figure 1)⁴:

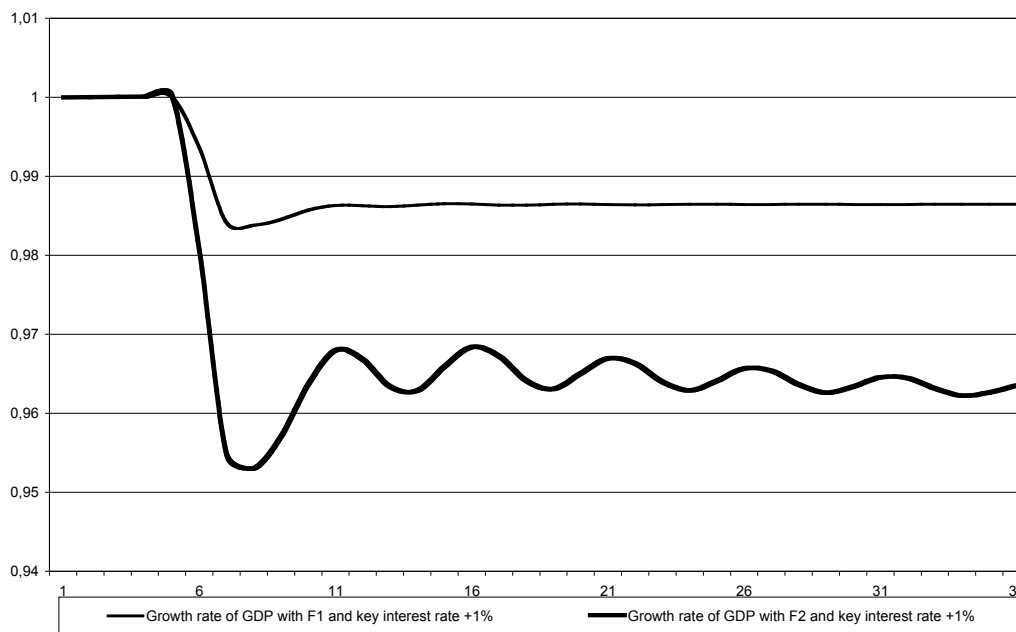


Figure 1 Higher key interest rate (from 2 to 3% after period 5): effects on the growth rate of the economy with F1 and F2

4 In all the figures (except the figure 4), all values on the vertical axis are homogenized to one for the steady state.

Firms: I, W, P, P^u, P^d, e, OG

The investment function is the most important one in a growth model. The stock of capital increases with the flow of net investment (I) that is financed by the total of external funds from commercial banks (gross finance = φ) and by the internal funds of firms. The self-financing of firms corresponds to the retained earnings (P^u) minus the redemption of the debts of firms (amort). Amortization concerns only the debt: loans (L), bonds (OF) and commercial papers (CP).

$$(8) \quad K = K_{-1} + I$$

$$(9\text{-iii}) \quad I \equiv \varphi + IF$$

$$(10) \quad IF = P^u - \text{amort}$$

$$(11) \quad \text{amort} = (a_l \cdot L_{-1}) + (a_{of} \cdot of_{-1}) + (a_{cp} \cdot CP_{-1})$$

In our model, we focus on the difference between actual investment (I) and the desired investment of firms (I_D). The banks accept to finance totally or in part the second one according their lender's risk (LR) (see equations 32, 33, 35). A monetary rationing on investment can exist ($\varphi < \varphi^d$ or $I < I_D$). The desired rate of accumulation (gr_{kD}) is function of an exogenous state of confidence (γ_0), the capacity utilization rate (u) and of the borrower's risk (BR), which is measured by the rate of cash flow (r_{cf}) and by the financial condition index (FCI). The rate of cash flow is the ratio of retained earnings to capital and the financial condition index captures the sensitivity of investment to the long-term interest rate, to the short-term interest rate and to the financial capitalization ratio. The lender's risk and the borrower's risk come from the analysis of H. Minsky.

$$(12) \quad I_D = gr_{kD} \cdot K_{-1}$$

$$(13) \quad \varphi^d = I^d - IF$$

$$(14) \quad gr_{kD} = \gamma_0 + (\gamma_1 \cdot r_{cf-1}) + (\gamma_2 \cdot u_{-1}) - (\gamma_3 \cdot FCI_{-1}) \quad \text{With } \gamma_i: \text{ constant}$$

where the rate of capacity utilization is defined as the ratio of output to full capacity output (Y_{fc}):

$$(15) \quad r_{cf} = P^u / K_{-1}$$

$$(16) \quad u = Y / Y_{fc}$$

The capital-to-full capacity ratio (σ) is defined as a constant:

$$(17) \quad Y_{fc} = K_{-1} \cdot \sigma \quad \text{With } \sigma: \text{ constant}$$

$$(18) \quad FCI = (\mu_1 \cdot i_l \cdot L/K) + (\mu_2 \cdot i_{cb} \cdot CP/K) - (\mu_3 \cdot E/Y) \quad \text{With } \mu_i: \text{ constants}$$

Concerning wages, they can be decomposed into a unit wage (w) times the level of employment (N):

$$(19a) \quad W = w \cdot N$$

where employment is determined by sales given productivity (σ_2):

$$(19b) \quad N = Y / \sigma_2 \quad \text{With } \sigma_2: \text{ constant}$$

The full employment (N_{fe}) is:

$$(19c) \quad N_{fe} = Y_{fc} / \sigma_2 \quad \text{With } \sigma_2: \text{ constant}$$

The unemployment (Un) or the output gap (OG) are easily found:

$$(19d) \quad Un = N_{fe} - N$$

$$(19e) \quad OG = Y - Y_{fc}$$

The rate of unemployment r_{un} is:

$$(19f) \quad r_{un} = Un / N_{fe}$$

For the model, we measure the output gap in ratio:

$$(19) \quad OG_R = (Y - Y_{fc}) / Y_{fc}$$

We assume that the ratio ‘wages on output’ (W/Y) is exogenous and constant.

$$(20) \quad W = Y / \rho \quad \text{With } \rho: \text{ constants}$$

Total profits (P) of firms are the difference between their sales and their expenditures (wages and interest payments on loans, commercial papers and bonds):

$$(21\text{-ii}) \quad P \equiv Y - W - (i_{l-1} \cdot L_{-1}) - (i_{cp-1} \cdot CP_{-1}) - (i_{of} \cdot of_{-1})$$

Distributed dividends (P^d) are a fraction of profits realized in the previous period:

$$(22) \quad P^d = (1 - s_f) \cdot P_{-1} \quad \text{With } s_f: \text{ constant}$$

Retained earnings (P^u) are determined as the residual:

$$(23\text{-ix}) \quad P^u \equiv P - P^d$$

Equations concerning issues of equities by firms are usually oversimplified in SFC models. We simply assume that the stock of shares grows at the rate of the GDP with a lag of one year (gr_{y-1}): $\Delta e / e_{-1} = gr_{y-1}$. The more the economy grows, the more firms issue equities. There are two explanations. First it is easier to sell new equities when the economy and thus the profits grow. Second, firms need new finance to follow the growth of the GDP.

$$(24) \quad e = e_{-1} \cdot (1 + gr_{y-1})$$

Households: C, D

We assume that households determine their consumption expenditure (C) on the basis of their expected disposable income and their wealth of the previous period (that consist entirely of bank deposits: current accounts and time deposits):

$$(25) \quad C = (\alpha_1 \cdot Y_w^a) + (\alpha_2 \cdot Y_v^a) + (\alpha_3 \cdot D_{-1}) \quad \text{With } \alpha_i: \text{ constant } 1 > \alpha_1 > \alpha_2 > \alpha_3 > 0$$

$$(26) \quad Y_w^a = Y_{w-1} + \theta_h \cdot (Y_{w-1} - Y_w^{a-1}) \quad \text{With } \theta_h: \text{ constant}$$

$$(27) \quad Y_v^a = Y_{v-1} + \theta_h \cdot (Y_{v-1} - Y_v^{a-1})$$

$$(28) \quad Y_w = W - T$$

$$(29) \quad Y_v = i_{d-1} \cdot D_{-1}$$

$$(30) \quad Y_h = Y_w + Y_v$$

Whereas (Y_w^a) is the expected disposable income of workers, (Y_v^a) the expected disposable financial income and each (α_i) is a propensity to consume. There are adaptive expectations⁵.

Following the Kaleckian tradition, we assume that wages are mostly consumed while financial income is largely devoted to saving ($1 > \alpha_1 > \alpha_2 > 0$). This class-based saving behaviour is of importance in a SFC model where interest payments play a great role. With the same high propensity to consume ($\alpha_1 = \alpha_2$), an increase of the interest rates can move the economy to a higher growth path in the long run. The consumption decision determines the amount that households will save out of their disposable income Y_h :

$$(31\text{-iv}) \quad D \equiv D_{-1} + Y_h - C$$

⁵ The expected value of any variable for current period (represented with the superscript a) depends on its value of the previous period plus an error correction mechanism where (θ) represents the speed of adjustment in expectations.

Private banks: $i_b, L, i_{cp}, CP, i_{of}, p_{of}, \phi, i_d, p_e, P_b$

Firms’ financing is fundamental in a monetary economy of production. Firms begin by being self-financed then turn to external finance (ΔF_D). Banks only finance projects they consider profitable, but confidence in their judgment is variable and can justify various strategies. Banks examine firms’ productive and financial expectations and also their financial structure. This investigation is made according to their confidence in the state of long-term expectations of yields on capital assets, influencing what Keynes referred to as ‘animal spirits’. The state of confidence of banks is notably taking into account by an exogenous variable (γ_4). After the study of expected production and of demand of financing that integrates the firm’s borrowing risk (r_b), bankers can refuse to finance. The state of confidence of banks summarizes these factors.

Banks know a lender’s risk (LR) when underwriting finance⁶ and creating money. Lender’s risk is the sum of three fundamental risks:

- First, risk of default corresponds to the bank’s perception regarding the borrower’s likelihood failure to repay the claim.
- Second, risk of liquidity. Liquidity entails the ability to reverse a decision at any moment at the smallest possible cost.
- Third, market risk corresponds to unanticipated changes on the various financial markets. Market risk can be split into other risks. Fluctuations in capital asset prices modify their value and explain capital risk - which is very high for equities and fixed-yield bonds. For the fixed-yield bonds, capital risk is inversely proportional to interest rates. The risk of income mainly concerns the highly uncertain dividends of equities and the variable yield of loans. Finally, monetary policy involves a money market risk when fluctuations in the money interest rates occur.

In equations (32, 35, 52, 53), the risks of default and of liquidity are take account by the gap of the leverage ratio with a conventional leverage ratio. We also introduce the value of the securities lodged as collateral and the cost of indebtedness for the risk of default. The market risk is taken into account by the expected capital gains on equities (CG_e^a) and on fixed-yield bonds (CG_{of}^a), but also with the central bank interest rate.

When the lender’s risk is at a maximum ($LR = 1$), commercial banks refuse to finance the net investment of firms: $\Delta F = 0$. Desired investment (I_D) faces a serious finance rationing. The flow of net investment is only financed by self-funding, that is the retained earnings (P^u), minus the amortization of the debt, minus the capital losses of firms (CG). Thus the money supply (in stock) can be reduced with the redemption of the debt. If the lender’s risk is null ($LR = 0$), desired investment is fully financed: $\Delta F = \Delta F_D$ or $\varphi = \varphi^d$. It is the horizontalist case. The capital losses of firms are also the capital gains of banks, measured by the capital losses on equities (CG_e) and on fixed rate bonds (CG_{of}) (équations 44 and 50).

$$(32) \quad \varphi = \varphi^d \cdot (1 - LR) \quad \text{With } 0 \leq LR \leq 1$$

$$(33) \quad \Delta F = \varphi - \text{amort} + CG$$

$$(34) \quad CG = CG_e + CG_{of}$$

⁶ We will take into account the loans (L) (long-term), the short-term securities as treasury bills (B) and commercial papers (CP), bonds (fixed-rate (OF)) and equities (E).

In the model, the lender's risk (LR) is measured by the difference between the current leverage ratio and the conventional leverage ratio (quantity of indebtedness), by the variation in the value of the securities lodged as collateral (V_C) and by the cost of indebtedness (i_{cb}). The higher current indebtedness of firms $((CP + OF + L)/K)$ is over the accepted indebtedness, the more the lender's risk is. The accepted indebtedness is conventional, but this conventional indebtedness can increase during a boom and decrease during a crisis. The variation in the value of the securities lodged as collateral (V_C) is measured by the value of equities (E) on the value of equities of the last period. The financial value is the value of the equities on the market.

$$(35) \quad LR = -\gamma_4 + a_1 \cdot (lev_{-1} - lev_c) - (b_1 \cdot V_C) + (c_1 \cdot i_{cb})$$

With γ_4, a_1, b_1, c_1 et lev_c : constant

$$(36) \quad lev = (CP + OF + L) / K$$

$$(37) \quad V_C = E / E_{-1}$$

We come to the equations defining the portfolio behaviour of banks. We follow the methodology developed by Godley and Lavoie (2007) and inspired by Tobin (1958). Banks can hold four different assets: bonds (with fixed rate of interest) $OF = of \cdot p_{of}$, equities $E = e \cdot p_e$, loans at variable long-term interest rate (L) and commercial paper (CP) at short-term interest rate. The λ_{ij} parameters follow the vertical, horizontal and symmetry constraints (Godley and Lavoie, 2007). Banks are assumed to make a certain proportion λ_{i0} of their financing in the form of asset i but this proportion is modified by the rates of return on these assets. Banks are concerned about (i_l) and (i_{cp}), the rates of interest on loans and on commercial paper to be determined at the end of the current period, but which will generate the interest payments in the following period. We have further assumed that it is the expected rates of return on equities (r_e^a) and on bonds (r_{of}^a) that enter into the determination of portfolio choice. The four assets demand function described with the matrix algebra are thus:

$$(38) \quad OF = (\lambda_{10} + \lambda_{11} \cdot r_{of}^a - \lambda_{12} \cdot r_e^a - \lambda_{13} \cdot i_l - \lambda_{14} \cdot i_{cp}) \cdot F$$

$$(39) \quad E = (\lambda_{20} - \lambda_{21} \cdot r_{of}^a + \lambda_{22} \cdot r_e^a - \lambda_{23} \cdot i_l - \lambda_{24} \cdot i_{cp}) \cdot F$$

$$(40) \quad L = (\lambda_{30} - \lambda_{31} \cdot r_{of}^a - \lambda_{32} \cdot r_e^a + \lambda_{33} \cdot i_l - \lambda_{34} \cdot i_{cp}) \cdot F$$

$$(41a) \quad CP = (\lambda_{40} - \lambda_{41} \cdot r_{of}^a - \lambda_{42} \cdot r_e^a - \lambda_{43} \cdot i_l - \lambda_{44} \cdot i_{cp}) \cdot F$$

As it is the case with every matrix, we cannot keep all these equations in the model because each one of them is a logical implication of the others. We model commercial paper as the residual equation:

$$(41) \quad CP = F - OF - E - L$$

For the bonds, the expected rate of yield (r_{of}^a) is the fixed interest rate plus the expected capital gains on the market value of the previous period of these bonds (OF_{-1}). The market value of the bonds is the number of bonds (of) times their prices (p_{of}). The interest rate (i_{of}) is always the long-term interest rate of the first period applied to the initial price (in t_0 , $p_{of} = 1$). But after the first period, the prices of the old and of the new fixed-yield bonds (p_{of}) is inversely proportional to the changes in the long-term interest rates (i_l).

The expected value of capital gains on bonds (CG_{of}^a) and on equities (CG_e^a) for current period depends on its value of the previous period plus an error correction mechanism where (θ) represents the speed of adjustment in expectations. The capital gains (CG_{of} and CG_e) correspond to the variations in the price times the quantity of the previous period.

$$(42) \quad r_{of}^a = i_{of} + CG_{of}^a / OF_{-1} \quad \text{With } i_{of} : \text{ constant}$$

$$(43) \quad CG_{of}^a = CG_{of-1} + \theta_b \cdot (CG_{of-1} - CG_{of}^a)_{-1}$$

$$(44) \quad CG_{of} = \Delta p_{of} \cdot of_{-1}$$

$$(45) \quad of = OF / p_{of}$$

$$(46) \quad p_{of} = p_{of-1} \cdot (1 + i_{of}) / (1 + i_l)$$

For the equities, the expected rate of yield (r_e^a) is the sum of the expected distributed profits (P^{da}) and the expected capital gains (CG_e^a), on the market value of the previous period of these equities (E_{-1}). As usual, the expected distributed profits (P^{da}) for current period depends on its value of the previous period plus an error correction mechanism where (θ) represents the speed of adjustment in expectations. The only price clearing mechanism of this model occurs in the equity market. The price of equities (p_e) will allow the equilibrium between the *number* of equities (e ; see equation 22) that has been issued by firms (the supply) and the *amount* of equities (E) that private banks want to hold (the demand).

$$(47) \quad r_e^a = (P^{da} + CG_e^a) / E_{-1}$$

$$(48) \quad P^{da} = P^{d}_{-1} + \theta_b \cdot (P^{d}_{-1} - P^{da}_{-1})$$

$$(49) \quad CG_e^a = CG_{e-1} + \theta_b \cdot (CG_{e-1} - CG_e^a)_{-1}$$

$$(50) \quad CG_e = \Delta p_e \cdot e_{-1}$$

$$(51) \quad p_e = E / e$$

Monetary authorities determine the key rate on the money market (i_{cb}). In 1936, Keynes asserts that this rate is widely conventional. In this model, central bank uses a Taylor rule. While central banks fix the short-term rates, private banks' liquidity preference determines banking rates (short, medium and long-term interest rates). Significant rates for growth and financing (loan) are the long-term interest rates (i_l). The link between short-term and long-term interest rates is complex. Macroeconomic banking interest rates (i_l) are the production costs of money plus a risk premium. The first element corresponds to functioning costs (wages, investment, immobilization); payment costs for monetary liabilities (subjected to the firms competition for households savings) and the cost of high powered money determined by the central bank; and to a rate of margin (χ) corresponding to standard profits of banks. The production costs of money are equal to (i_{cb}) plus a relatively constant mark up (χ).

Risk premiums are not constant because they are the fruits of the banks' liquidity preference. Risk premiums cover lender's risk (lr). Five expectations strongly influence risk premiums: anticipations about the productivity, economic evolution (growth, employment) and budget; expected inflation; the level of future short-term rates of interest; financial markets' evolution and capital assets' prices; foreign long-term rates present. In the model, we use the same lender's risk as the one seen previously (equation 35), that is a mix of state of confidence, leverage ratio and variation in the value of the securities lodged as collateral. But with the different coefficients (γ_5), (a_2) and (b_2), (lr) can be negative and reduces the mark up. Therefore the long-term interest rate

becomes endogenous and the spread between (i_{cb}) and (i_l) is not constant. Contrary to the horizontalist' view, we introduce an endogenous curve of the interest rates. To explain the short-term interest rates (i_b or i_{cp}), i_{cb} and χ are sufficient. On the contrary, lr is the primary variable in order to explain long-term interest rates (i_l, i_{of}). Banks apply a spread (χ_3) between the key rate and the rate on deposits in order to realize profits.

$$(52) \quad i_l = i_{cb} + lr + \chi_1 \quad \text{With } \chi_1: \text{ constant } \chi_1 > \chi_2$$

$$(53) \quad lr = \gamma_5 + a_2 \cdot (lev_{-1} - lev_c) - b_2 \cdot V_C$$

With $\gamma_5, a_2, b_2, lev_c$ constant and $c =$ convention on the 'normal' debt ratio

$$(54) \quad i_{cp} = i_{cb} + \chi_2 \quad \text{With } \chi_2: \text{ constant } \chi_1 > \chi_2$$

$$(55) \quad i_d = i_{cb} - \chi_3$$

The initial structure of interest rates is as following: $i_l > i_{of} > i_{cp} > i_b = i_{cb} > i_d$

Banks try to maximize their net income. To make a profit, they finance the economy and agree to become less liquid. By making the almost irreversible decisions of financing, they are subjected to the lender's risk. They can hope for big profits only by lowering their LP_B . Economic activity also depends on the animal spirits of banks. Finance scarcity can only be the consequence of a deliberate choice. 'Desired scarcity' of financing is the sign of banks' liquidity preference. From an optimal structure of their balance sheet, we can measure the profits of commercial banks (P_b) obtained by monetary financing:

$$(56-v) \quad P_b \equiv i_{b-1} \cdot B_{-1} + i_{l-1} \cdot L_{-1} + i_{cp-1} \cdot CP_{-1} + i_{of} \cdot of_{-1} + P^d - i_{d-1} \cdot D_{-1} - i_{cb-1} \cdot REF_{-1}$$

Central Bank : H, i_{cb} , REF, i_b , P_{cb} , , Π

It is assumed that banks are obliged by the government to hold reserve requirements (H) in high powered money that do not generate interest payments and that must always be a fixed share (the compulsory ratio η) of deposits:

$$(57) \quad H = \eta \cdot D$$

Since the central bank is collecting interest payments advances while paying out no interest on the notes, it is also making profits P_{cb} :

$$(58-vii) \quad P_{cb} \equiv i_{cb-1} \cdot REF_{-1}$$

It is assumed, in line with current practice, that any profits realized by the central bank revert to the government. Following the theory of endogenous money, we assume that the central bank is fully accommodating. First the central bank fixes the key rate of interest (i_{cb}) using a Taylor rule and second it provides whatever advances (REF) demanded by banks at this rate.

Taylor propounded his first rule in 1993, modelling the dual mandate of the Fed. It was founded on the output gap and on the inflation gap. But the output gap generates a theoretical problem to the RBC models (Goodfriend-King or Rotemberg-Woodford) and creates an implementation problem for inflation targeting. Inflation targeting is more a hierarchical mandate than a dual mandate. A truncated rule (without the output gap) appeared as a theoretical answer (Batini and Haldane, 1999).

From the Taylor rule, we can summarize monetary policy according to three dimensions: strategy, flexibility and intensity. Strategy represents the mandate and therefore the long-term policy. Flexibility measures the deviation in the short term of the policy from the strategy. Intensity

is the weight put respectively on output gap and inflation gap. With the ‘Taylor principle’, coefficients must be superior to one to avoid that inflation expectations produce inflation.

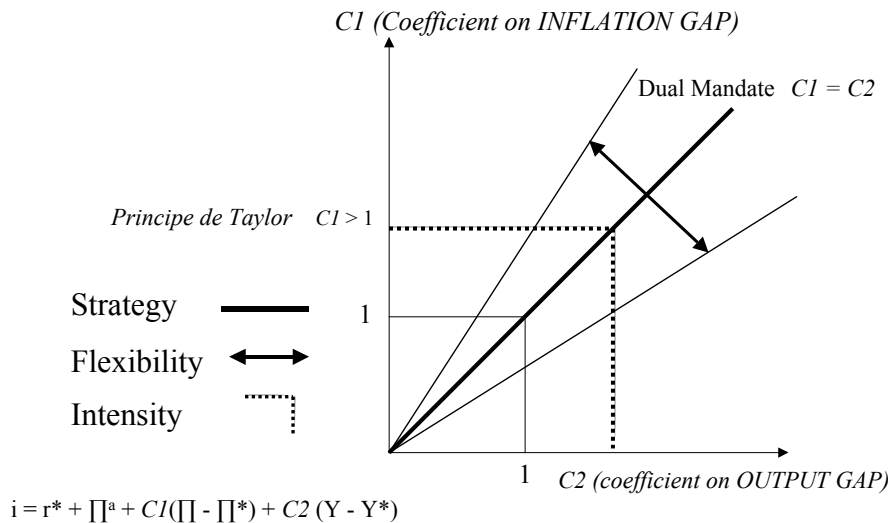


Figure 2 Monetary policy of central bank

The first hypothesis (M1) is that central bank uses a standard Taylor rule, modelling the dual mandate of the Fed. The key interest rate (i_{cb}) is a negative function of the output gap and a positive function of the inflation gap. Output gap is the difference between the full capacity output (Y_{fc}) and the current output (Y). Output gap in ratio (see equation 19 for OG_R) is output over the output gap. We refused the New Keynesian potential output that is founded on a NAIRU. Inflation gap is the difference between current inflation and the target of inflation (Π^*). Inflation gap is the difference between current inflation and the target of inflation (Π^*). As in standard Taylor rule, we add a neutral interest rate, exogenously fixed at 2 % as Keynes in the *General Theory*. The inflation target is 1 %. At the steady state, the key interest rate is equal to 3 %, so the real key interest rate is equal to the neutral interest rate ($i_{cb} - \Pi^* = i^* = 2\%$). In this case, the three gaps (output, inflation and interest rate) are equal to zero. The monetary rule M1 is:

$$(59-M1) \quad i_{cb} = i^* + \Pi + \alpha_4 \cdot OG_R + \alpha_6 (\Pi - \Pi^*)$$

The second hypothesis (M2) is a truncated Taylor rule similar to the unique mandate of ECB. A truncated Taylor rule only contains the inflation gap. With inflation targeting, the fear of inflation is higher. We should have: $\alpha_5 > \alpha_6$. We put $\alpha_6 = 0,5$ and $\alpha_5 > 1$. The monetary rule (M2) is:

$$(59-M2) \quad i_{cb} = i^* + \alpha_5 (\Pi - \Pi^*)$$

$$(60-vi) \quad REF \equiv REF_{-1} + \Delta H + \Delta B + \Delta F - CG - P_b - \Delta D$$

A special kind of Phillips Curve models inflation. (Taylor, 1979). When inflation is low and close to its target, we consider that the anticipations of inflation are anchored on the target. In this case, inflation does not react to the variations of output gap (OG_R). Inflation depends only on the anticipated inflation (Π^a) that is anchored on the target: $\Pi^a = \Pi^*$. This leads to a horizontal NKPC. But if the variations in output are too important (for instance, close to full capacity output) or, if an

exogenous supply shock occurs (for instance, a shock in the productivity or in the oil price), inflation reacts. Inflation reappears over OG_{Rmini} and disinflation under OG_{Rmaxi} . The idea that for small disturbances the inflation rate is stable while for large disturbances it is unstable was coined by Leijonhufvud (1981:112n) in the notion of a ‘corridor’. The economy has stability inside the corridor, while it will lose stability outside. Such a ‘corridor of stability’ can provide another way of looking at Keynes's insight that the economy is not violently unstable. The shape of the curve is as follows:

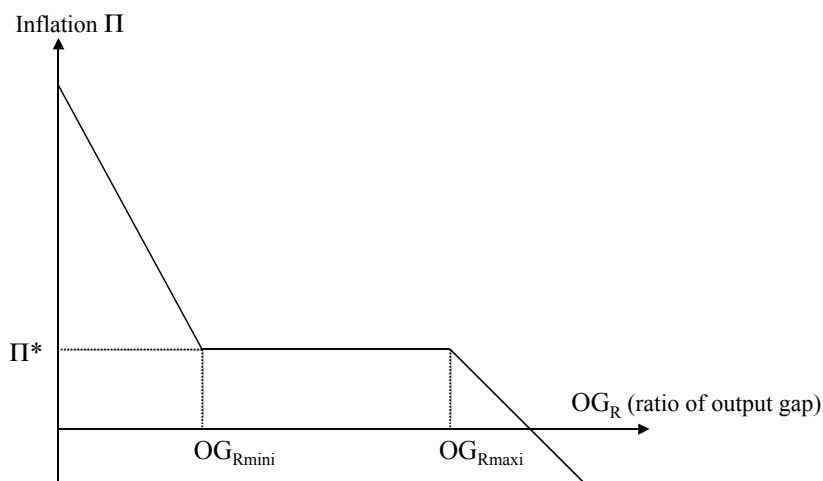


Figure 3 Inflation curve

To write the equation of inflation, we use the output gap and the inflation gap:

$$(61) \quad \Pi = \Pi^* + d_1 \cdot (OG_{Rmini} + OG_R) + d_2 \cdot (OG_{Rmaxi} + OG_R)$$

Our model is now closed. We have defined the 25 variables of the transactions matrix introducing 36 new variables⁷ and we now have the same number of equations (61) and unknowns. Furthermore, we have managed to use the $M + N - 1 = 8$ accounting identities issued from the transcription of the transactions matrix. The missing identity concerns the capital account of the central bank:

$$(62viii) \quad REF = H$$

This identity reflects the fact that high-powered money is supplied through advances to private banks. Of course, this accounting identity must invariably hold. When we solve numerically our model, identity (viii) $H \equiv REF$ perfectly holds.

⁷ These 37 new variables are the following:

Government: DG

Firms: $gr_y, gr_{KD}, Y, Y_{fc}, K, I_D, r_{cf}, u, ICF, \varphi, \varphi^d, IF, amort, OG_R$

Private Banks: $CG, CG_{of}, CG_{of}^a, CG_e, CG_e^a, LR, lev, V_c, OF, E, r_{of}^a, r_e^a, P^{da}, lr$

Households: $Y_w^a, Y_v^a, Y_w, Y_v, Y_h$

Central Bank : i_{cb}, Π

EXPERIMENTS ABOUT CONFIDENCE AND FINANCIAL CRISIS ON BANKING BEHAVIOUR WITH TWO POLICY MIX

Crisis in the state of confidence

We make simulations⁸ by imposing exogenous shock corresponding to the financial crisis during four years (5, 6, 7 and 8). Shocks are stronger in 6 and 7 than in 5 and 8. Numerous features in our standard model correspond to a ‘financiarized’ economy: an important financial market, four different financial assets, the lender’s risk, the borrower’s risk, a time structure of interest rate, etc.. We assume that financial crisis involves essentially a drop in the state of confidence of the economic agents and, in our model, especially that of banks. The aim is to deal with the channels of transmission of these psychological variables on the real sector. We want to show that psychological reactions (lower confidence) are sufficient to explain the spread of financial crisis to the real sector. We try also to understand the effects of the policy mix on it. Model and shocks are the same for both economies, even if the steady states are a little bit different because the policy mix is different. We develop four processes for the crisis.

A drop in the state of confidence of commercial banks: B

First, the state of confidence of banks decreases sharply and then the lender’s risk increases. We change exogenously (γ_4) and (γ_5) in equations (35) and (53) of lender’s risk. More the level of the conventional leverage ratio (quantity of firms indebtedness considered as normal (lev_c)) falls strongly in these equations. Last, the variation in the value of the securities lodged as collateral (V_C) is certainly negative at the beginning of the financial crisis. But this change is endogenous. Accordingly lender’s risk and rationing of finance increase.

A drop in the state of confidence of firms: F

Second, the state of confidence of firms (γ_0) falls with the development of the financial crisis. We change exogenously (γ_0) in the equation (14) of the desired rate of accumulation. Pessimistic expectations of firms depress effective demand. We could also increase the weight of the financial condition index in this equation (γ_3) to take into account the higher borrower’s risk.

A drop in the state of confidence of households: H

Third, the state of confidence of households is going down and their propensity to consume is falling (α_1 and α_2 in equation 25), involving a negative demand shock.

Generalized crisis in the state of confidence (banks, firms, households): B+F+H

Fourth, we put the three processes together for a generalized fall of the state of confidence. In the experiments, the respective importance of the crisis in the different economic sectors is not relevant. To respect the stylized facts of the last crisis, we assume that the drop in the state of confidence of banks is higher than those of others sectors (firms and then households). Polls on expectations and confidence of various kinds of agents can be used. The liquidity preference increases for all the economic agents.

The consequences of the financial crisis are examined for two kinds of policy mix:

⁸ We use the E-views 5.5 software.

- For country (1), monetary policy is determined by a standard Taylor rule (M1) that corresponds to a dual mandate: output gap and inflation gap. The fiscal policy rule (F1) has a stabilizing effect. But this effect is insufficient to restore the economy to the previous steady state. There is a co-ordination between the monetary and the fiscal policies.
- For country (2), monetary policy is determined by a ‘truncated’ Taylor rule (M2) that corresponds to a unique mandate of the independant central bank: inflation gap only. Fiscal policy (F2) is neutralized, because we assume the fiscal rule that the ratio of the current deficit of the Government on the GDP is constant and equal to zero, as imposed by the Maastricht treaty for the European Union.

The drop in the state of confidence of banks and firms involves a supply shock. In contrast the drop in the state of confidence of household involves a shock of demand. As risk is deflation, the equations of complete or truncated Taylor react similarly. In fact the output gap as the anticipation of lower prices requires lower interest rates.

In our economy, the steady state is not the full-employment equilibrium. The output gap is positive, with a significant rate of unemployment. Potential output corresponds to the full capacity output. To simplify, we introduced inflation only in our special Phillips curve and we do not take into account the difference between real and monetary variables in the rest of the model. Inflation could be integrated into the determinants of lender’s risk and borrower’s risk and into the portfolio matrix, in order to better integrate the wealth effects. Monetary policy tries to neutralize expectations of inflation.

Let us examine the bank-balance-sheet channel. Four channels are usually taken into account by literature: wealth effect (Davis et Palumbo, 2001), Tobin’s q (Tobin, 1969), the financial accelerator (Bernanke and al., 1999) and the capital of banks (Van den Heuvel, 2002). We had these four channels in our previous model (Le Heron, 2007a). In this model, we put the value of collaterals.

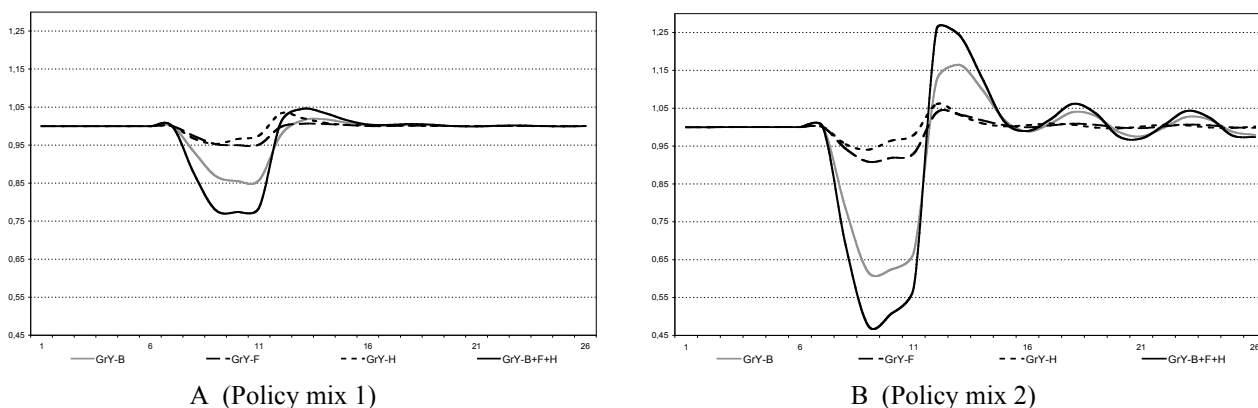


Figure 4. Fall in the state of confidence during 4 years. Effects on the growth rate of the economy⁹

In the short-term, the growth rate in the national income decreases strongly. Depressed effective demand that is the cause of higher unemployment can be explained by lost confidence of firms but also of banks. In our approach, private banks are no longer neutral.

⁹ In all the figures (except the figures 9 and 10), all values on the vertical axis are homogenized to one for the steady state. The drops in the state of confidence are respectively: B for Banks, F for Firms, H for Households and B+F+H for all the private sectors.

Following the approaches of Minsky and Keynes, financial features and confidence explain the crisis. Figures (4A-B) show that country (1) resists much better than country (2) to a fall in the state of confidence.

The fall in the growth rate is much lower. In addition, the emergence of economic cycles is obvious in country (2). With the removal of the fiscal tool, the economic situation deteriorates deeply and becomes more strongly cyclical.

The drop in state of confidence of firms is the first explanation to the depressed effective demand, *i.e.* the desired growth rate of accumulation of capital (Figures 5A-B). But, particularly with the policy mix (2), banks have also an important responsibility, because financing conditions deteriorate. The rate of utilization of productive capacity falls more in the second country than in the first (Figures 6A-B). The financial behaviour of firms explains widely these developments. With the depressed financial condition index and the lower cash flow ratio, the borrower's risk increases seriously.

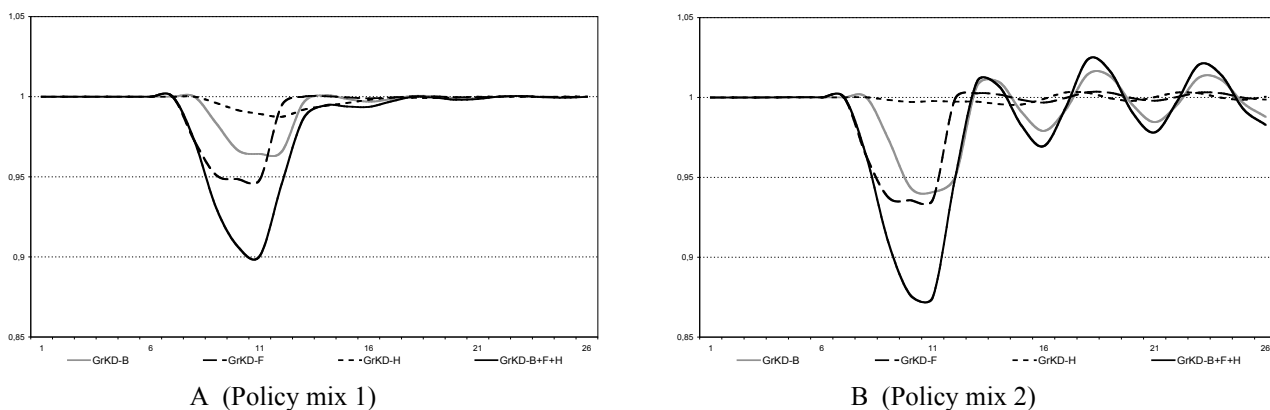


Figure 5. Fall in the state of confidence during 4 years
Effects on the desired growth rate of accumulation of capital of Firms

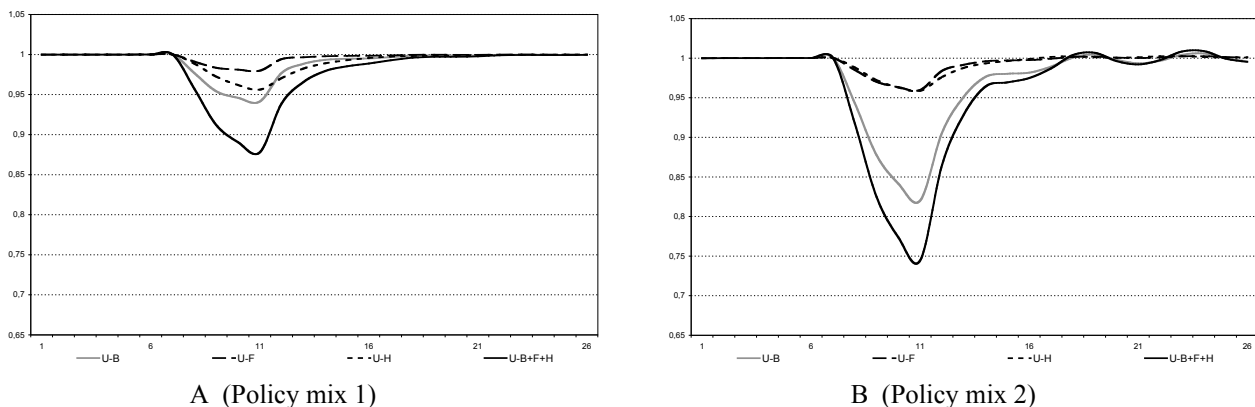


Figure 6. Fall in the state of confidence during 4 years. Effects on the capacity utilisation rate of firms

The effects on the self-financing of firms are very interesting (Figures 7A-B). With the higher borrower's and lender's risks, firms and banks reduce external financing: self-financing of firms increases. It corresponds to a supply shock and a credit crunch. On the contrary, the lost confidence of households involves a shock of demand and self-financing of firms decreases. With the policy mix (1), the higher government deficit allows an increase of the cash flow of firms. Their self-

financing increases. Government indebtedness substitutes the one of firms. With the policy mix (2), the weight of banks and households behaviours is stronger and durably lowers self-financing of firms. We understand why the reding of the ratio of self-financing is difficult and why it does not show the good state of economy.

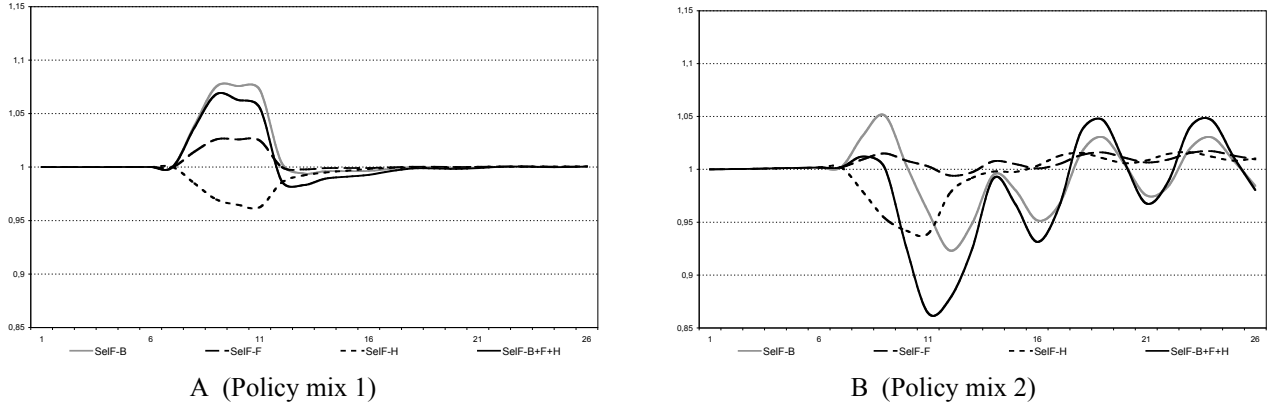


Figure 7. Fall in the state of confidence during 4 years. Effects on the ratio of self-financing of Firms

The leverage ratio of firms increases with the shock of demand (households), but decreases with rising the borrower' risk and the lender' risk. With the policy mix 1, there is a credit crunch.

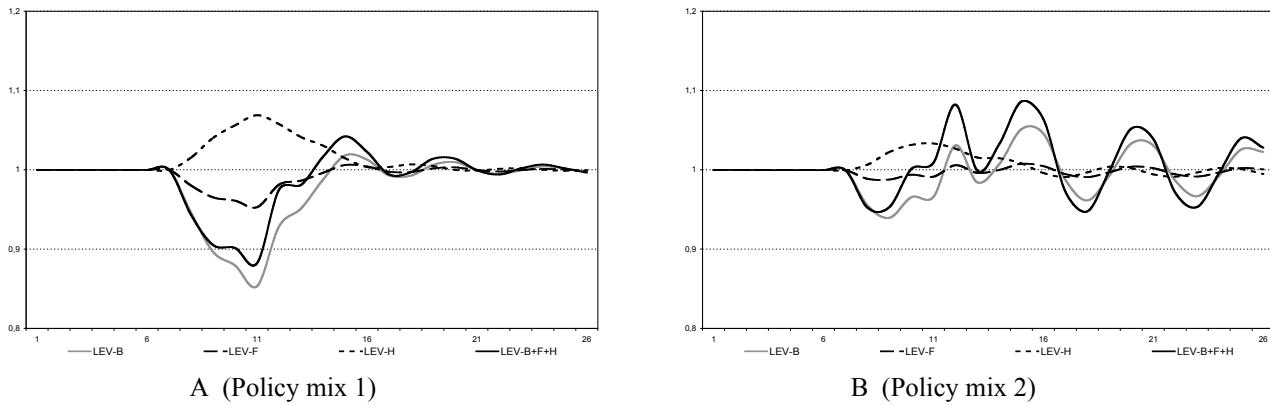


Figure 8. Fall in the state of confidence during 4 years. Effects on the leverage ratio of firms $((CP + OF + L) / K)$

One key element of the experiments is the increase of the lender's risk (Figures 9A-B). The fall of collateral value, the supposed lowest solvency of firms and the new strict convention of firms indebtedness explain the rise of the lender's risk.

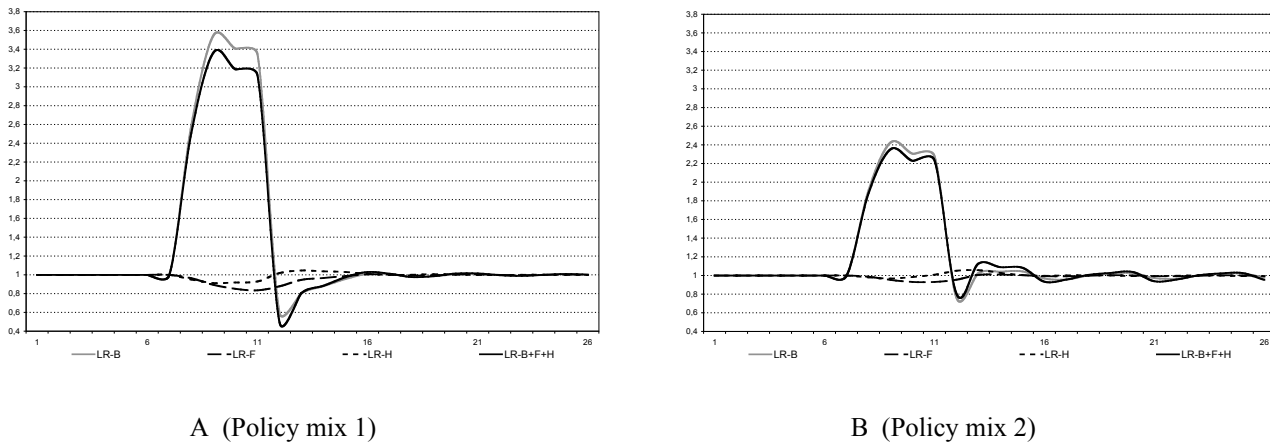


Figure 9. Fall in the state of confidence during 4 years. Effects on the lender's risk of commercial banks

The consequence is a financing rationing of the investment of firms by private banks: $\varphi < \varphi^d$ (Figures 10A-B). We can understand the credit crunch. The financing rationing of firms explains in part an increasing rate of unemployment. It exists a sharp volatility in the financial markets (stocks and bonds) and a significant fall in the profit of banks. During the crisis, private banks try reaching a new equilibrium in their asset allocation. The structure of their balance sheet changes clearly. It is sure that our model over-estimates the size of equities. In the financiarized economy, the firms finance more the financial market that the financial market finances the firms (Figures 11A-B). Of course, the credit crunch will be deeper without the equities. These elements could explain the crossing of the financial crise to the real world.

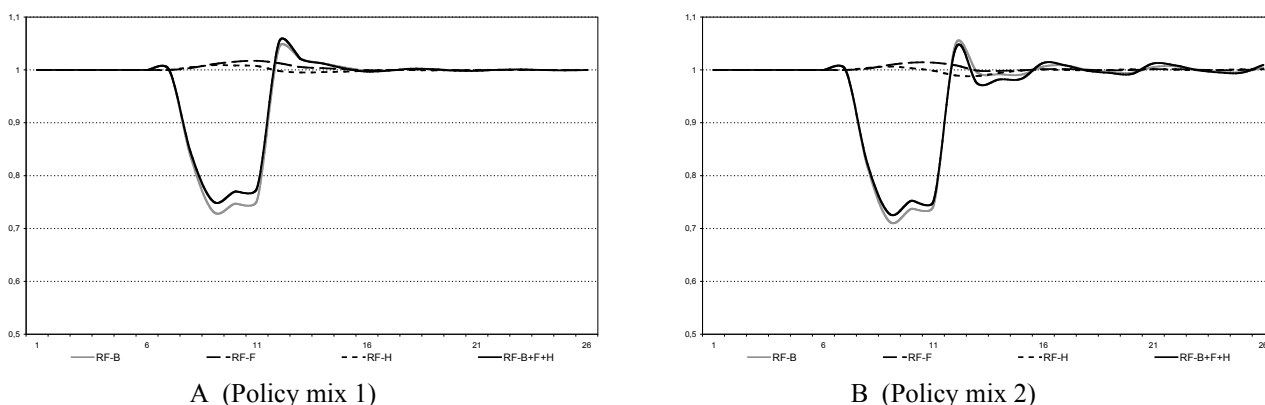
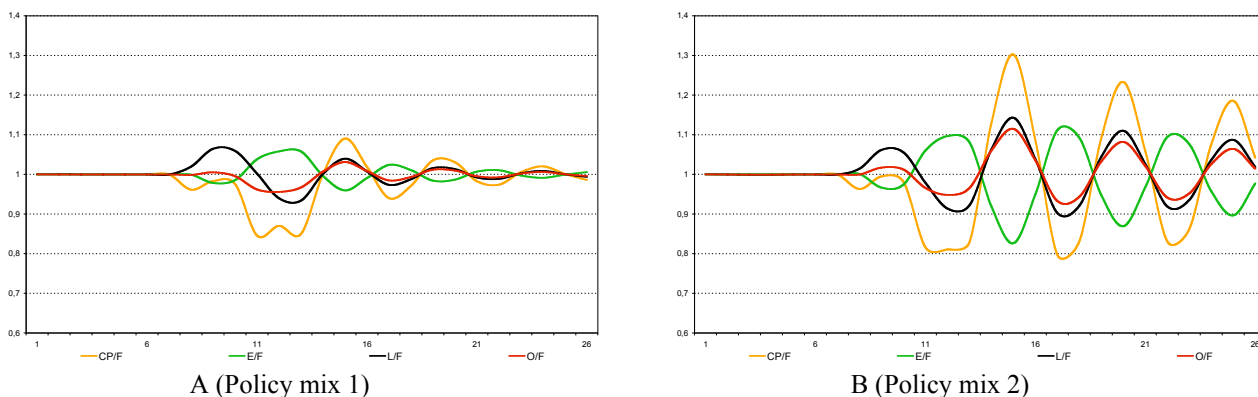


Figure 10. Fall in the state of confidence during 4 years. Effects on the rationing of finance from banks



Structure of financing at the stationary state:
 CP = 7 %, E = 52 %, L = 17 %, O = 24 %

Structure of financing at the stationary state:
 CP = 9 %, E = 47,5 %, L = 19 %, O = 24,5 %

Figure 11. Fall in the state of confidence during 4 years. Effects on the structure of the financing from banks

We see the beginning of the deflation (Figures 12A-B). With the deep crisis, monetary policy tries to avoid deflation, then the two kinds of Taylor rule work similarly : key interest rate goes down quickly to stop the fall of prices. The influence of output gap on the key interest rate is the same but is lower than that of inflation, even with the standard Taylor rule. With the desinflation, the truncated Taylor rule reacts more. If the fear is inflation, it is the opposite because output gap pushes in the other way.

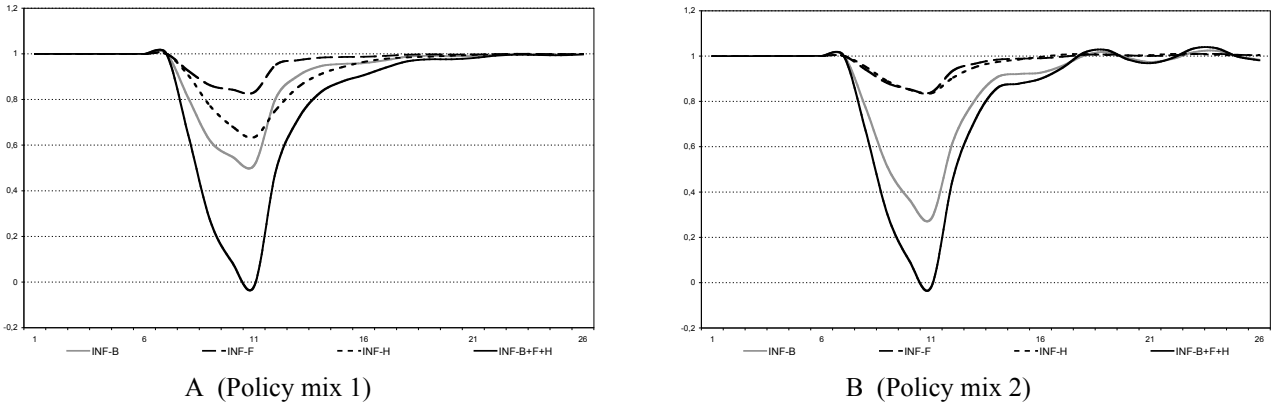


Figure 12. Fall in the state of confidence during 4 years. Effects on the rate of inflation

Contrary to IS-LM, to New-Keynesians or to usual PK-SFC models, the curve of interest rates is not exogenous. The spread between the short-term and the long-term interest rate is not constant. The Figures (13A-B) show the same evolution as the stylized facts of the last crisis: a quick rise of this spread (almost 3%), which corresponds to higher lender’s risk, at the time of the key rate decreasing by central bank.

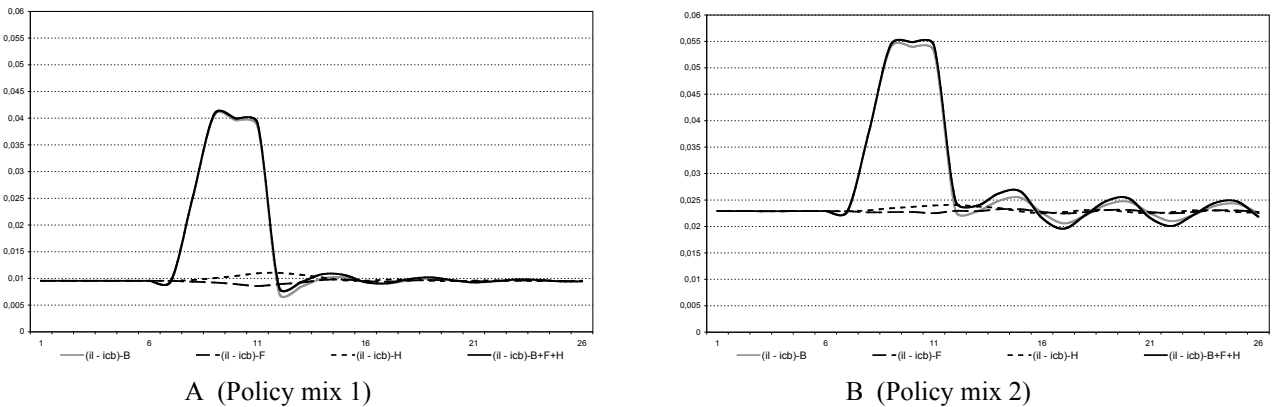


Figure 13. Fall in the state of confidence during 4 years. Effects on the spread: Long-term interest rate (i_t) – Short-term interest rate (i_{cb})

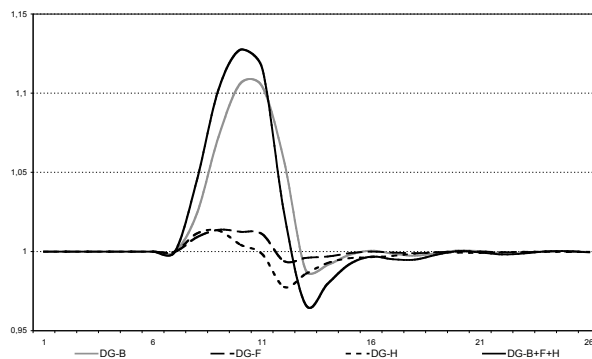


Figure 14. Fall in the state of confidence during 4 years. Effects on the Fiscal Deficit with policy mix 1.

A fall of the state of confidence in the private sector involves that the government ‘becomes’ optimistic and supports the effective demand with an increasing fiscal deficit. It is the case of the country (1)(Figure 14). But, by hypothesis, there is a balanced budget in the country (2).

A finance-led economy

We can consider that one feature of our present economy is the ‘financiarized’ accumulation of the profits. We can experiment our model with a higher part in the profits distributed to the shareholders. At the steady state, the part of profits distributed to the shareholders is 25 %. We assume that this distributed part increases from 25 % to 40 %. As a consequence, the rate of growth (Figure 15A-B) decreases and the borrower’s and the lender’s risks increases (Figure 16). The inflation decreases with the lower rate of growth and then the key interest rate of the central bank (Figure 17). With the higher leverage ratio and the lower self-financing for the firms (Figure 18), the gap between the short-term interest rate and the long-term interest rate increases (Figure 19). This is the situation in United States during the early 2000s.

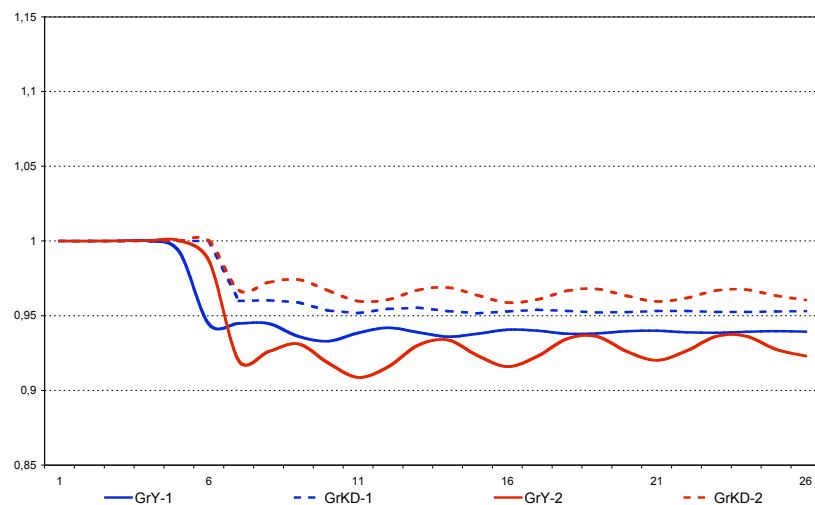


Figure 15A Part of distributed profits to the shareholders from 25 % to 40 % (Policy mix: 1 - 2)
Effects on the growth rate of the economy and on the desired growth rate of accumulation of capital

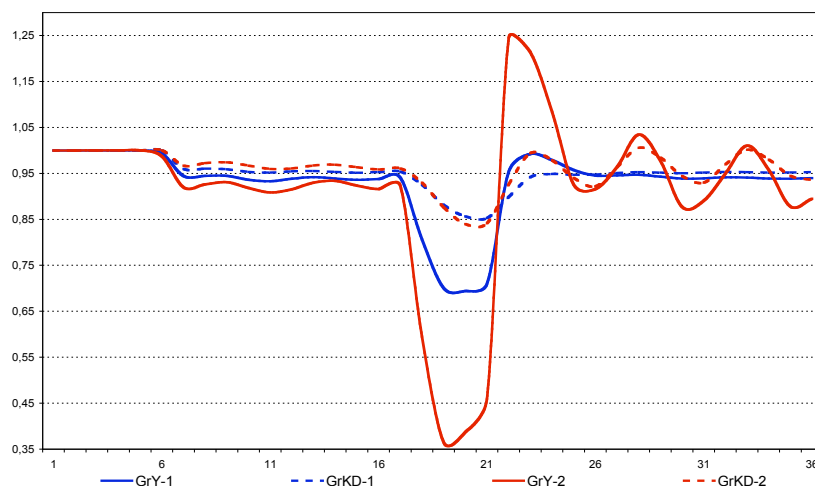


Figure 15B Part of distributed profits to the shareholders from 25 % to 40 %
and Fall in the state of confidence during 4 years (17 to 21) (Policy mix: 1 - 2)
Effects on the growth rate of the economy and on the desired growth rate of accumulation of capital

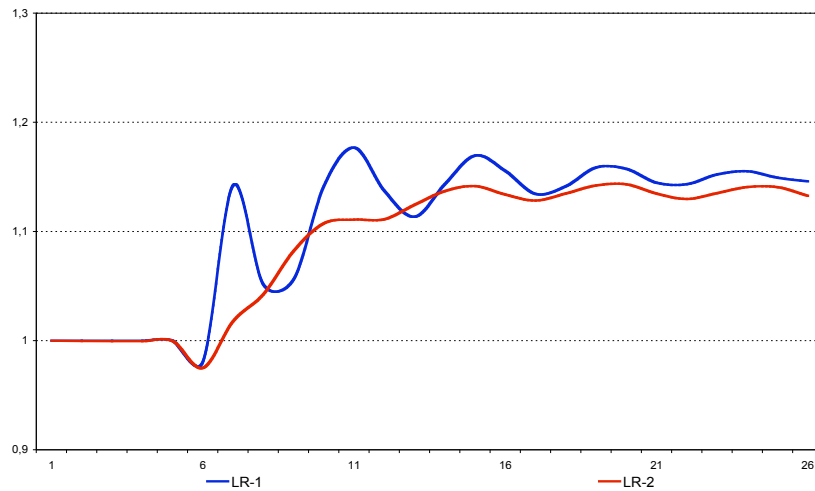


Figure 16 Part of distributed profits to the shareholders from 25 % to 40 %
Effects on the lender's risk of commercial banks

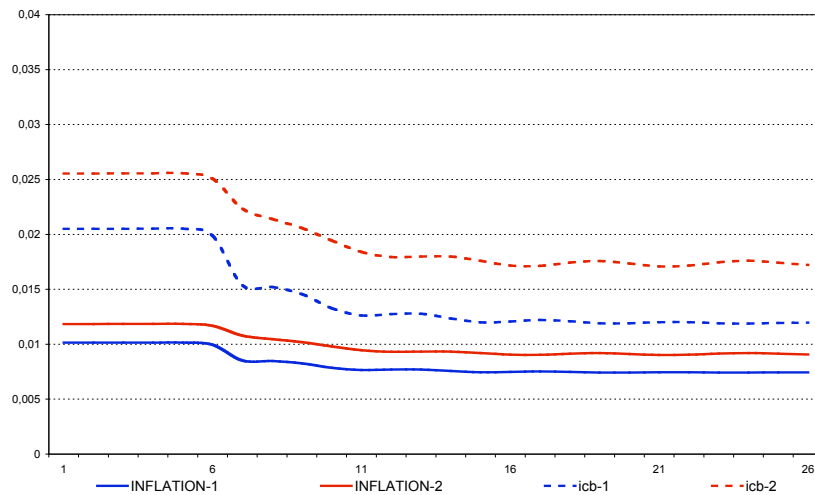


Figure 17 Part of distributed profits to the shareholders from 25 % to 40 %
Effects on the rate of inflation and on the key interest rate of the central bank

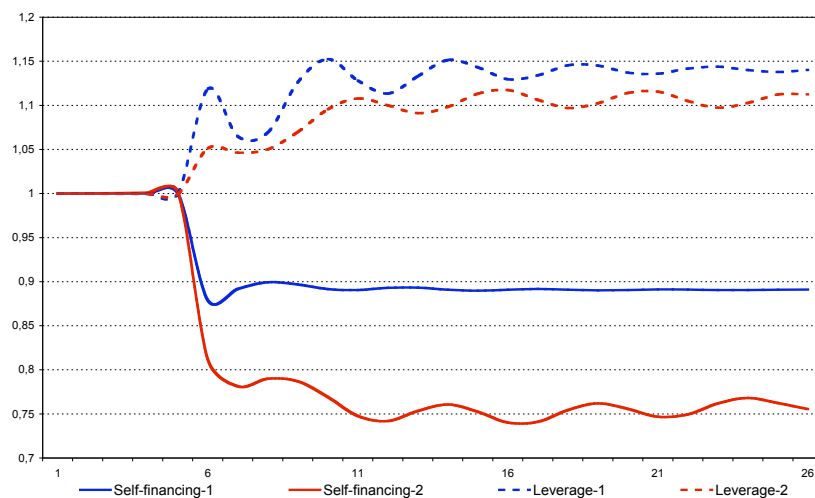


Figure 18 Part of distributed profits to the shareholders from 25 % to 40 %
Effects on self-financing and of leverage ratio of firms

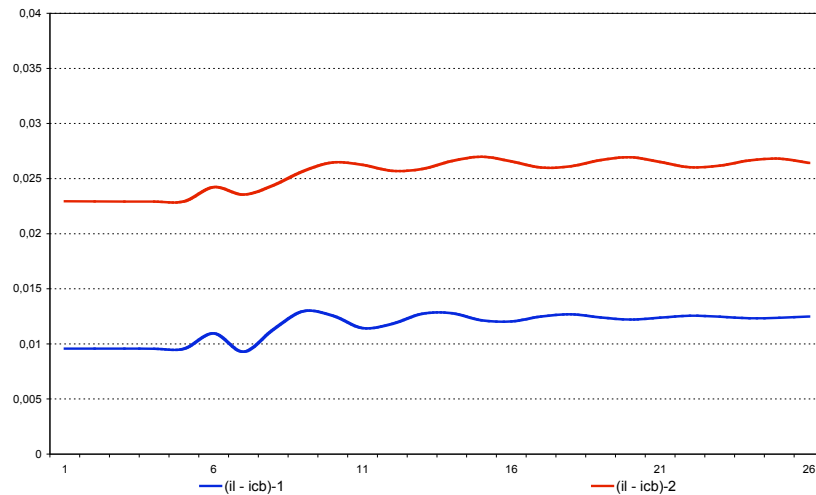


Figure 19 Part of distributed profits to the shareholders from 25 % to 40 %
 Effects on the interest rate gap: Long-term interest rate (i_l) – Short-term interest rate (i_{cb})
 (You multiply by 100 to obtain the result in %)

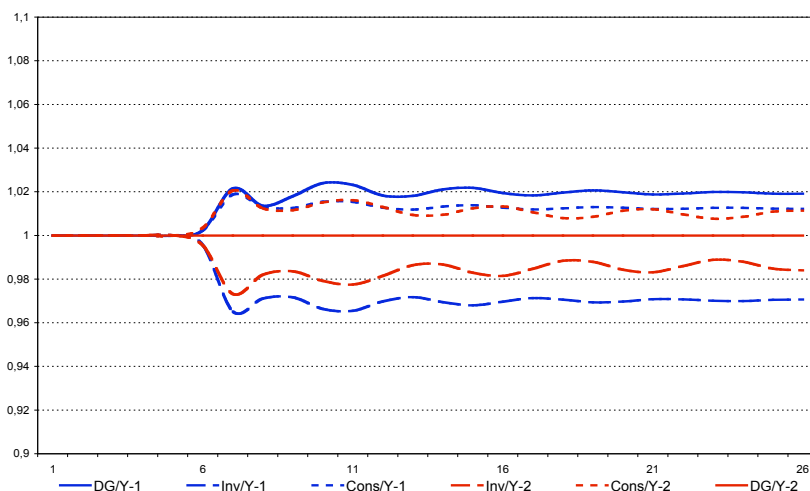


Figure 20 Part of distributed profits to the shareholders from 25 % to 40 %
 Effects on the distribution of Fiscal Deficit of State (DG/Y), Investment (Inv/Y) and Consumption (Cons/Y)
 By hypothesis, there is a balanced budget in the country 2: $DG = 0$

* * *

In this chapter, to better understand the last financial crisis and its generalization to the real world, we have tried to take into account the behaviour of private banks, the financial risks of firms and banks, and the psychological variables (state of confidence). In order to do so, Keynes and Minsky give an adequate framework. We have analyzed more deeply the problems of co-ordination between fiscal and monetary policy. We can argue that it is better to include a stabilizing fiscal policy. Indeed, simulations showed a high volatility in production with the policy mix (2) and financial instability may be also an unforeseen consequence. This stock-flow consistent model is a first step into this research agenda.

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Appendix 1. Glossary of variables

Y	National income	γ_4, γ_5	State of confidence of banks
Y_{fc}	Output of full capacity	r_{of}^a	Expected yield of bonds
gr_y	Growth rate in the national income	r_e^a	Expected return on equities
Π	Inflation	P^d	Expected distributed profits
Π^*	Inflation target	lev	Leverage ratio
N	Employment	V_C	Variation of the value of collateral
N_{fe}	Full employment		
OG	Output gap		
OG_R	Ratio of output gap		
Un	Unemployment		
r_{un}	Rate of unemployment		
L	Loans (variable long-term rate)		
CP	Commercial paper		
B	Treasury bills		
E	Equities		
e	Number of equities		
p_e	Price of equities		
OF	Bonds (Fixed rate)		
of	Number of bonds		
p_{of}	Price of fixed rate bonds		
LF	Loss function of the society		
	<i>Central Bank</i>		
P_{cb}	Central bank profits		
REF	Reserve requirements (CB refunds)		
H	High-powered money		
i_{cb}	Central bank key interest rate		
i^*	Neutral interest rate		
	<i>Commercial Banks</i>		
P_b	Banks profits		
V_b	Net wealth of banks		
CG	Capital gains of banks (Capital losses of firms)		
CG _e	Capital gains on equities		
CG _e ^a	Expected capital gains on equities		
CG _{of}	Capital gains on bonds		
CG _{of} ^a	Expected capital gains on bonds		
i_{cp}	Interest rate on commercial paper		
i_d	Interest rate on deposits		
i_l	Interest rate on loans		
i_b	Interest rate on treasury bills		
FCI	Financial Condition Index		
LR	Lender's risk		
lr	Lender's risk for long-term interest rate		
	<i>Firms</i>		
I	Net investment		
I_D	Investment demand		
W	Wages		
K	Stock of capital		
V_f	Net wealth of firms		
u	Capacity utilization rate		
gr_k	Growth rate in the stock of capital		
gr_{kD}	Desired growth rate in the stock of capital		
ΔF	Net finance		
φ	Gross finance		
φ^d	Desired gross investment		
IF	Internal Funds		
amort	Amortization (debt redemption)		
P	Firms profits		
P^d	Distributed profits		
P^u	Undistributed profits		
r_{cf}	Borrower's risk (ratio of cash flow)		
γ_0	State of confidence of firms		
	<i>Government</i>		
G	Government expenditure		
DG	Government deficit		
g_{dg}	Constant ratio of government deficit		
P_{cb}	Central bank profits		
T	Taxes		
	<i>Households</i>		
C	Consumption		
D	Bank deposits		
Y_w^a	Expected disposable income of workers		
Y_v^a	Expected disposable financial income		
Y_w	Disposable income of workers		
Y_v	Disposable financial income		
Y_h	Disposable income of household		

APPENDIX 2. THE COMPLETE MODEL: 2 VERSIONS WITHIN 4 HYPOTHESIS

Country (1) F1-M1

Country (2) F2-M2

(1)	$Y = C + I + G$	National income
(2)	$gr_y = \Delta Y / Y_{-1}$	Growth rate (of national income)
(3)	$T = \tau \cdot W_{-1}$	Taxes
(4)	$B = B_{-1} + DG$	Treasury bills
(5)	$i_b = i_l$	Interest rate on treasury bills

With τ : constant

F 1: Model 1 with a countercyclical fiscal policy

(F1-6)	$G = G_{-1} \cdot (1 + gr_{y-1})$	Government expenditure
(F1-7-i)	$DG = G + i_{b-1} \cdot B_{-1} - T - P_{cb}$	Government deficit

F 2: Model 2 with a neutral fiscal policy: DG/Y-1 constant

(F2-6-i)	$G = DG - i_{b-1} \cdot B_{-1} + T + P_{cb}$	Government expenditure
(F2-7)	$DG = g_{dg} \cdot Y$	With g_{dg} : constant ratio Government deficit

(8)	$K = K_{-1} + I$	Stock of capital
(9-iii)	$I = \varphi + IF$	Net investment
(10)	$IF = P^u - \text{amort}$	Autofinancement
(11)	$\text{amort} = a_l \cdot L_{-1} + a_{of} \cdot of_{-1} + a_{CP} \cdot CP_{-1}$	Internal Funds
(12)	$I_D = gr_{kD} \cdot K_{-1}$	Demande d'investissement
(13)	$\varphi^d = I^d - IF$	Desired gross investment
(14)	$gr_{kD} = \gamma_0 + \gamma_1 \cdot r_{cf-1} + \gamma_2 \cdot u_{-1} - \gamma_3 \cdot FCI_{-1}$ With γ_i : constant	Desired growth in the stock of capital
(15)	$r_{cf} = P^u / K_{-1}$	Borrower's risk (ratio of cash flow)
(16)	$u = Y / Y_{fc}$	Capacity utilization rate
(17)	$Y_{fc} = K_{-1} \cdot \sigma$	Output of full capacity
(18)	$FCI = \mu_1 \cdot i_l \cdot L / K + \mu_2 \cdot i_{cb} \cdot CP / K - \mu_3 \cdot E / Y$ With μ_i : constant	Financial Condition Index
(19)	$OG_R = Y_{fc} - Y / Y_{fc}$	Output gap ratio
(20)	$W = Y / (1 + \rho)$	Wages
(21-ii)	$P = Y - W - i_{l-1} \cdot L_{-1} - i_{CP-1} \cdot CP_{-1} - i_{of} \cdot of_{-1}$	Firms profits
(22)	$P^d = (1 - s_f) \cdot P_{-1}$	Profits distribués
(23-ix)	$P^u = P - P^d$	Distributed profits
(24)	$e = e_{-1} \cdot (1 + gr_{y-1})$	Number of equities
(25)	$C = \alpha_1 \cdot Y_w^a + \alpha_2 \cdot Y_v^a + \alpha_3 \cdot D_{-1}$ With α_i : constant	Consumption
(26)	$Y_w^a = Y_{w-1} + \theta_h \cdot (Y_{w-1} - Y_w^a_{-1})$ With θ_h : constant	Expected disposable income of workers
(27)	$Y_v^a = Y_{v-1} + \theta_h \cdot (Y_{v-1} - Y_v^a_{-1})$ With θ_h : constant	Revenu financier disponible anticipé
(28)	$Y_w = W - T$	Expected disposable financial income
(29)	$Y_v = i_{d-1} \cdot D_{-1}$	Revenu financier disponible
(30)	$Y_h = Y_w + Y_v$	Disposable income of workers
(31-iv)	$D = D_{-1} + Y_h - C$	Bank deposits
(32)	$\varphi = \varphi^d \cdot (1 - LR)$	Gross finance
(33)	$\Delta F = \varphi - \text{amort} + CG$	Net finance
(34)	$CG = CG_e + CG_{of}$	Capital gains of banks (Capital losses of firms)
(35)	$LR = \gamma_4 + a_1 \cdot (lev_{-1} - lev_c) - b_1 \cdot V_C + c_1 \cdot i_{cb}$ With $\gamma_4, a_1, b_1, lev_c$ and c_1 : constant	Lender's risk

- (36) $lev = (CP + OF + L) / K$ Leverage ratio
- (37) $V_C = E / E_{-1}$ Value of the collateral
- (38) $OF = (\lambda_{10} + \lambda_{11} \cdot r_{of}^a - \lambda_{12} \cdot r_e^a - \lambda_{13} \cdot i_l - \lambda_{14} \cdot i_{CP}) \cdot F$ Bonds (Fixed rate)
- (39) $E = (\lambda_{20} - \lambda_{21} \cdot r_{of}^a + \lambda_{22} \cdot r_e^a - \lambda_{23} \cdot i_l - \lambda_{24} \cdot i_{CP}) \cdot F$ Equities
- (40) $L = (\lambda_{30} - \lambda_{31} \cdot r_{of}^a - \lambda_{32} \cdot r_e^a + \lambda_{33} \cdot i_l - \lambda_{34} \cdot i_{CP}) \cdot F$ Loans (variable long-term rate)
- (41) $CP = F - OF - E - L$ Commercial paper
- (42) $r_{of}^a = i_{of} + CG_{of}^a / OF_{-1}$ With i_{of} : constant Expected yield of bonds
- (43) $CG_{of}^a = CG_{of-1} + \theta_b \cdot (CG_{of-1} - CG_{of}^a)$ Expected capital gains on bonds
- (44) $CG_{of} = \Delta p_{of} \cdot of_{-1}$ Capital gains on bonds
- (45) $of = OF / p_{of}$ Number of bonds
- (46) $p_{of} = p_{of-1} (1 + i_{of}) / (1 + i_l)$ Prix des obligations à taux fixe
- (47) $r_e^a = (P^{da} + CG_e^a) / E_{-1}$ Expected return on equities
- (48) $P^{da} = P_{-1}^d + \theta_b \cdot (P_{-1}^d - P^{da})$ Expected distributed profits
- (49) $CG_e^a = CG_{e-1} + \theta_b \cdot (CG_{e-1} - CG_e^a)$ Expected capital gains on equities
- (50) $CG_e = \Delta p_e \cdot e_{-1}$ Capital gains on equities
- (51) $p_e = E / e$ Price of equities
- (52) $i_l = i_{cb} + lr + \chi_1$ With χ_1 : constant Interest rate on loans
- (53) $lr = \gamma_5 + a_2 \cdot (lev_{-1} - lev_c) - b_2 \cdot V_C$ Lender's risk for long-term interest rate
With γ_5, a_2 and b_2, Lev_c constant = convention on leverage ratio
- (54) $i_{CP} = i_{cb} + \chi_2$ With χ_2 : constant $\chi_1 > \chi_2$ Interest rate on comm. paper
- (55) $i_d = i_{cb} - \chi_3$ Interest rate on deposits
- (56-v) $P_b \equiv i_{b-1} \cdot B_{-1} + i_{l-1} \cdot L_{-1} + i_{CP-1} \cdot CP_{-1} + i_{of} \cdot of_{-1} + P^d - i_{d-1} \cdot D_{-1} - i_{cb-1} \cdot REF_{-1}$ Banks profits
- (57) $H = \eta \cdot D$ High powered money (bank reserves)
- (58-vii) $P_{cb} \equiv i_{cb-1} \cdot REF_{-1}$ Central bank profits

M1: Country 1 with a Taylor rule (inflation gap and output gap) RM1

(M1-59) $i_{cb} = i^* + \Pi - \alpha_4 \cdot OG + \alpha_5 (\Pi - \Pi^*)$ Central bank key interest rate (Taylor rule)

M2: Country 2 with a truncated Taylor rule (only inflation gap) RM2

(M2-59) $i_{cb} = i^* + \alpha_5 (\Pi - \Pi^*)$ Central bank key interest rate (Truncated TR)

(60-vi) $REF \equiv REF_{-1} + \Delta H + \Delta B + \Delta F - CG - P_b - \Delta D$ Reserve requirements (CB refunds)

(61) $\Pi = \Pi^* + d_1 \cdot (OG_{Rmini} - OG_R) + d_2 \cdot (OG_{Rmaxi} - OG_R)$ Inflation (NKPC)

Missing equation : (62-viii) $REF = H$